APPENDIX A

OhioEPA

State of Ohio Environmental Protection Agency

STREET ADDRESS:

00 WaterMark Drive
mbus, OH 43215-1099

TELE: (614) 644-3020 FAX: (614) 644-2329

MAILING ADDRESS:

P.O. Box 1049
Columbus, OH 43216-1049

August 28, 1995

Re: Ohio EPA Permit No. 4PE00001*GD
Facility Name: Newark Waste Water Treatment Plant

Mayor and Council
City of Newark
40 West Main Street
Newark, Ohio 43055

Ladies and Gentlemen:

Transmitted herewith is one copy of the final National Pollutant Discharge Elimination System permit referenced above.

You are hereby notified that this action of the director is final and may be appealed to the Environmental Board of Review pursuant to Section 3745.04 of the Ohio Revised Code. The appeal must be in writing and shall set forth the action complained of and the grounds upon which the appeal is based. It must be filed with the Environmental Board of Review within thirty (30) days after notice of the director's action. A copy of the appeal must be served on the director of the Ohio Environmental Protection Agency and the Environmental Law Division of the Office of the Attorney General within three days of filing with the Board. An appeal may be filed with the Environmental Board of Review at the following address:

Environmental Board of Review
236 East Town Street, Room 300
Columbus, Ohio 43215

Sincerely,

Martha D. Spurbeck

Martha D. Spurbeck, Supervisor
Permit Processing Unit
Division of Surface Water

MDS/ph

Enclosure

CERTIFIED MAIL

AUG 1995
MAYOR'S OFFICE
RECEIVED

STATEMENT OF NPDES PERMIT FEE DUE

PLEASE RETURN THIS COPY WITH YOUR REMITTANCE

Entity Name:

Mayor and Council
City of Newark

Permit No.: 4PE00001*GD

Effective Date: October 1, 1995

Mailing Address:

40 West Main Street
Newark, Ohio 43055

Facility Location:

Newark Waste Water Treatment Plant
1003 East Main Street
Newark, Ohio 43055

Permit fees for the above facility were computed in accordance with the following information and at rates established in Section 3745.11 of the Ohio Revised Code.

Outfall Number	Design Flow (GPD)	Rate	Charges
001	8,000,000	$ 750.00	$ 750.00

FEE PAYMENT DUE: $ 750.00

Please remit not later than 15 days after the cited effective date of this permit. Make check payable to "Treasurer, State of Ohio" and mail it to:

Ohio Environmental Protection Agency
Office of Fiscal Administration
P. O. Box 1049
Columbus, OH 43216-1049

Please enclose this copy with your payment.

45/CN

Application No. OH0026671

Issue Date: August 28, 1995

Effective Date: October 1, 1995

Expiration Date: October 31, 1999

Ohio Environmental Protection Agency
Authorization to Discharge Under the National Pollutant Discharge Elimination System

In compliance with the provisions of the Federal Water Pollution Control Act, as amended (33 U.S.C. 1251 et. seq., hereinafter referred to as the "Act"), and the Ohio Water Pollution Control Act (Ohio Revised Code Section 6111),

City of Newark

is authorized by the Ohio Environmental Protection Agency, hereinafter referred to as "Ohio EPA," to discharge from the wastewater treatment works located at 1003 East Main Street, Newark, Ohio, Licking County

and discharging to the Licking River

in accordance with the conditions specified in Parts I, II, and III of this permit.

This permit is conditioned upon payment of applicable fees as required by Section 3745.11 of the Ohio Revised Code.

This permit and the authorization to discharge shall expire at midnight on the expiration date shown above. In order to receive authorization to discharge beyond the above date of expiration, the permittee shall submit such information and forms as are required by the Ohio EPA no later than 180 days prior to the above date of expiration.

Donald R Schregardus

Donald R. Schregardus
Director

Form EPA 4429

Part I, A. - FINAL EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

1. During the period beginning on the effective date of this permit and lasting until the expiration date, the permittee is authorized to discharge in accordance with the following limitations and monitoring requirements from outfall 4PE00001001. See Part II, **OTHER REQUIREMENTS**, for locations of effluent sampling.

EFFLUENT CHARACTERISTIC			DISCHARGE LIMITATIONS				MONITORING REQUIREMENTS	
			Concentration Specified Units		Loading* kg/day			
Reporting Code	Units	Parameter	30 day	7 day	30 day	7 day	Meas. Freq.	Sample Type
00010	°C	Water Temperature	-	-	-	-	Daily	Continuous Max. Ind. Therm.
00530	mg/l	Total Suspended Solids						
		(Summer)	15	23	454	697	3/Week	Composite
		(Winter)	30	45	909	1,363	3/Week	Composite
00556	mg/l	Oil and Grease	Not to exceed 10 at any time.				1/2 Weeks	Grab
00610	mg/l	Nitrogen, Ammonia (NH_3)						
		(Summer)	2.5	3.8	76	115	3/Week	Composite
		(Winter)	12.0	18.0	363	545	3/Week	Composite
31616	#/100ml	Fecal Coliform (Summer Only)	1000	2000	-	-	3/Week	Grab
50050	MGD	Flow Rate	-	-	-	-	Daily	Continuous
80082	mg/l	$CBOD_5$ (Summer)	15	23	454	697	3/Week	Composite
		(Winter)	25	40	757	1,212	3/Week	Composite

2. The pH (Reporting Codes 00402 (minimum) and 00401 (maximum)) shall not be less than 6.5 S.U. nor greater than 9.0 S.U. and shall be monitored daily by multiple grab sample.

3. If the entity uses chlorine for disinfection, the Chlorine Residual shall be maintained at a level not to exceed 0.038 mg/l and shall be monitored daily by multiple grab sample. (Summer only)**

4. The Dissolved Oxygen (Reporting Code 00300) shall be maintained at a level of not less than 6.0 mg/l (summer) and 2 mg/l (winter) and shall be monitored daily by multiple grab sample.

* The average effluent loading limitations are established using the following flow value: 8.0 MGD.
** See Part II, Items I, J, and M.

Part I, A. - **FINAL EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS**

5. During the period beginning on the effective date of this permit and lasting until the expiration date, the permittee is authorized to discharge in accordance with the following limitations and monitoring requirements from outfall 4PE00001001. See Part II, **OTHER REQUIREMENTS**, for locations of effluent sampling.

EFFLUENT CHARACTERISTIC			DISCHARGE LIMITATIONS				MONITORING REQUIREMENTS	
			Concentration Specified Units		Loading kg/day			
Reporting Code	Units	Parameter	30 day	Daily Max.	30 day	Daily Max.	Meas. Freq.	Sample Type
00335	mg/l	COD	-	-	-	-	1/Month	Composite
00625	mg/l	Nitrogen, Total Kjeldahl	-	-	-	-	1/Month	Composite
00630	mg/l	Nitrogen, Nitrite + Nitrate	-	-	-	-	1/Month	Composite
00981	µg/l	Selenium, Total Recoverable*	-	-	-	-	1/Quarter	Composite
00982	µg/l	Thallium, Total Recoverable*	-	-	-	-	1/Quarter	Composite
01074	µg/l	Nickel, Total Recoverable*	-	-	-	-	1/Quarter	Composite
01094	µg/l	Zinc, Total Recoverable*	-	-	-	-	1/Quarter	Composite
01113	µg/l	Cadmium, Total Recoverable*	6.8	31	.21	.94	1/Month	Composite
01114	µg/l	Lead, Total Recoverable*	75	880	2.27	26.7	1/Month	Composite
01118	µg/l	Chromium, Total Recoverable*	-	-	-	-	1/Quarter	Composite
01119	µg/l	Copper, Total Recoverable*	63	88	1.91	2.67	1/Month	Composite
01220	µg/l	Chromium, Dissolved Hexavalent**	-	-	-	-	1/Quarter	Grab
39100	µg/l	Bis(2-ethylhexyl) Phthalate**	-	-	-	-	1/Quarter	Grab
99992	µg/l	Mercury, Total Recoverable*(1)	0.036	0.3	.0011	.0091	1/Month	Composite
99995	mg/l	Cyanide, Free**	0.037	0.092	1.12	2.79	1/Month	Grab

* See Part II, Item P.
** See Part II, Item Q.

(1) See Part II, Item M.

Part I, B. - ADDITIONAL MONITORING REQUIREMENTS

1. Influent Monitoring. The permittee shall monitor the treatment works' influent wastewater at Station Number 4PE00001601, and report to the Ohio EPA in accordance with the following table. Samples of influent used for determination of net values or percent removal must be taken the same day as those samples of effluent used for that determination. See Part II, OTHER REQUIREMENTS, for location of influent sampling.

CHARACTERISTIC			MONITORING REQUIREMENTS	
Reporting Code	Units	Parameter	Measurement Frequency	Sample Type
00010	°C	Water Temperature	Daily	Continuous Max.
00401	S.U.	pH, Maximum	Daily	Multiple Grab
00402	S.U.	pH, Minimum	Daily	Multiple Grab
00530	mg/l	Total Suspended Solids	3/Week	Composite
00981	µg/l	Selenium, Total Recoverable*	1/Quarter	Composite
00982	µg/l	Thallium, Total Recoverable*	1/Quarter	Composite
01074	µg/l	Nickel, Total Recoverable*	1/Quarter	Composite
01094	µg/l	Zinc, Total Recoverable*	1/Quarter	Composite
01113	µg/l	Cadmium, Total Recoverable*	1/Month	Composite
01114	µg/l	Lead, Total Recoverable*	1/Month	Composite
01118	µg/l	Chromium, Total Recoverable*	1/Quarter	Composite
01119	µg/l	Copper, Total Recoverable*	1/Month	Composite
01220	µg/l	Chromium, Dissolved Hexavalent**	1/Quarter	Grab
39100	µg/l	Bis(2-ethylhexyl) Phthalate**	1/Quarter	Grab
80082	mg/l	CBOD$_5$	3/Week	Composite
99992	µg/l	Mercury, Total Recoverable*	1/Month	Composite
99996	mg/l	Cyanide, Total*	1/Month	Composite

* See Part II, Item P.
** See Part II, Item R.

Part I, B. - ADDITIONAL MONITORING REQUIREMENTS

2. Upstream and Downstream. The permittee shall monitor the receiving stream, upstream of the point of discharge, at Station Number 4PE00001801, and downstream of the point of discharge, at Station Number 4PE00001901, and report to the Ohio EPA in accordance with the following table. See Part II, OTHER REQUIREMENTS, for location of sampling.

CHARACTERISTIC			MONITORING REQUIREMENTS	
Reporting Code	Units	Parameter	Measurement Frequency	Sample Type
00010	°C	Water Temperature	1/Month	Grab
00300	mg/l	Dissolved Oxygen	1/Month	Grab
00400	S.U.	pH	1/Month	Grab
00610	mg/l	Nitrogen, Ammonia (NH_3)	1/Month	Grab
00900	mg/l	Hardness, Total ($CaCO_3$)	1/Month	Grab*
01074	µg/l	Nickel, Total Recoverable**	1/Quarter	Grab*
01094	µg/l	Zinc, Total Recoverable**	1/Quarter	Grab*
01113	µg/l	Cadmium, Total Recoverable**	1/Month	Grab*
01114	µg/l	Lead, Total Recoverable**	1/Month	Grab*
01118	µg/l	Chromium, Total Recoverable**	1/Quarter	Grab*
01119	µg/l	Copper, Total Recoverable**	1/Month	Grab*
01220	µg/l	Chromium, Dissolved Hexavalent**	1/Quarter	Grab*
31616	#/100ml	Fecal Coliform (Summer)	1/Month	Grab
99992	µg/l	Mercury, Total Recoverable**	1/Month	Grab*
99996	mg/l	Cyanide, Total**	1/Month	Grab*

* Downstream only.
** See Part II, Item P.

Part I, B. - ADDITIONAL MONITORING REQUIREMENTS

3. Sludge. The permittee shall monitor the treatment works' final sludge at Station Number 4PE00001581, and report to the Ohio EPA in accordance with the following table. See Part II, OTHER REQUIREMENTS, for location of sludge sampling.

CHARACTERISTIC			MONITORING REQUIREMENTS*	
Reporting Code	Units	Parameter	Measurement Frequency	Sample Type
00403	S.U.	pH	1/Month	Grab
00611	mg/kg	Nitrogen, Ammonia	1/Month	Composite
00627	mg/kg	Nitrogen, Total Kjeldahl	1/Month	Composite
00668	mg/kg	Phosphorous	1/Month	Composite
01003	mg/kg	Arsenic, Total	1/Quarter	Composite
01028	mg/kg	Cadmium, Total	1/Quarter	Composite
01029	mg/kg	Chromium, Total	1/Quarter	Composite
01043	mg/kg	Copper, Total	1/Quarter	Composite
01052	mg/kg	Lead, Total	1/Quarter	Composite
01068	mg/kg	Nickel, Total	1/Quarter	Composite
01093	mg/kg	Zinc, Total	1/Quarter	Composite
01148	mg/kg	Selenium, Total	1/Quarter	Composite
70316	Dry Tons	Sludge Weight***	Daily	Total
70318	%	Sludge Solids, Percent Total	Daily	Grab
70322	%	Sludge Solids, Percent Volatile	Daily	Grab
71921	mg/kg	Mercury, Total	1/Quarter	Composite
78465	mg/kg	Molybdenum, Total	1/Quarter	Composite

See Part II, OTHER REQUIREMENTS, Items S and T.

* When sludge is removed from the wastewater treatment facility and disposed of by land application. If no sludge is removed during month, leave data area blank and enter "No sludge removed during month" in the "Additional Remarks" section (signature still required).

** Units of mg/kg on dry weight basis.

*** Calculated total for the sampling period.

Part I, B. ADDITIONAL MONITORING REQUIREMENTS

4. Plant Bypasses. The permittee shall monitor the treatment plant's bypasses, when discharging, at stations 4PE00001002 through 4PE00001003 and report to the Ohio EPA in accordance with the following table. See Part II, OTHER REQUIREMENTS, for location of sampling.

CHARACTERISTIC Reporting Code	Units	Parameter	MONITORING REQUIREMENTS Measurement Frequency	Sample Type
00530	mg/l	Suspended Solids	Once/day	Grab
50050	MGD	Flow	Daily	Continuous
80082	mg/l	$CBOD_5$	Once/day	Grab
80998	Number	Occurrences	Daily	Continuous
80999	Hr/day	Duration	Daily	Continuous

Data for the number of occurrence(s) per day, the daily duration, and the total daily flow may be estimated.

If there are no bypass discharges during month, leave data area blank and enter "No discharges during month" in the "Additional Remarks" section (signature still required).

Treatment plant bypass is prohibited except under emergency conditions as authorized by federal regulation at 40 CFR 122.41(m) or Part III, Item 11, General Conditions, of this permit.

Part I, C.- SCHEDULE OF COMPLIANCE

1. A. The permittee shall evaluate the adequacy of local industrial user limitations to attain compliance with final table limits. No later than four months after the effective date of this permit or by February 1, 1996, the permittee shall submit to Ohio EPA, Central Office Pretreatment Unit, in duplicate, technical justification for revising local industrial user limitations to attain compliance with final table limits, along with a pretreatment program modification request, or technical justification for retaining existing local industrial user limitations.

   Technical justification is required for cadmium, chromium, copper, lead, nickel, and zinc. Technical justification is also required for arsenic, cyanide, mercury, molybdenum, selenium, and silver unless screening of wastewater and sludge indicate these pollutants are not present in significant amounts. Furthermore, technical justification is required for any other pollutants where a local limit may be necessary to protect against pass through and interference.

   To demonstrate technical justification for new local industrial user limits or justification for retaining existing limits, the following information must be submitted to Ohio EPA.

   a. Domestic/background and industrial pollutant contributions.

   b. Treatment plant removal efficiencies.

   c. A comparison of maximum allowable headworks loadings based on all applicable criteria. Criteria may include sludge disposal, NPDES permit limits, and interference with biological processes such as activated sludge, sludge digestion, nitrification, etc.

   d. If revised industrial user discharge limits are proposed, the method of allocating available pollutant loads to industrial users.

   e. Supporting data, assumptions, and methodologies used in establishing the information A through D above.

   B. If revisions to local industrial user limitations are required to attain compliance with the final table limits, no later than twelve months after the effective date of this permit or by October 1, 1996, the permittee shall incorporate revised local industrial user limitations in all industrial user control documents. The permittee shall notify Ohio EPA, Central Office Pretreatment Unit, in writing, within two weeks of incorporation of revised local industrial user limitations in all user control documents.

See Part III, Item 12. Noncompliance Notification.

Part I, C.- SCHEDULE OF COMPLIANCE (Continued)

2\. A. The permittee is required to immediately implement the nine minimum control measures identified by U.S. EPA as BCT/BAT for CSOs that are applicable to its system:

1. Proper operation and regular maintenance for the sewer system and CSO points;
2. Maximum use of the collection system for storage of wet weather flow prior to allowing overflows;
3. Review and modification of pretreatment program to minimize the impact of nondomestic discharges from CSOs;
4. Maximization of flow to POTW for treatment;
5. Prohibition of dry weather overflows;
6. Control of solid and floatable materials in CSO discharges;
7. Required inspection, monitoring and reporting of CSOs;
8. Pollution prevention programs that focus on reducing the level of contaminants in CSOs; and
9. Public notification for any areas affected by CSOs, especially beach areas and areas where contact recreation occurs. (Ohio EPA expects communities to develop and implement an effective public advisory system that informs the public of the possible health and environmental impacts associated with CSOs, and advises against contact recreation when elevated bacteria levels may endanger public health.)

B. Within 8 months of the effective date of this permit, or by June 1, 1996, the permittee shall submit two copies of an addendum for the City of Newark Combined Sewer Overflow Operational & Maintenance Plan to the Central District Office of Ohio EPA for approval. The addendum shall provide documentation on the actions the permittee is taking to implement minimum controls numbered A.7 through A.9 above. If a minimum control is not applicable, this must be explained. If the permittee is not fully implementing a minimum control, the documentation shall include a fixed date schedule leading to complete implementation of the control by no later than January 1, 1997.

During the time between submission of the addendum to the CSO Operational & Maintenance Plan and its approval by Ohio EPA, the permittee shall continue implementation of the minimum controls as outlined in the documentation. When the addendum to the Plan is approved, the permittee shall operate and maintain the entire wastewater treatment system in accordance with the approved Plan, including the approved addendum.

3\. Within four (4) months of the effective date of this permit, or by February 1, 1996, the permittee shall submit to the Central District Office of Ohio EPA documentation that the wastewater treatment plant is adequately treating all wet weather flow that the plant receives. This shall include at least the following: 1) documentation that the equalization basins are not bypassed and do not overflow (for a minimum of 2-3 years); 2) illustrations that the wet weather flow has been meeting permit requirements (for example picking out several wet months and providing supporting information like rainfall, effluent results, hourly peak flow, equalization basin use, etc. for a few specific time periods); 3) an updated version of the flow graph contained in Exhibit V-C of the City of Newark Combined Sewer Overflow Operational and Maintenance Plan to include the most recent data; and 4) verification that the city is not knowingly preventing flow from reaching the plant - or if they are, how those decisions are made (this could include demonstrating that the influent sewers are hydraulically at a maximum or that there is no throttling of the influent in any way).

Part I, C.- SCHEDULE OF COMPLIANCE (Continued)

4. Within 27 months of the effective date of this permit or by January 1, 1998, the permittee shall submit the results of a study characterizing the fecal coliform levels in the Licking River upstream and downstream of its combined sewer overflow discharges. Sampling shall be conducted during the summer months, May - October.

   Baseline bacteria sampling shall be conducted during dry weather periods when there has been no rainfall during the preceding 72 hours. The study shall include dry weather data from at least 10 days.

   Wet weather sampling shall be conducted following three rain events during which combined sewer overflows occur. Sampling should occur only if the rainfall volume exceeds 0.1 inches, and, if possible, the rain events should vary in magnitude and duration. Wet weather sampling shall begin on the day of the rain event and continue for the next 3 days. At least 1 sample shall be collected each day.

   The upstream sampling points shall be on the North Fork Licking River, South Fork Licking River and Raccoon Creek above all of the permittee's combined sewer overflows. The downstream sampling point shall be on the Licking River below all of the permittee's combined sewer overflows, and, if possible, above the wastewater treatment plant outfall. Fecal coliform sampling done by the permittee as part of this study may be used, as appropriate, to fulfill monitoring requirements at stations 4PE00001801 and 4PE00001901.

   Samples for this study shall be collected as grab samples.

   Results reported to Ohio EPA shall include a description of the four sampling locations, the date and time when samples were collected, a description of the sampling procedure, the analytical results, and for wet weather sampling, the inches and duration of the preceding rainfall. Based on the results of the instream bacteria study, this permit may be modified to require the permittee to develop controls to ensure that these waters attain the applicable water quality standards for bacteria when contact recreation is occurring. This would include a proposal for notifying the public when elevated bacteria levels may endanger public health.

5. A. Within 6 months of the effective date of this permit or by April 1, 1996, the permittee shall submit to the Central District office for review and comment 2 copies of a proposal for a monitoring program that satisfies the following objectives:

   - o provides adequate data to characterize and model the collection system and combined sewer overflows
   - o supports development and implementation of the minimum control measures for CSOs
   - o supports development and implementation of a long-term control plan
   - o allows the effectiveness of the control measures to be evaluated.

   Characterization includes developing an understanding of the collection system and how it responds to a variety of rain events; identifying separate sewered areas tributary to combined sewer overflows and determining the impacts on CSOs; identifying sources of toxic and hazardous pollutants and estimating the loads entering the combined sewer system; determining the frequency and volume of overflows; and determining the concentrations and loadings of pollutants being discharged.

   If the portion of the collection system tributary to the North Fork Licking River CSO's can be isolated, the scope of the monitoring proposal may be restricted to those areas.

Part I, C.- **SCHEDULE OF COMPLIANCE** (Continued)

5. Continued

   B. Within 24 months of the effective date of this permit or by October 1, 1997, the permittee shall submit to the Central District Office 2 copies of a report on the characterization of the collection system and the combined sewer overflows.

6. Within 36 months of the effective date of this permit or by October 1, 1998, the permittee shall develop and submit for approval to the Central District Office two copies of a Combined Sewer System Long-Term Control Plan. The goal of the plan is that discharges from combined sewer overflows shall not cause or significantly contribute to violations of water quality standards or impairment of designated uses. The plan shall address, as a minimum, water quality impacts to the North Fork Licking River, and shall include the following:

   A. The permittee shall consider either the "presumption" or the "demonstration" approach included in U.S. EPA's National Combined Sewer Overflow Policy (April 19, 1994). Elimination of overflows shall always be evaluated as a control option and shall be implemented if it is cost effective, economically achievable, and does not cause new or significantly increased overflows elsewhere in the system. As part of CSO control, Ohio EPA expects communities to identify combined and separate sewered areas and to minimize the impact of separate sanitary flows on CSO discharges. Steps to consider include: using express sewers to route sanitary flows around combined sewer areas; reducing infiltration and inflow into the separate sewers. Communities also should consider ways to reduce stormwater flow into combined sewers. Steps to consider include: diverting stormwater away from the combined system (e.g, by constructing retention basins; removing inflow, such as roof drains); using catch basin flow restriction.

   B. The permittee shall conduct cost/performance analyses to determine where the increment of CSO abatement achieved diminishes compared to the increased costs.

   C. The permittee shall propose revisions to the Combined Sewer Overflow Operational and Maintenance Plan necessary to implement long term controls.

   D. The permittee shall propose an implementation schedule based on consideration of the following: the relative magnitude of adverse impacts on water quality standards and designated uses, the community's financial capability, the relative cost/performance evaluations of individual projects, the priorities developed through public participation, and previous efforts to control CSOs.

   E. The permittee shall give the public affected by the development and implementation of the CSO control plan the opportunity to actively participate in the process. This includes participation in the evaluation and selection of controls, in determining the value that the community places on recreation opportunities that are impacted by CSO discharges, and in setting priorities for CSO control projects.

   When the long term control plan is approved by the Director of Ohio EPA, the implementation schedule included in the plan shall be incorporated by reference as part of this permit, or this permit may be modified to incorporate the approved implementation schedule.

Part II, OTHER REQUIREMENTS

A. The wastewater treatment works must be under supervision of a Class IV State certified operator as required by rule 3745-7-02 of the Ohio Administrative Code.

B. The plant must be staffed and operated in accordance with the Ohio EPA approved Operation and Maintenance Manual.

C. Description of the location of the required sampling stations are as follows:

Sampling Station	Description of Location
4PE00001001	Plant effluent. (Lat: 40° 31′ 10"; Long: 82° 21′ 48")
4PE00001002	Raw bypass.
4PE00001003	Settled bypass.
4PE00001581	Sludge for disposal by land application at agronomic rates.
4PE00001601	Plant influent.
4PE00001801	Upstream of outfall, outside zone of effluent/receiving water interaction.
4PE00001901	Downstream station.

D. All parameters, except flow, need not be monitored on days when the plant is not normally staffed (Saturdays, Sundays, and Holidays). On those days, report "AN" on the monthly report form.

E. The permittee is authorized to discharge from the following overflows and bypasses only during wet weather periods when the flow in the sewer system exceeds the capacity of the sewer system. See Part II, Item F for monitoring and reporting requirements. Also see Part III, Item 11.

Station Number	Description	Latitude	Longitude	Receiving Stream
4PE00001004	West Bank of North Fork, East of North Street	82° 24′ 00"	40° 04′ 15"	North Fork Licking River
4PE00001005	West Bank of North Fork, South of Expressway	82° 23′ 48"	40° 03′ 39"	North Fork Licking River
4PE00001006	East Bank of North Fork, West of Monroe Street	82° 23′ 42"	40° 03′ 25"	North Fork Licking River
4PE00001007	West Bank of North Fork, South of Everett Avenue	82° 23′ 48"	40° 03′ 40"	North Fork Licking River
4PE00001008	West Bank of North Fork, South of Ohio Street	82° 23′ 30"	40° 03′ 11"	North Fork Licking River
4PE00001009	West Bank of North Fork, North of Manning Street	82° 24′ 06"	40° 04′ 21"	North Fork Licking River
4PE00001012	South Bank of South Fork, Northwest of Nathaniel Street	82° 23′ 44"	40° 03′ 05"	South Fork Licking River
4PE00001013	North Bank of South Fork, East of South Second Street	82° 23′ 48"	40° 03′ 02"	South Fork Licking River
4PE00001014	North Bank of South Fork, South of National Drive between South Fourth and Fifth Streets	82° 24′ 08"	40° 02′ 51"	South Fork Licking River
4PE00001015	South Bank of South Fork, North of Franklin Avenue	82° 24′ 28"	40° 02′ 42"	South Fork Licking River
4PE00001016	West Bank of South Fork, South of West Orchard Street	82° 24′ 49"	40° 02′ 30"	South Fork Licking River

Part II, OTHER REQUIREMENTS (Continued)

Station Number	Description	Latitude	Longitude	Receiving Stream
4PE00001017	West Bank Raccoon Creek, East of Iron Avenue	82° 24' 41"	40° 03' 02"	Racoon Creek
4PE00001018	East Bank of Raccoon Creek, North of B & O Railroad	82° 24' 41"	40° 03' 10"	Racoon Creek
4PE00001019	West Bank of Raccoon Creek, South of Wilson Street	82° 24' 42"	40° 03' 11"	Racoon Creek
4PE00001020	East Bank of Raccoon Creek, North of Wilson Street	82° 24' 42"	40° 03' 12"	Racoon Creek
4PE00001021	East Bank of Raccoon Creek, South of Jefferson Street	82° 24' 43"	40° 03' 14"	Racoon Creek
4PE00001022	West Bank of Raccoon Creek, North of Main Street	82° 24' 46"	40° 03' 19"	Racoon Creek
4PE00001023	North Bank of Raccoon Creek at 9th Street	82° 24' 42"	40° 03' 19"	Racoon Creek
4PE00001024	North Bank of Raccoon Creek at 10th Street	82° 24' 57"	40° 03' 20"	Racoon Creek
4PE00001025	South Bank of Raccoon Creek at 11th Street	82° 25' 03"	40° 03' 19"	Racoon Creek
4PE00001026	North Bank of Raccoon Creek at 11th Street	82° 25' 04"	40° 03' 19"	Racoon Creek
4PE00001027	South Bank of Raccoon Creek at North Pine Street	82° 25' 18"	40° 03' 21"	Racoon Creek
4PE00001028	South Bank of Raccoon Creek at Bowers Avenue	82° 25' 32"	40° 03' 25"	Racoon Creek
4PE00001030	East Bank of Raccoon Creek, East of North 21st	82° 25' 43"	40° 03' 48"	Racoon Creek
4PE00001031	North Bank of Licking River at Lynn and Miller Streets	82° 23' 28"	40° 03' 09"	Licking River
4PE00001033	East Bank of North Fork, North of Everett Avenue Bridge	82° 23' 47"	40° 03' 41"	North Fork Licking River

F. Composite samples shall be comprised of a series of grab samples collected over a 24-hour period and proportionate in volume to the sewage flow rate at the time of sampling. Such samples shall be collected at such times and locations, and in such a fashion, as to be representative of the facility's overall performance.

G. Grab samples shall be collected at such times and locations, and in such fashion, as to be representative of the facility's performance.

H. Multiple grab samples shall be comprised of at least three grab samples collected at intervals of at least three hours during the period that the plant is staffed on each day for sampling. Samples shall be collected at such times and locations, and in such fashion, as to be representative of the facility's overall performance. The critical value shall be reported.

Part II, OTHER REQUIREMENTS (Continued)

I. Multiple grab samples for chlorine residual shall be comprised of grab samples taken once every two hours during the period that the plant is staffed on each day of sampling. Samples shall be collected at such times and locations, and in such fashion, as to be representative of the facility's overall performance. The highest value shall be reported.

J. Effluent disinfection is not directly required, however, the entity is required to meet all applicable discharge permit limits. If disinfection facilities exist, they shall be maintained in an operable condition. Any design of wastewater treatment facilities should provide for the capability to install disinfection if required at a future time. Disinfection may be required if future bacteriological studies or emergency conditions indicate the need.

K. The treatment works must obtain at least 85 percent removal of carbonaceous biochemical oxygen demand (five-day) and suspended solids during the winter (see Part III, Item 1).

L. The permittee shall comply with the requirements under Section 201(b) through (g) of P.L. 95-217 consistent with the terms of the permittee's construction grant or WPCLF loan.

M. The parameters listed below have had effluent limitations established that are below the OEPA Practical Quantification Level (OEPA PQL) of the 40 CFR Part 136 promulgated analytical procedure for those parameters. In accordance with ORC 6111.13, if an effluent limit is set below the OEPA PQL, any analytical result reported equal to or less than the OEPA PQL shall be considered to be in compliance with that limit.

REPORTING:
All analytical results, even those below the OEPA PQL (listed below), shall be reported. Analytical results are to be reported as follows:

1. Results above the PQL: Report the analytical result for the parameter of concern.

2. Results above the MDL, but below the PQL: Report the analytical result, even though it is below the PQL.

3. Results below the MDL: Analytical results below the method detection limit shall be reported as 'below detection' using the reporting code 'AA'.

The following table will be used to determine compliance with NPDES permit limit(s):

Parameter	PQL
Total Residual Chlorine	0.060 mg/l
Total Recoverable Mercury	1.0 µg/l

N. POTWs that accept hazardous wastes by truck, rail, or dedicated pipeline are considered to be hazardous waste treatment, storage, and disposal facilities (TSDFs) and are subject to regulation under the Resource Conservation and Recovery Act (RCRA). Under the "permit-by-rule" regulation found at 40 CFR 270.60(c), a POTW must 1) comply with all conditions of its NPDES permit, 2) obtain a RCRA ID number and comply with certain manifest and reporting requirements under RCRA, 3) satisfy corrective action requirements, and 4) meet all federal, state, and local pretreatment requirements.

Part II, OTHER REQUIREMENTS (Continued)

O. Final permit limitations based on preliminary or approved waste load allocations are subject to change based on modifications to or finalization of the allocation or report or changes to Water Quality Standards. Monitoring requirements and/or special conditions of this permit are subject to change based on regulatory or policy changes.

P. Sampling for these parameters at station 4PE00001001, 4PE00001601 and 4PE00001901 shall occur the same day.

Q. Sampling at station 4PE00001001 for these parameters shall occur one detention time (the time it takes for a volume of water to travel through the treatment plant) after sampling at station 4PE00001601 for the same parameters on the same day.

R. Sampling at station 4PE00001601 for these parameters shall occur one detention time (the time it takes for a volume of water to travel through the treatment plant) prior to sampling at station 4PE00001001 for the same parameters on the same day.

S. Within 6 months of the effective date of this permit, the permittee shall submit to Ohio EPA's Central District Office an evaluation of its sludge management plan, which was approved on November 3, 1992. This evaluation shall examine the adequacy of the plan, including any implementation problems encountered and any changes required, and is to reflect the actual sludge disposal practices. If significant changes are required, the permittee may be required to submit for approval a modified sludge management plan.

T. Not later than January 31 of each calendar year, the permittee shall submit two (2) copies of a report summarizing the sludge disposal and/or reuse activities of the facility during the previous year. One copy of the report shall be sent to the Ohio EPA, Division of Surface Water, Central Office, and one copy of the report shall be sent to the Central District Office. This report shall address:
1) Amount of sludge disposed of/reused in dry tons.
2) Method(s) of disposal/reuse.
3) Summary of all analyses made on the sludge, including any priority pollutant scans that may have been performed. (If a priority pollutant scan has been conducted as a part of the pretreatment program, the most recent analysis should be submitted.)
4) Problems encountered including any complaints received. The cause or reason for the problem and corrective actions taken to solve the problem should also be included. Any incidents of interference with the method of sludge disposal shall be identified, along with the cause of interference (i.e., excessive metals concentration, contaminated sludge, etc.) and the corrective actions taken.

U. It is understood by Ohio EPA that, at the time permit 4PE00001*GD becomes effective, the analytical technology does not exist to evaluate compliance with the mercury effluent limitations contained in the permit. The permittee must utilize the best available analytical technology currently approved under 40 CFR 136 for monitoring this parameter.

U. Continued.

If approval for an analytical procedure with a lower method detection level is promulgated during the period when this permit is effective, the permittee shall, within twelve months after promulgation, adopt the improved procedure for monitoring compliance with the mercury effluent limitations contained in the permit. During this twelve month interim period, the permittee shall perform analyses utilizing both the improved procedure and the previous procedure for comparison purposes while reporting only the results of the previous procedure for compliance purposes. Utilization of both types of analyses shall begin within six months of promulgation of the improved procedure, allowing a six month evaluation period.

V. PRETREATMENT PROGRAM REQUIREMENTS

Pursuant to the requirements of 40 CFR 403.8(c) and Section 6111.03(Q)(3) of the Ohio Revised Code, the permittee's pretreatment program approved by the Director and subsequent modifications approved by the Director, including conditions of such approval, are hereby incorporated by reference as terms and conditions of this permit. To ensure that the approved program is implemented in accordance with 40 CFR 403 and Chapter 6111 of the Ohio Revised Code, the permittee shall comply with the following conditions:

1) Legal Authority

The permittee shall adopt and maintain legal authority which enables it to fully implement and enforce all aspects of its approved pretreatment program including the identification and characterization of industrial sources, issuance of control documents, compliance monitoring and reporting, and enforcement.

2. Industrial User Inventory

The permittee shall identify all industrial users subject to pretreatment standards and requirements and characterize the nature and volume of pollutants in their wastewater. Dischargers determined to be Significant Industrial Users according to OAC 3745-3-01(CC) must be notified of applicable pretreatment standards and requirements within 30 days of making such a determination. This inventory shall be updated at a frequency to ensure proper identification and characterization of industrial users.

3. Local Limits

The permittee shall develop and enforce technically based local limits to prevent the introduction of pollutants into the POTW which will interfere with the operation of the POTW, pass through the treatment works, be incompatible with the treatment works, or limit wastewater or sludge use options.

For the following pollutants for which the permittee has no discharge limitation, local limits shall be developed to achieve discharge levels at or below these water quality based criteria:

Chromium, hexavalent	9 μg/l
Chromium, total	80 μg/l
Nickel	729 μg/l
Selenium	10 μg/l
Zinc	505 μg/l
Thallium	38 μg/l

V. Continued.

For the purpose of periodically reevaluating local limits, the permittee shall implement and maintain a sampling program to characterize pollutant contribution to the POTW from industrial and residential sources and to determine pollutant removal rates through the POTW. The permittee shall continue to review and develop local limits as necessary.

4. <u>Control Mechanisms</u>

The permittee shall issue individual control mechanisms to all industries determined to be Significant Industrial Users as define in OAC 3745-3-01(CC). Control mechanisms must meet at least the minimum requirements of OAC-3745-3-03(C)(1)(c).

5. <u>Industrial Compliance Monitoring</u>

The permittee shall sample and inspect industrial users in accordance with the approved program. However, monitoring frequencies must be adequate to determine the compliance status of industrial users independent of information submitted by such users. Sample collection, preservation and analysis must be performed in accordance with procedures in 40 CFR 136 and with sufficient care to produce evidence admissible in judicial enforcement proceedings.

The permittee shall also require, receive, and review self-monitoring and other industrial user reports when necessary to determine compliance with pretreatment standards and requirements.

6. <u>POTW Priority Pollutant Monitoring</u>

The permittee shall annually monitor priority pollutants, as defined by U.S. EPA, in the POTW's influent, effluent and sludge. Sample collection, preservation, and analysis shall be performed using U.S. EPA approved methods.

a. A sample of the influent and the effluent shall be collected when industrial discharges are occurring at normal to maximum levels. Both samples shall be collected on the same day or, alternately, the effluent sample may be collected following the influent sample by approximately the retention time of the POTW. The samples shall be 24 hour composites except for volatile organics and cyanide which shall be collected by appropriate grab sampling techniques. Sampling of the influent shall be done prior to any recycle streams and sampling of the effluent shall be after disinfection.

   Another sample shall be representative of sludge removed to final disposal. A minimum of one grab sample shall be taken during actual sludge removal and disposal unless the POTW uses more than one disposal option. If multiple disposal options are used, the POTW shall collect a composite of grab samples from all disposal practices which are proportional to the annual flows to each type of disposal.

Part II, OTHER REQUIREMENTS (Continued)

V. 6. Continued.

b. A reasonable attempt shall be made to identify and quantify additional constituents (excluding priority pollutants and unsubstituted aliphatic compounds) at each sample location. Identification of additional peaks more than ten times higher than the adjacent background noise on the total ion plots (reconstructed gas chromatograms) shall be attempted through the use of U.S. EPA/NIH computerized library of mass spectra, with visual confirmation by an experienced analyst. Quantification may be based on an order of magnitude estimate compared with an internal standard.

The results of these samples must be submitted on Ohio EPA Form 4221 with the permittee's annual pretreatment report. Samples may be collected at any time during the 12 months preceding the due date of the annual report and may be used to fulfill other NPDES monitoring requirements where applicable.

7. Enforcement

The permittee shall investigate all instances of noncompliance with pretreatment standards and requirements and take timely, appropriate, and effective enforcement action to resolve the noncompliance in accordance with the permittee's approved enforcement response plan.

On or prior to November 15th of each year, the permittee shall publish, in the largest daily newspaper within the permittee's service area, a list of industrial users which, during the previous 12 months, have been in Significant Noncompliance [OAC 3745-3-03(C)(2)(g)] with applicable. pretreatment standards or requirements.

8. Reporting

All reports required under this section shall be submitted to the following address in duplicate:

Ohio Environmental Protection Agency
Division of Surface Water
Pretreatment Unit
P.O. Box 1049
Columbus, OH 43216-1049

a. Quarterly Industrial User Violation Report

On or prior to the 15th day of February, May, August, and November, the permittee shall report the industrial users that are in violation of applicable pretreatment standards during the previous quarter. The report shall be prepared in accordance with guidance provided by Ohio EPA and shall include a description of all industrial user violations and corrective actions taken to resolve the violations.

V. 8. Continued.

b. Annual Pretreatment Report

On or prior to November 15th of each year, the permittee shall submit an annual report on the effectiveness of the pretreatment program, prepared in accordance with guidance provided by Ohio EPA. The report shall include, but not be limited to: a discussion of program effectiveness; and industrial user inventory; a description of the permittee's monitoring program; a description of any pass through or interference incidents; a copy of the annual publication of industries in Significant Noncompliance; and, priority pollutant monitoring results.

9. Record Keeping

All records of pretreatment activities including, but not limited to, industrial inventory data, monitoring results, enforcement actions, and reports submitted by industrial users must be maintained for a minimum of three (3) years. This period of retention shall be extended during the course of any unresolved litigation. Records must be made available to Ohio EPA and U.S. EPA upon request.

10. Program Modifications

Any proposed modifications of the approved pretreatment program must be submitted to the Ohio EPA for review, on forms available from Ohio EPA and consistent with guidance provided by Ohio EPA. If the modification is deemed to be substantial, prior approval must be obtained before implementation; otherwise, the modification is considered to be effective 45 days after the date of application. Substantial program modifications include, among other things, changes to the POTW's legal authority, control mechanism, local limits, confidentiality procedures, or monitoring frequencies.

PART III - GENERAL CONDITIONS

1. DEFINITIONS

"daily load limitations" is the total discharge by weight during any calendar day. If only one sample is taken during a day, the weight of pollutant discharge calculated from it is the daily load.

"daily concentration limitation" means the arithmetic average (weighted by flow) of all the determinations of concentration made during the day. If only one sample is taken during the day, its concentration is the daily concentration. Coliform bacteria limitations compliance shall be determined using the geometric mean.

"7-day load limitation" is the total discharge by weight during any 7-day period divided by the number of days in that 7-day period that the facility was in operation. If only one sample is taken in a 7-day period, the weight of pollutant discharge calculated from it is the 7-day load. If more than one sample is taken during the 7-day period, the 7-day load is calculated by determining the daily load for each day sampled, totaling the daily loads for the 7-day period, and dividing by the number of days sampled.

"7-day concentration limitation" means the arithmetic average (weighted by flow) of all the determinations of daily concentration limitation made during the 7-day period. If only one sample is taken during the 7-day period, its concentration is the 7-day concentration limitation for that 7-day period. Coliform bacteria limitations compliance shall be determined using the geometric mean.

"30-day load limitation" is the total discharge by weight during any 30-day period divided by the number of days in the 30-day period that the facility was in operation. If only one sample is taken in a 30-day period, the weight of pollutant discharge calculated from it is the 30-day load. If more than one sample is taken during one 30-day period, the 30-day load is calculated by determining the daily load for each day sampled, totaling the daily loads for the 30-day period and dividing by the number of days sampled.

"30-day concentration limitation" meana the arithmetic average (weighted by flow) of all the determinations of daily concentration made during the 30-day period. If only one sample is taken during the 30-day period, its concentration is the 30-day concentration for that 30-day period. Coliform bacteria limitations compliance shall be determined using the geometric mean.

"85 percent removal limitations" means the arithmetic mean of the values for effluent samples collected in a period of 30 consecutive days shall not exceed 15 percent of the arithmetic mean of the values for influent samples collected at approximately the same times during the same period.

"Absolute Limitations" Compliance with limitations having descriptions of "shall not be less than," "nor greater than," "shall not exceed," "minimum," or "meximum" shall be determined from any single value for effluent samples and/or measurements collected.

"Net concentration" shall mean the difference between the concentration of a given substance in a sample taken of the discharge and the concentration of the same substances in a sample taken at the intake which supplies water to the given process. For the purpose of this definition, samples that are taken to determine the net concentration shall always be 24-hour composite samples made up of at least six increments taken at regular intervals throughout the plant day.

"Net load" shall mean the difference between the load of a given substance as calculated from a sample taken of the discharge and the loed of the same substance in a sample taken at the intake which supplies water to given process. For purposes of this definition, samples that are taken to determine the net loading shall always be 24-hour composite samples made up of at least six increments taken at regular intervals throughout the plant day.

"MGD" means million gallons per day.

"mg/l" means milligrams per liter.

"µg/l" means micrograms per liter.

"Reporting Code" is a five digit number used by the Ohio EPA in processing reported data. The reporting code does not imply the type of analysis used nor the sampling techniques employed.

"Quarterly sampling frequency" means the sampling shall be done in the months of March, June, August, and December.

"Yearly sampling frequency" means the sampling shall be done in the month of September.

"Semi-annual sampling frequency" means the sampling shall be done during the months of June and December.

"Winter" shall be considered to be the period from November 1 through April 30.

"Bypass" means the intentional diversion of waste streams from any portion of the treatment facility.

"Summer" shall be considered to be the period from May 1 through October 31.

"Severe property damage" means substantial physical damage to property, damage to the treatment facilities which would cause them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expectad to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production.

PART III - GENERAL CONDITIONS (continued)

"Upset" means an exceptional incident in which there is unintentional and temporary noncompliance with technology based permit effluent limitations because of factors beyond the reasonable control of the permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventive maintenance, or careless or improper operation.

2. GENERAL EFFLUENT LIMITATIONS

The effluent shall, at all times, be free of substances:

A. In amounts that will settle to form putrescent, or otherwise objectionable, sludge deposits; or that will adversely affect aquatic life or water fowl;

B. Of an oily, greasy, or surface-active nature, and of other floating debris, in amounts that will form noticeable accumulations of scum, foam or sheen;

C. In amounts that will alter the natural color or odor of the receiving water to such degree as to create a nuisance;

D. In amounts that either singly or in combination with other substances are toxic to human, animal, or aquatic life;

E. In amounts that are conducive to the growth of aquatic weeds or algae to the extent that such growths become inimical to more desirable forms of aquatic life, or create conditions that are unsightly, or constitute a nuisance in any other fashion;

F. In amounts that will impair designated instream or downstream water uses.

3. FACILITY OPERATION AND QUALITY CONTROL

All wastewater treatment works shall be operated in a manner consistent with the following:

A. At all times, the permittee shall maintain in good working order and operate as efficiently as possible all treatment or control facilities or systems installed or used by the permittee necessary to achieve compliance with the terms and conditions of this permit. Proper operation and maintenance also includes adequate laboratory controls and appropriate quality assurance procedures. This provision requires the operation of back-up or auxiliary facilities or similar systems which are installed by a permittee only when the operation is necessary to achieve compliance with conditions of the permit.

B. The permittee shall effectively monitor the operation and efficiency of treatment and control facilities and the quantity and quality of the treated discharge.

C. Maintenance of wastewater treatment works that results in degradation of effluent quality shall be scheduled during non-critical water quality periods and shall be carried out in a manner approved by the Ohio EPA as specified in the Paragraph in this PART III entitled, "UNAUTHORIZED DISCHARGES".

4. REPORTING

A. Monitoring data required by this permit shall be reported on the Ohio EPA report form (4500) on a monthly basis. Individual reports for each sampling station for each month are to be received no later than the 15th day of the next month. The original plus first copy of the report form must be signed and mailed to:

Ohio Environmental Protection Agency
Division of Surface Water
Enforcement Section, ES/MOR
P.O. Box 1049
Columbus, Ohio 43266-0149

B. If the permittee monitors any pollutant at the location(s) designated herein more frequently than required by this permit, using approved analytical methods as specified below, the results of such monitoring shall be included in the calculation and reporting of the values required in the reports specified above.

C. Analyses of pollutants not required by this permit, except as noted in the preceding paragraph, shall not be reported on Ohio EPA report form (4500) but records shall be retained as specified in the paragraph entitled "RECORDS RETENTION".

5. SAMPLING AND ANALYTICAL METHODS

Samples and measurements taken as required herein shall be representative of the volume and nature of the monitored flow. Test procedures for the analysis of pollutants shall conform to regulation 40 CFR 136, "Test Procedures For The Analysis of Pollutants" unless other test procedures have been specified in this permit. The permittee shall periodically calibrate and perform maintenance procedures on all monitoring and analytical instrumentation at intervals to insure accuracy of measurements.

PART III - GENERAL CONDITIONS (continued)

6. RECORDING OF RESULTS

For each measurement or sample taken pursuant to the requirements of this permit, the permittee shall record the following information:

A. The exact place and date of sampling; (time of sampling not required on EPA 4500)

B. The person(s) who performed the sampling or measurements;

C. The date the analyses were performed on those samples;

D. The person(s) who performed the analyses;

E. The analytical techniques or methods used; and

F. The results of all analyses and measurements.

7. RECORDS RETENTION

The permittee shall retain all of the following records for the wastewater treatment works for a minimum of three years, including:

A. All sampling and analytical records (including internal sampling data not reported);

B. All original recordings for any continuous monitoring instrumentation;

C. All instrumentation, calibration and maintenance records;

D. All plant operation and maintenance records;

E. All reports required by this permit; and

F. Records of all data used to complete the application for this permit for a period of at least three years from the date of the sample, measurement, report, or application.

These periods will be extended during the course of any unresolved litigation, or when requested by the Regional Administrator or the Ohio EPA. The three year period for retention of records shall start from the date of sample, measurement, report, or application.

8. AVAILABILITY OF REPORTS

Except for data determined by the Ohio EPA to be entitled to confidential status, all reports prepared in accordance with the terms of this permit shall be available for public inspection at the appropriate district offices of the Ohio EPA. Both the Clean Water Act and Section 6111.05 Ohio Revised Code state that effluent data and receiving water quality data shall not be considered confidential. Knowingly making any false statement on any such report may result in the imposition of criminal penalties as provided for in Ohio Revised Code Section 6111.99.

9. DUTY TO PROVIDE INFORMATION

The permittee shall furnish to the Director, within a reasonable time, any information which the Director may request to determine whether cause exists for modifying, revoking, and reissuing, or terminating the permit, or to determine compliance with this permit. The permittee shall also furnish to the Director, upon request, copies of records required to be kept by this permit.

10. RIGHT OF ENTRY

The permittee shall allow the Director, or an authorized representative upon presentation of credentials and other documents as may be required by law to;

A. Enter upon the permittee's premises where a regulated facility or activity is located or conducted, or where records must be kept under the conditions of this permit.

B. Have access to and copy, at reasonable times, any records that must be kept under the conditions of the permit.

C. Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this permit.

D. Sample or monitor at reasonable times, for the purposes of assuring permit compliance or as otherwise authorized by the Clean Water Act, any substances or parameters at any location.

11. UNAUTHORIZED DISCHARGES

A. Bypassing or diverting of wastewater from the treatment works is prohibited unless:

   1. Bypass was unavoidable to prevent loss of life, personal injury, or severe property damage;

2. There were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of downtime. This condition is not satisfied if adequate back up equipment should have been installed in the exercise of reesonable engineering judgment to prevent a bypass which occurred during normal periods of equipment downtime or preventive maintenance; and

3. The permittee submitted notices as required under peragraph D. of this section.

B. If the permittee knows in advance of the need for a bypass, it shell submit prior notice, if possible at least ten days before the date of the bypass.

C. The Director may approve an unanticipated bypass, after considering its adverse effects, if the Director determines that it has met the three conditions listed in paragraph 11.A. of this section.

D. The permittee shall submit notice of an unanticipated bypass as required in section 12.

E. The permittee may allow any bypass to occur which does not cause effluent limitations to be exceeded if that bypass ia for essential maintenanca to assure efficient operation.

12. <u>NONCOMPLIANCE NOTIFICATION</u>

A. The permittee shall by telephone report any of the following within twenty-four (24) hours of discovery at (toll free) 1-800-282-9378:

1. Any noncompliance which may endanger health or the environment;
2. Any unanticipated bypass which exceeds any effluent limitation in the permit; or
3. Any upset which exceeds any effluent limitation in the permit.
4. Any violation of a maximum daily discharge limitation for any of the pollutants listed by the Director in the permit.

B. For the telephone reports required by Part 12.A., the following information must be included:

1. The times at which the discharge occurred, and was discovered;
2. The approximate amount and the charactaristics of the discharge;
3. The stream(s) affected by tha discharge;
4. Tha circumstances which created the discharga;
5. The names and telephone numbers of the persons who have knowledge of these circumstances;
6. What remedial steps are being taken; and
7. The names and telephone numbers of the persons responsible for such remedial steps.

C. These telephone reports shall be confirmed in writing within five days of the discharge and submitted to the appropriate Ohio EPA district office. The report shall include the following:

1. The limitation(s) which has been exceeded;
2. The extent of the exceedance(a);
3. The cause of the exceedance(s);
4. The period of the exceedance(s) including exact dates and times;
5. If uncorrected, the anticipated time the exceedance(s) is expected to continue, and
6. Steps being taken to reduce, eliminate, and/or prevent recurrence of the exceedance(s).

D. Compliance Schedule Events:

If the permittee is unable to meet any date for achieving an event, as specified in the schedule of compliance, the permittee shall submit a written report to the appropriate district office of the Ohio EPA within 14 days of becoming aware of such situation. The report shall include the following:

1. The compliance event which has been or will be violated;
2. The cause of the violation;
3. The remedial action being taken;,
4. The probable date by which compliance will occur; and

5. The probability of complying with subsequent and final events as scheduled.

E. The permittee shall report all instances of noncompliance not reported under paragraphs A, B, or C of this section, at the time monitoring reports are submitted. The reports shall contain the information listed in paragraphs B and C of this section.

F. Where the permittee becomes aware that it failed to submit any relevant application or submitted incorrect information in a permit application or in any report to the director, it shall promptly submit such facts or information.

13. RESERVED

14. DUTY TO MITIGATE

The permittee shall take all reasonable steps to minimize or prevent any discharge in violation of this permit which has a reasonable likelihood of adversely affecting human health or the environment.

15. AUTHORIZED DISCHARGES

All discharges authorized herein shall be consistent with the terms and conditions of this permit. The discharge of any pollutant identified in this permit more frequently than, or at a level in excess of, that authorized by this permit shall constitute a violation of the terms and conditions of this permit. Such violations may result in the imposition of civil and/or criminal penalties as provided for in Section 309 of the Act and Ohio Revised Code Sections 6111.09 and 6111.99.

16. DISCHARGE CHANGES

The following changes must be reported to the appropriate Ohio EPA district office as soon as practicable.

A. For all treatment works, any significant change in character of the discharge which the permittee knows or has reason to believe has occurred or will occur which would constitute cause for modification or revocation and reissuance. The permittee shall give advance notice to the Director of any planned changes in the permitted facility or activity which may result in noncompliance with permit requirements. Notification of permit changes or anticipated noncompliance does not stay any permit condition.

B. For publicly owned treatment works:

1. Any proposed plant modification, addition, and/or expansion that will change the capacity or efficiency of the plant;

2. The addition of any new significant industrial discharge; and

3. Changes in the quantity or quality of the wastes from existing tributary industrial discharges which will result in significant new or increased discharges of pollutants.

C. For non-publicly owned treatment works, any proposed facility expansions, production increases, or process modifications, which will result in new, different, or increased discharges of pollutants.

Following this notice, modifications to the permit may be made to reflect any necessary changes in permit conditions, including any necessary effluent limitations for any pollutants not identified and limited herein. A determination will also be made as to whether a National Environmental Policy Act (NEPA) review will be required. Sections 6111.44 and 6111.45, Ohio Revised Code, require that plans for treatment works or improvements to such works be approved by the Director of the Ohio EPA prior to initiation of construction.

D. In addition to the reporting requirements under 40 CFR 122.41(1) and per 40 CFR 122.42(a), all existing manufacturing, commercial, mining, and silvicultural dischargers must notify the Director as soon as they know or have reason to believe:

1. That any activity has occurred or will occur which would result in the discharge on a routine or frequent basis of any toxic pollutant which is not limited in the permit. If that discharge will exceed the highest of the "notification levels" specified in 4D CFR Sections 122.42(a)(1)(i) through 122.42(a)(1)(iv).

2. That any activity has occurred or will occur which would result in any discharge, on a non-routine or infrequent basis, of a toxic pollutant which is not limited in the permit, if that discharge will exceed the highest of the "notification levels" specified in 122.42(a)(2)(i) through 122.42(a)(2)(iv).

17. TOXIC POLLUTANTS

The permittee shall comply with effluent standards or prohibitions established under Section 307 (a) of the Clean Water Act for toxic pollutants within the time provided in the regulations that establish these standards or prohibitions, even if the permit has not yet been modified to incorporate the requirement. Following establishment of such standards or prohibitions, the Director shall modify this permit and so notify the permittee.

ART III - GENERAL CONDITIONS (continued)

25. PROPERTY RIGHTS

The issuance of this permit does not convey any property rights in either real or personal property, or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor any infringement of federal, state, or local laws or regulations.

26. UPSET

The provisions of 40 CFR Section 122.41(n), relating to "Upset," are specifically incorporated herein by reference in their entirety. For definition of "upset," see Part 1, DEFINITIONS.

27. SEVERABILITY

The provisions of this permit are severable, and if any provision of this permit, or the application of any provision of this permit to any circumstance, is held invalid, the application of such provision to other circumstances, and the remainder of this permit, shall not be affected thereby.

28. SIGNATORY REQUIREMENTS

All applications submitted to the Director shall be signed and certified in accordance with the requirements of 40 CFR 122.22(b) and (c).

All reports submitted to the Director shall be signed and certified in accordance with the requirements of 40 CFR Section 122.22(b) and (c).

29. OTHER INFORMATION

A. Where the permittee becomes aware that it failed to submit any relevant facts in a permit application or submitted incorrect information in a permit application or in any report to tha Director, it shall promptly submit such facts or information.

B. ORC 6111.99 provides that any person who falsifies, tampers with, or knowingly renders inaccurate any monitoring device or method required to be maintained under this permit shall, upon conviction, be punished by a fine of not more than $25,000 per violation.

C. ORC 6111.99 states that any person who knowingly makes any false statement, representation, or certification in any record or other document submitted or required to be maintained under this permit including monitoring reports or reports of compliance or noncompliance shall, upon conviction, be punished by a fine of not more than $25,000 per violation.

D. ORC 6111.99 provides that any person who violates Sections 6111.04, 6111.042., 6111.05., or division (A) of Section 6111.07 of the Revised Code shall be fined not mora than twenty-five thousand dollars or imprisoned not more than one year, or both.

30. NEED TD HALT OR REDUCE ACTIVITY

40 CFR 122.41(c) statas that it shall not be a defense for a permittee in an enforcement action that it would have bean necessary to halt or reduce the permitted activity in order to maintain compliance with conditions of this permit.

31. APPLICABLE FEDERAL RULES

All references to 40 CFR in this permit mean the version of 4D CFR which is effective as of the effective date of this permit.

18. PERMIT MODIFICATION OR REVOCATION

A. After notice and opportunity for a hearing, this permit may be modified or revoked, by the Ohio EPA, in whole or in part during its term for cause including, but not limited to, the following:

1. violation of any terms or conditions of this permit;

2. obtaining this permit by misrepresentation or failure to disclose fully all relevant facts; or

3. change in any condition that requires either a temporary or permanent reduction or elimination of the permitted discharge.

B. Pursuant to rule 3745-33-06, Ohio Administrative Code, the permittee may at any time apply to the Ohio EPA for modification of any part of this permit. The filing of a request by the permittee for a permit modification or revocation does not stay any permit condition. The application for modification should be received by the appropriate Ohio EPA district office at least ninety days before the date on which it is desired that the modification become effective. The application shall be made only on forms approved by the Ohio EPA.

19. TRANSFER OF OWNERSHIP OR CONTROL

This permit cannot be transferred or assigned nor shall a new owner or successor be authorized to discharge from this facility, until the following requirements are met:

A. The permittee shall notify the succeeding owner or successor of the existence of this permit by a letter, a copy of which shall be forwarded to the appropriate Ohio EPA district office. The copy of that letter will serve as the permittee's notice to the Director of the proposed transfer. The copy of that letter shall be received by the appropriate Ohio EPA district office sixty days prior to the proposed date of transfer;

B. A written agreement containing a specific date for transfer of permit responsibility and coverage between the current and new permittee (including acknowledgement that the existing permittee is liable for violations up to that date, and that the new permittee is liable for violations from that date on) shall be submitted to the appropriate Ohio EPA district office within sixty days after receipt by the district office of the copy of the letter from the permittee to the succeeding owner;

C. The Director does not exercise his right within thirty days after receipt of the written agreement to notify the current permittee and the new permittee of his or her intent to modify or revoke the permit and to require that a new application be filed; and

D. The new owner or successor receives written confirmation and approval of the transfer from the Director of the Ohio EPA.

At anytime during the sixty (60) day period between notification of the proposed transfer and the effective date of the transfer, the Director may prevent the transfer if he concludes that such transfer will jeopardize compliance with the terms and conditions of the permit.

20. OIL AND HAZARDOUS SUBSTANCE LIABILITY

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties to which the permittee is or may be subject under Section 311 of the Act.

21. SOLIDS DISPOSAL

Collected screenings, slurries, sludges, and other solids shall be disposed of in such a manner as to prevent entry of those wastes into waters of the state. For publicly owned treatment works, these shall be disposed of in accordance with the approved Ohio EPA Sludge Management Plan.

22. CONSTRUCTION AFFECTING NAVIGABLE WATERS

This permit does not authorize or approve the construction of any onshore or offshore physical structures or facilities or the undertaking of any work in any navigable waters.

23. CIVIL AND CRIMINAL LIABILITY

Except as exempted in the permit conditions on UNAUTHORIZED DISCHARGES or UPSETS, nothing in this permit shall be construed to relieve the permittee from civil or criminal penalties for noncompliance.

24. STATE LAWS AND REGULATIONS

Nothing in this permit shall be construed to preclude the institution of any legal action nor relieve the permittee from any responsibilities, liabilities, or penalties established pursuant to any applicable state law or regulation under authority preserved by Section 510 of the Act.

APPENDIX B

SIMULATION #1

0.24 inches in 3.75 hours

Conduit CSO 1005d

Summary Statistics

Total Discharge Volume (cf)	Duration (hr)	CBOD (lbs)	SS (lbs)	TKN (lbs)	Cu (lbs)	Cd (lbs)	Pb (lbs)	Zn (lbs)
2.91E+01	3.20	0.089636	0.507278	0.019288	0.000077	0.000006	0.000160	0.000372

Conduit CSO 1005d

Time (hours)	Time (minutes)	Flow (ft^3/s)	Mean Flow	CBOD Conc.	CBOD Mean Conc.	CBOD Discharge lbs.	SS Conc. mg/l	SS Mean Conc.	SS Discharge lbs.	TKN Conc. mg/l	TKN Mean Conc.	TKN Discharge lbs.	Cu Conc. mg/l	Cu Mean Conc.	Cu Discharge lbs.	Cd Conc. mg/l	Cd Mean Conc.	Cd Discharge lbs.	Pb Conc. mg/l	Pb Mean Conc.	Pb Discharge lbs.	Zn Conc. mg/l	Zn Mean Conc.	Zn Discharge lbs.
12.5	0	2.11E-04		108	94.5		390	377.5		29	24.5		0.051	0.0525		0.003	0.003		0.135	0.112		0.227	0.238	
12.6	8	8.12E-04	5.11E-04		94.5	0.001082		377.5	0.004323		24.5	0.000281		0.0525	6.01E-07		0.003	7.27E-08		0.112	1.28E-06		0.238	2.73E-06
12.7	12	1.49E-03	1.15E-03		94.5	0.002437		377.5	0.009738		24.5	0.000632		0.0525	1.35E-06		0.003	1.64E-07		0.112	2.89E-06		0.238	6.14E-06
12.8	18	2.14E-03	1.82E-03	81	76.5	0.003842	365	334	0.015348	20	17	0.000996	0.054	0.054	2.13E-06	0.003	0.0035	2.58E-07	0.089	0.093	4.55E-06	0.249	0.2445	9.68E-06
12.9	24	2.80E-03	2.47E-03		76.5	0.004228		334	0.018458		17	0.000939		0.054	2.98E-06		0.0035	3.31E-07		0.093	5.14E-06		0.2445	1.35E-05
13	30	3.56E-03	3.18E-03	72	76.5	0.005441	303	289	0.023754	14	12.5	0.001209	0.054	0.0485	3.84E-06	0.004	0.0035	4.26E-07	0.097	0.0905	6.61E-06	0.24	0.23	1.74E-05
13.1	36	4.42E-03	3.99E-03		76.5	0.00683		289	0.025801		12.5	0.001118		0.0485	4.33E-06		0.0035	5.35E-07		0.0905	8.08E-06		0.23	2.05E-05
13.2	42	5.26E-03	4.84E-03		76.5	0.008287		289	0.031305		12.5	0.001354		0.0485	5.25E-06		0.0035	6.49E-07		0.0905	9.8E-06		0.23	2.49E-05
13.3	48	5.97E-03	5.61E-03	45	41.5	0.009616	275	260	0.036329	11	9.5	0.001571	0.043	0.042	6.1E-08	0.003	0.003	7.54E-07	0.084	0.099	1.14E-05	0.22	0.214	2.89E-05
13.4	54	6.49E-03	6.23E-03		41.5	0.005789		260	0.036267		9.5	0.001325		0.042	5.86E-06		0.003	3.89E-07		0.099	1.38E-05		0.214	2.99E-05
13.5	60	6.60E-03	6.55E-03	38	40.5	0.006083	245	236.5	0.038112	8	8.5	0.001393	0.041	0.04	8.16E-06	0.003	0.003	4.09E-07	0.114	0.092	1.45E-05	0.208	0.194	3.14E-05
13.6	66	6.16E-03	6.38E-03		40.5	0.00579		236.5	0.033809		8.5	0.001215		0.04	5.72E-06		0.003	3.89E-07		0.092	1.32E-05		0.194	2.77E-05
13.7	72	5.34E-03	5.75E-03		40.5	0.005216		236.5	0.030461		8.5	0.001095		0.04	5.15E-06		0.003	3.5E-07		0.092	1.18E-05		0.194	2.5E-05
13.8	78	4.41E-03	4.87E-03		40.5	0.004419		236.5	0.025807		8.5	0.000928		0.04	4.36E-06		0.003	2.97E-07		0.092	1E-05		0.194	2.12E-05
13.9	84	3.58E-03	3.99E-03		40.5	0.003623		236.5	0.021155		8.5	0.00076		0.04	3.58E-06		0.003	2.43E-07		0.092	8.23E-06		0.194	1.74E-05
14	90	2.90E-03	3.24E-03	43	37	0.002939	228	298.5	0.017161	9	8.5	0.000617	0.039	0.038	2.9E-06	0.003	0.003	1.97E-07	0.07	0.0685	6.68E-06	0.18	0.175	1.41E-05
14.1	96	2.35E-03	2.62E-03		37	0.002172		298.5	0.017525		8.5	0.000499		0.038	2.23E-06		0.003	1.46E-07		0.0685	4.02E-06		0.175	1.03E-05
14.2	102	1.99E-03	2.17E-03		37	0.001798		298.5	0.014504		8.5	0.000413		0.038	1.85E-06		0.003	1.21E-07		0.0685	3.33E-06		0.175	8.5E-06
14.3	108	1.84E-03	1.91E-03		37	0.001587		298.5	0.012799		8.5	0.000364		0.038	1.83E-06		0.003	1.07E-07		0.0685	2.94E-06		0.175	7.5E-06
14.4	114	1.82E-03	1.83E-03		37	0.001514		298.5	0.012212		8.5	0.000348		0.036	1.55E-06		0.003	1.02E-07		0.0685	2.8E-06		0.175	7.16E-06
14.5	120	1.82E-03	1.82E-03	31	24.5	0.001506	369	318.5	0.012148	8	8.5	0.000346	0.037	0.0345	1.55E-06	0.003	0.003	1.01E-07	0.067	0.0745	2.79E-06	0.17	0.187	7.12E-06
14.6	126	1.75E-03	1.78E-03		24.5	0.000978		316.5	0.012634		8.5	0.000339		0.0345	1.38E-06		0.003	6.57E-08		0.0745	2.97E-06		0.187	7.46E-06
14.7	132	1.59E-03	1.67E-03		24.5	0.000915		316.5	0.011817		8.5	0.000317		0.0345	1.29E-06		0.003	6.15E-08		0.0745	2.78E-06		0.187	6.98E-06
14.8	138	1.37E-03	1.48E-03		24.5	0.000811		316.5	0.010478		8.5	0.000281		0.0345	1.14E-06		0.003	5.45E-08		0.0745	2.47E-06		0.187	6.19E-06
14.9	144	1.14E-03	1.25E-03		24.5	0.000688		318.5	0.00889		8.5	0.000239		0.0345	9.69E-07		0.003	4.62E-08		0.0745	2.09E-06		0.187	5.25E-06
15	150	9.20E-04	1.03E-03		24.5	0.000565		316.5	0.007295		8.5	0.000196		0.0345	7.95E-07		0.003	3.79E-08		0.0745	1.72E-06		0.187	4.31E-06
15.1	156	7.14E-04	8.17E-04		24.5	0.000448		316.5	0.00579		8.5	0.000155		0.0345	6.31E-07		0.003	3.01E-08		0.0745	1.36E-06		0.187	3.42E-06
15.2	162	5.40E-04	6.27E-04		24.5	0.000344		316.5	0.004442		8.5	0.000119		0.0345	4.84E-07		0.003	2.31E-08		0.0745	1.05E-06		0.187	2.62E-06
15.3	168	3.98E-04	4.69E-04		24.5	0.000257		316.5	0.003322		8.5	5.92E-05		0.0345	3.62E-07		0.003	1.73E-08		0.0745	7.82E-07		0.187	1.96E-06
15.4	174	2.79E-04	3.38E-04		24.5	0.000186		318.5	0.002397		8.5	6.44E-05		0.0345	2.61E-07		0.003	1.25E-08		0.0745	5.64E-07		0.187	1.42E-06
15.5	180	1.82E-04	2.30E-04		24.5	0.000126		316.5	0.001632		8.5	4.36E-05		0.0345	1.78E-07		0.003	8.49E-09		0.0745	3.84E-07		0.187	9.64E-07
15.6	186	9.86E-05	1.40E-04		24.5	7.7E-05		316.5	0.000994		8.5	2.67E-05		0.0345	1.08E-07		0.003	5.17E-09		0.0745	2.34E-07		0.187	5.87E-07
15.70028	192	3.24E-05	6.55E-05		24.5	3.59E-05		318.5	0.000454		8.5	1.25E-05		0.0345	5.06E-08		0.003	2.41E-09		0.0745	1.09E-07		0.187	2.74E-07
	198		1.62E-05		24.5	8.88E-06		316.5	0.000115		8.5	3.08E-06		0.0345	1.25E-08		0.003	5.97E-10		0.0745	2.7E-08		0.187	6.78E-08

Conduit CSO 1006

Summary Statistics

Total Discharge Volume (cf)	Duration (hr)	CBOD (lbs)	SS (lbs)	TKN (lbs)	Cu (lbs)	Cd (lbs)	Pb (lbs)	Zn (lbs)
4.25E+03	1.60	19.381	84.401	4.490	0.013	0.001	0.027	0.060

Conduit CSO 1006

Time (hours)	Time (minutes)	Flow (ft^3/s)	Mean Flow	CBOD Conc.	CBOD Mean Conc.	CBOD Discharge lbs.	SS Conc. mg/l	SS Mean Conc.	SS Discharge lbs.	TKN Conc. mg/l	TKN Mean Conc.	TKN Discharge lbs.	Cu Conc. mg/l	Cu Mean Conc.	Cu Discharge lbs.	Cd Conc. mg/l	Cd Mean Conc.	Cd Discharge lbs.	Pb Conc. mg/l	Pb Mean Conc.	Pb Discharge lbs.	Zn Conc. mg/l	Zn Mean Conc.	Zn Discharge lbs.
12.5	0	3.22E-02		108	94.5		390	377.5		29	24.5		0.051	0.0525		0.003	0.003		0.135	0.112		0.227	0.238	
12.6	6	2.073437	1.05E+00		94.5	2.227974		377.5	8.900107		24.5	0.577623		0.0525	0.001238		0.003	0.00015		0.112	0.002641		0.238	0.005611
12.7	12	1.86563	1.97E+00		94.5	4.167866		377.5	16.64941		24.5	1.080558		0.0525	0.002315		0.003	0.00028		0.112	0.00494		0.238	0.010497
12.8	18	1.439044	1.65E+00	81	76.5	3.496625	365	334	13.968	20	17	0.906532	0.054	0.054	0.001943	0.003	0.0035	0.000235	0.089	0.093	0.004144	0.249	0.2445	0.008806
12.9	24	1.007508	1.22E+00		76.5	2.095581		334	9.149334		17	0.465685		0.054	0.001479		0.0035	0.000164		0.093	0.002548		0.2445	0.006698
13	30	0.691029	8.49E-01	72	76.5	1.454872	303	289	6.351992	14	12.5	0.323305	0.054	0.0485	0.001027	0.004	0.0035	0.000114	0.097	0.0905	0.001769	0.24	0.23	0.00465
13.1	36	0.533683	6.12E-01		76.5	1.04902		289	3.962966		12.5	0.171409		0.0485	0.000665		0.0035	8.22E-05		0.0905	0.001241		0.23	0.003154
13.2	42	0.506376	5.20E-01		76.5	0.890858		289	3.365462		12.5	0.145565		0.0485	0.000565		0.0035	6.98E-05		0.0905	0.001054		0.23	0.002678
13.3	48	0.551482	5.29E-01	45	41.5	0.906103	275	260	3.423055	11	9.5	0.148056	0.043	0.042	0.000574	0.003	0.003	7.1E-05	0.084	0.099	0.001072	0.22	0.214	0.002724
13.4	54	0.606249	5.79E-01		41.5	0.537953		260	3.370307		9.5	0.123146		0.042	0.000544		0.003	3.81E-05		0.099	0.001283		0.214	0.002774
13.5	60	0.634264	6.20E-01	38	40.5	0.576419	245	236.5	3.611297	8	8.5	0.131951	0.041	0.04	0.000583	0.003	0.003	3.87E-05	0.114	0.092	0.001375	0.208	0.194	0.002972
13.6	66	0.613273	6.24E-01		40.5	0.565714		236.5	3.303493		8.5	0.11873		0.04	0.000559		0.003	3.8E-05		0.092	0.001285		0.194	0.00271
13.7	72	0.530178	5.72E-01		40.5	0.518515		236.5	3.027872		8.5	0.108824		0.04	0.000512		0.003	3.48E-05		0.092	0.001178		0.194	0.002484
13.8	78	0.391533	4.61E-01		40.5	0.417964		236.5	2.440701		8.5	0.087721		0.04	0.000413		0.003	2.81E-05		0.092	0.000949		0.194	0.002002
13.9	84	0.231785	3.12E-01		40.5	0.282653		238.5	1.660552		8.5	0.059322		0.04	0.000279		0.003	1.9E-05		0.092	0.000642		0.194	0.001354
14	90	9.44E-02	1.63E-01	43	37	0.147919	228	298.5	0.863776	9	8.5	0.031045	0.039	0.038	0.000146	0.003	0.003	9.94E-06	0.07	0.0685	0.000336	0.18	0.175	0.000709
14.1	96	7.05E-03	5.07E-02		37	0.042032		298.5	0.339097		8.5	0.009656		0.036	4.32E-05		0.003	2.82E-06		0.0685	7.78E-05		0.175	0.000199
	102		3.52E-03		37	0.002919		298.5	0.023549		8.5	0.000671		0.038	3E-06		0.003	1.96E-07		0.0685	5.4E-06		0.175	1.38E-05

Conduit CSO 1007

Summary Statistics

Total Discharge Volume (cf)	Duration (hr)	CBOD (lbs)	SS (lbs)	TKN (lbs)	Cu (lbs)	Cd (lbs)	Pb (lbs)	Zn (lbs)
7.23E+03	4.70	23.078	129.970	5.046	0.019	0.002	0.040	0.093

Conduit CSO 1007

Time (hours)	Time (minutes)	Flow (ft^3/s)	Mean Flow	CBOD Conc.	CBOD Mean Conc.	CBOD Discharge lbs.	SS Conc. mg/l	SS Mean Conc.	SS Discharge lbs.	TKN Conc. mg/l	TKN Mean Conc.	TKN Discharge lbs.	Cu Conc. mg/l	Cu Mean Conc.	Cu Discharge lbs.	Cd Conc. mg/l	Cd Mean Conc.	Cd Discharge lbs.	Pb Conc. mg/l	Pb Mean Conc.	Pb Discharge lbs.	Zn Conc. mg/l	Zn Mean Conc.	Zn Discharge lbs.
11.4	0	0.117505		108	94.5		390	377.5		29	24.5		0.051	0.0525		0.003	0.003		0.135	0.112		0.227	0.238	
11.5	6	0.426516	2.72E-01		94.5	0.57562		377.5	2.299435		24.5	0.149235		0.0525	0.00032		0.003	3.87E-05		0.112	0.000682		0.238	0.00145
11.6	12	0.534223	4.80E-01		94.5	1.016544		377.5	4.060796		24.5	0.263548		0.0525	0.000565		0.003	6.83E-05		0.112	0.001205		0.238	0.00256
11.7	18	0.637802	5.86E-01	81	76.5	1.240102	365	334	4.953846	20	17	0.321508	0.054	0.054	0.000689	0.003	0.0035	8.33E-05	0.089	0.093	0.00147	0.249	0.2445	0.003123
11.8	24	0.847897	7.43E-01		76.5	1.272568		334	5.556048		17	0.282793		0.054	0.000698		0.0035	9.97E-05		0.093	0.001547		0.2445	0.004067
11.9	30	1.076935	9.62E-01	72	76.5	1.648705	303	289	7.198267	14	12.5	0.366379	0.054	0.0485	0.001164	0.004	0.0035	0.000129	0.097	0.0905	0.002004	0.24	0.23	0.005269
12	36	1.314196	1.20E+00		76.5	2.048111		289	7.737306		12.5	0.334659		0.0485	0.001298		0.0035	0.000161		0.0905	0.002423		0.23	0.006158
12.1	42	1.432688	1.37E+00		76.5	2.352829		289	8.888465		12.5	0.384449		0.0485	0.001492		0.0035	0.000184		0.0905	0.002783		0.23	0.007074
12.2	48	1.495007	1.46E+00	45	41.5	2.507702	275	260	9.473539	11	9.5	0.409755	0.043	0.042	0.00159	0.003	0.003	0.000197	0.084	0.099	0.002967	0.22	0.214	0.007539
12.3	54	1.544237	1.52E+00		41.5	1.41222		260	8.847841		9.5	0.323279		0.042	0.001429		0.003	9.49E-05		0.099	0.003369		0.214	0.007282
12.4	60	1.450245	1.50E+00	38	40.5	1.39142	245	236.5	8.717333	8	8.5	0.318518	0.041	0.04	0.001408	0.003	0.003	9.35E-05	0.114	0.092	0.003319	0.208	0.194	0.007175
12.5	66	1.151803	1.30E+00		40.5	1.179937		236.5	6.890251		8.5	0.247541		0.04	0.001165		0.003	7.93E-05		0.092	0.00268		0.194	0.005652
12.6	72	0.826772	9.89E-01		40.5	0.897214		236.5	5.239288		8.5	0.188304		0.04	0.000886		0.003	6.03E-05		0.092	0.002038		0.194	0.004298
12.7	78	0.519867	8.73E-01		40.5	0.610653		236.5	3.565914		8.5	0.128162		0.04	0.000603		0.003	4.1E-05		0.092	0.001387		0.194	0.002925
12.8	84	0.493097	5.06E-01		40.5	0.459343		236.5	2.682338		8.5	0.096405		0.04	0.000454		0.003	3.09E-05		0.092	0.001043		0.194	0.0022
12.9	90	0.516608	5.05E-01	43	37	0.457865	228	298.5	2.673708	9	8.5	0.096095	0.039	0.038	0.000452	0.003	0.003	3.08E-05	0.07	0.0685	0.00104	0.18	0.175	0.002193
13	96	0.556577	5.37E-01		37	0.444595		298.5	3.586804		8.5	0.102137		0.038	0.000457		0.003	2.99E-05		0.0685	0.000823		0.175	0.002103
13.1	102	0.551677	5.54E-01		37	0.459124		298.5	3.704011		8.5	0.105474		0.038	0.000472		0.003	3.08E-05		0.0685	0.00085		0.175	0.002172
13.2	108	0.521138	5.36E-01		37	0.444442		288.5	3.585568		8.5	0.102102		0.038	0.000456		0.003	2.99E-05		0.0685	0.000823		0.175	0.002102
13.3	114	0.490077	5.06E-01		37	0.418923		298.5	3.379686		8.5	0.096239		0.038	0.00043		0.003	2.81E-05		0.0685	0.000776		0.175	0.001981
13.4	120	0.438818	4.54E-01	31	24.5	0.384819	369	318.5	3.104556	8	8.5	0.088404	0.037	0.0345	0.000395	0.003	0.003	2.59E-05	0.067	0.0745	0.000712	0.17	0.187	0.00182
13.5	126	0.347153	3.93E-01		24.5	0.215608		316.5	2.78528		8.5	0.074802		0.0345	0.000304		0.003	1.45E-05		0.0745	0.000656		0.187	0.001646
13.8	132	0.266236	3.07E-01		24.5	0.168264		316.5	2.173693		8.5	0.058377		0.0345	0.000237		0.003	1.13E-05		0.0745	0.000512		0.187	0.001284
13.7	138	0.179332	2.23E-01		24.5	0.122227		318.5	1.578979		8.5	0.042405		0.0345	0.000172		0.003	8.21E-06		0.0745	0.000372		0.187	0.000933
13.8	144	0.140741	1.60E-01		24.5	0.087802		316.5	1.134256		8.5	0.030462		0.0345	0.000124		0.003	5.9E-06		0.0745	0.000267		0.187	0.00067
13.9	150	0.122401	1.32E-01		24.5	0.072184		316.5	0.932506		8.5	0.025044		0.0345	0.000102		0.003	4.85E-06		0.0745	0.000219		0.187	0.000551
14	156	0.109367	1.16E-01		24.5	0.063578		316.5	0.821326		8.5	0.022058		0.0345	8.95E-05		0.003	4.27E-06		0.0745	0.000193		0.187	0.000485
14.1	162	0.121626	1.15E-01		24.5	0.063366		316.5	0.81858		8.5	0.021984		0.0345	8.92E-05		0.003	4.26E-06		0.0745	0.000193		0.187	0.000484
14.2	168	0.167513	1.45E-01		24.5	0.079316		316.5	1.024635		8.5	0.027518		0.0345	0.000112		0.003	5.33E-06		0.0745	0.000241		0.187	0.000605
14.3	174	0.225983	1.97E-01		24.5	0.107943		316.5	1.394449		8.5	0.03745		0.0345	0.000152		0.003	7.25E-06		0.0745	0.000328		0.187	0.000824
14.4	180	0.265705	2.46E-01		24.5	0.134879		316.5	1.742414		8.5	0.046795		0.0345	0.00019		0.003	9.06E-06		0.0745	0.00041		0.187	0.001029
14.5	186	0.233056	2.49E-01		24.5	0.136819		316.5	1.767479		8.5	0.047468		0.0345	0.000193		0.003	9.19E-06		0.0745	0.000416		0.187	0.001044
14.6	192	0.186789	2.10E-01		24.5	0.115171		316.5	1.487823		8.5	0.039957		0.0345	0.000162		0.003	7.74E-06		0.0745	0.00035		0.187	0.000879
14.7	198	0.138657	1.63E-01		24.5	0.089276		318.5	1.153297		8.5	0.030973		0.0345	0.000128		0.003	6E-06		0.0745	0.000271		0.187	0.000681
14.8	204	0.114822	1.27E-01		24.5	0.069534		318.5	0.898264		8.5	0.024124		0.0345	9.79E-05		0.003	4.67E-06		0.0745	0.000211		0.187	0.000531
14.9	210	0.101785	1.08E-01		24.5	0.059419		318.5	0.767603		8.5	0.020615		0.0345	8.37E-05		0.003	3.99E-06		0.0745	0.800181		0.187	0.000454
15	216	9.08E-02	9.63E-02		24.5	0.052843		316.5	0.682646		8.5	0.018333		0.0345	7.44E-05		0.003	3.55E-06		0.0745	0.000161		0.187	0.000403
15.1	222	8.09E-02	8.59E-02		24.5	0.047117		316.5	0.608674		8.5	0.016347		0.0345	6.63E-05		0.003	3.17E-06		0.0745	0.000143		0.187	0.00036
15.2	228	7.14E-02	7.82E-02		24.5	0.041791		316.5	0.539872		8.5	0.014499		0.0345	5.88E-05		0.003	2.81E-06		0.0745	0.000127		0.187	0.000319
15.3	234	6.18E-02	6.66E-02		24.5	0.036535		318.5	0.471974		8.5	0.012675		0.0345	5.14E-05		0.003	2.45E-06		0.0745	0.000111		0.187	0.000279
15.4	240	5.18E-02	5.68E-02	18	19.5	0.031148	264	207	0.402352	9	8	0.010806	0.032	0.029	4.39E-05	0.003	0.0025	2.09E-06	0.082	0.0705	9.47E-05	0.204	0.1835	0.000238
15.5	246	4.18E-02	4.88E-02		19.5	0.020423		207	0.216797		6	0.006284		0.029	3.04E-05		0.0025	1.14E-06		0.0705	7.38E-05		0.1835	0.000192
15.6	252	3.15E-02	3.66E-02		19.5	0.015994		207	0.18978		6	0.004921		0.029	2.38E-05		0.0025	8.95E-07		0.0705	5.78E-05		0.1835	0.000151
15.70028	258	2.15E-02	2.65E-02		19.5	0.011565		207	0.122771		6	0.003559		0.029	1.72E-05		0.0025	6.47E-07		0.0705	4.18E-05		0.1835	0.000109
15.80028	264	1.21E-02	1.88E-02		19.5	0.007325		207	0.077753		8	0.002254		0.029	1.09E-05		0.0025	4.1E-07		0.0705	2.65E-05		0.1835	6.89E-05
15.90028	270	4.28E-03	8.18E-03		19.5	0.003572		207	0.037922		8	0.001099		0.029	5.31E-08		0.0025	2E-07		0.0705	1.29E-05		0.1835	3.36E-05
16.00028	278	8.79E-04	2.48E-03		19.5	0.001084		207	0.011602		6	0.000333		0.029	1.61E-06		0.0025	6.07E-08		0.0705	3.92E-06		0.1835	1.02E-05
18.10028	282	1.99E-04	4.39E-04		19.5	0.000192		207	0.002035		8	5.9E-05		0.029	2.85E-07		0.0025	1.07E-08		0.0705	6.93E-07		0.1835	1.8E-06
	288		9.95E-05		19.5	4.34E-05		207	0.000481		6	1.34E-05		0.029	6.46E-08		0.0025	2.43E-09		0.0705	1.57E-07		0.1835	4.09E-07

Conduit CSO 1033

Summary Statistics

Total Discharge Volume (cf)	Duration (hr)	CBOD (lbs)	SS (lbs)	TKN (lbs)	Cu (lbs)	Cd (lbs)	Pb (lbs)	Zn (lbs)
3.09E+01	0.60	0.16860	0.69063	0.04125	0.00010	0.00001	0.00020	0.00046

Conduit CSO 1033

Time (hours)	Time (minutes)	Flow (ft^3/s)	Mean Flow	CBOD Conc.	CBOD Mean Conc.	CBOD Discharge lbs.	SS Conc. mg/l	SS Mean Conc.	SS Discharge lbs.	TKN Conc. mg/l	TKN Mean Conc.	TKN Discharge lbs.	Cu Conc. mg/l	Cu Mean Conc.	Cu Discharge lbs.	Cd Conc. mg/l	Cd Mean Conc.	Cd Discharge lbs.	Pb Conc. mg/l	Pb Mean Conc.	Pb Discharge lbs.	Zn Conc. mg/l	Zn Mean Conc.	Zn Discharge lbs.
12.3	0	4.21E-03		108	94.5		390	377.5		29	24.5		0.051	0.0525		0.003	0.003		0.135	0.112		0.227	0.238	
12.4	6	1.43E-02	9.28E-03		94.5	0.019634		377.5	0.078432		24.5	0.00509		0.0525	1.09E-05		0.003	1.32E-06		0.112	2.33E-05		0.238	4.94E-05
12.5	12	2.47E-02	1.95E-02		94.5	0.041306		377.5	0.165007		24.5	0.010709		0.0525	2.29E-05		0.003	2.77E-06		0.112	4.9E-05		0.238	0.000104
12.6	18	2.39E-02	2.43E-02	81	76.5	0.051427	365	334	0.205435	20	17	0.013333	0.054	0.054	2.86E-05	0.003	0.0035	3.45E-06	0.089	0.093	6.1E-05	0.249	0.2445	0.00013
12.7	24	1.45E-02	1.92E-02		76.5	0.032856		334	0.143449		17	0.007301		0.054	2.32E-05		0.0035	2.58E-06		0.093	3.99E-05		0.2445	0.000105
12.8	30	5.39E-03	9.92E-03	72	76.5	0.016993	303	289	0.074193	14	12.5	0.003776	0.054	0.0485	1.2E-05	0.004	0.0035	1.33E-06	0.097	0.0905	2.07E-05	0.24	0.23	5.43E-05
12.9	36	1.03E-03	3.21E-03		76.5	0.005498		289	0.020772		12.5	0.000898		0.0485	3.49E-06		0.0035	4.31E-07		0.0905	6.5E-06		0.23	1.65E-05
	42		5.16E-04		76.5	0.000885		289	0.003342		12.5	0.000145		0.0485	5.61E-07		0.0035	6.93E-08		0.0905	1.05E-06		0.23	2.66E-06

SIMULATION #2

0.75 inches in 9 hours

Conduit CSO 1004 - S2CSO4.XLS

Summary Statistics

Total Discharge

Volume (cf)	Duration (hr)	CBOD (lbs)	SS (lbs)	TKN (lbs)	Cu (lbs)	Cd (lbs)	Pb (lbs)	Zn (lbs)
5.07E+01	0.10	0.298063	1.190676	0.077276	0.000166	0.000020	0.000353	0.000751

Conduit CSO 1004

Time (hours)	Time (minutes)	Flow (ft^3/s)	Mean Flow	CBOD Conc.	CBOD Mean Conc.	CBOD Discharge lbs.	SS Conc. mg/l	SS Mean Conc.	SS Discharge lbs.	TKN Conc. mg/l	TKN Mean Conc.	TKN Discharge lbs.	Cu Conc. mg/l	Cu Mean Conc.	Cu Discharge lbs.	Cd Conc. mg/l	Cd Mean Conc.	Cd Discharge lbs.	Pb Conc. mg/l	Pb Mean Conc.	Pb Discharge lbs.	Zn Conc. mg/l	Zn Mean Conc.	Zn Discharge lbs.
16.3	0	0.136411		108	94.5		390	377.5		29	24.5		0.051	0.0525		0.003	0.003		0.135	0.112		0.227	0.238	
16.4	6	7.26E-02	1.05E-01		94.5	0.221199		377.5	0.883624		24.5	0.057348		0.0525	0.000123		0.003	1.49E-05		0.112	0.000262		0.238	0.000557
	12		3.63E-02		94.5	0.076865		377.5	0.307052		24.5	0.019928		0.0525	4.27E-05		0.003	5.16E-06		0.112	9.11E-05		0.238	0.000194

Conduit CSO 1005D - S2CSO5D.XLS

Summary Statistics

Total Discharge Volume (cf)	Duration (hr)	CBOD (lbs)	SS (lbs)	TKN (lbs)	Cu (lbs)	Cd (lbs)	Pb (lbs)	Zn (lbs)
7.71E+02	8.40	2.0133	13.2285	0.4671	0.0019	0.0001	0.0040	0.0096

Conduit CSO 1005D

Time (hours)	Time (minutes)	Flow (ft^3/s)	Mean Flow	CBOD Conc.	CBOD Mean Conc.	CBOD Discharge lbs.	SS Conc. mg/l	SS Mean Conc.	SS Discharge lbs.	TKN Conc. mg/l	TKN Mean Conc.	TKN Discharge lbs.	Cu Conc. mg/l	Cu Mean Conc.	Cu Discharge lbs.	Cd Conc. mg/l	Cd Mean Conc.	Cd Discharge lbs.	Pb Conc. mg/l	Pb Mean Conc.	Pb Discharge lbs.	Zn Conc. mg/l	Zn Mean Conc.	Zn Discharge lbs.
12.7	0	8.15E-04		108	94.5		390	377.5		29	24.5		0.051	0.0525		0.003	0.003		0.135	0.112		0.227	0.238	
12.8	6	1.19E-02	6.35E-03		94.5	0.01343		377.5	0.053651		24.5	0.003482		0.0525	7.46E-06		0.003	9.02E-07		0.112	1.59E-05		0.238	3.38E-05
12.9	12	3.64E-02	2.42E-02		94.5	0.051122		377.5	0.204216		24.5	0.013254		0.0525	2.84E-05		0.003	3.43E-06		0.112	6.08E-05		0.238	0.000129
13	18	6.03E-02	4.84E-02	81	76.5	0.102371	365	334	0.408942	20	17	0.026541	0.054	0.054	5.69E-05	0.003	0.0035	6.88E-06	0.089	0.093	0.000121	0.249	0.2445	0.000258
13.1	24	7.59E-02	6.81E-02		76.5	0.116652		334	0.509306		17	0.025923		0.054	8.23E-05		0.0035	9.14E-06		0.093	0.000142		0.2445	0.000373
13.2	30	8.50E-02	8.04E-02	72	76.5	0.137755	303	289	0.601442	14	12.5	0.030612	0.054	0.0485	9.72E-05	0.004	0.0035	1.08E-05	0.097	0.0905	0.000167	0.24	0.23	0.00044
13.3	36	9.05E-02	8.77E-02		76.5	0.160322		289	0.567882		12.5	0.024562		0.0485	9.53E-05		0.0035	1.18E-05		0.0905	0.000178		0.23	0.000452
13.4	42	9.32E-02	9.19E-02		76.5	0.157418		289	0.594589		12.5	0.025722		0.0485	9.98E-05		0.0035	1.23E-05		0.0905	0.000186		0.23	0.000473
13.5	48	9.28E-02	9.30E-02	45	41.5	0.159388	275	260	0.602131	11	9.5	0.026044	0.043	0.042	0.000101	0.003	0.003	1.25E-05	0.084	0.099	0.000189	0.22	0.214	0.000479
13.6	54	9.07E-02	9.18E-02		41.5	0.085291		260	0.534356		9.5	0.019525		0.042	8.63E-05		0.003	5.73E-06		0.099	0.000203		0.214	0.00044
13.7	60	8.84E-02	8.96E-02	38	40.5	0.083232	245	236.5	0.521454	8	8.5	0.019053	0.041	0.04	8.42E-05	0.003	0.003	5.59E-06	0.114	0.092	0.000199	0.208	0.194	0.000429
13.8	66	8.63E-02	8.74E-02		40.5	0.079223		236.5	0.462625		8.5	0.016627		0.04	7.82E-05		0.003	5.32E-06		0.092	0.00018		0.194	0.000379
13.9	72	8.18E-02	8.40E-02		40.5	0.076201		236.5	0.444979		8.5	0.015993		0.04	7.53E-05		0.003	5.12E-06		0.092	0.000173		0.194	0.000365
14	78	7.34E-02	7.76E-02		40.5	0.070356		236.5	0.410845		8.5	0.014766		0.04	6.95E-05		0.003	4.73E-06		0.092	0.00016		0.194	0.000337
14.1	84	6.34E-02	6.84E-02		40.5	0.062039		236.5	0.362279		8.5	0.013021		0.04	6.13E-05		0.003	4.17E-06		0.092	0.000141		0.194	0.000297
14.2	90	5.47E-02	5.90E-02	43	37	0.053539	228	298.5	0.312643	9	8.5	0.011237	0.039	0.038	5.29E-05	0.003	0.003	3.6E-06	0.07	0.0685	0.000122	0.18	0.175	0.000256
14.3	96	4.75E-02	5.11E-02		37	0.042304		298.5	0.341292		8.5	0.009719		0.038	4.34E-05		0.003	2.84E-06		0.0685	7.83E-05		0.175	0.0002
14.4	102	4.10E-02	4.42E-02		37	0.036641		298.5	0.295601		8.5	0.008417		0.038	3.76E-05		0.003	2.46E-06		0.0685	6.78E-05		0.175	0.000173
14.5	108	3.62E-02	3.86E-02		37	0.031959		298.5	0.257828		8.5	0.007342		0.038	3.28E-05		0.003	2.15E-06		0.0685	5.92E-05		0.175	0.000151
14.6	114	3.28E-02	3.45E-02		37	0.028572		298.5	0.23051		8.5	0.006564		0.038	2.93E-05		0.003	1.92E-06		0.0685	5.29E-05		0.175	0.000135
14.7	120	3.13E-02	3.21E-02	31	24.5	0.026562	369	316.5	0.214292	8	8.5	0.006102	0.037	0.0345	2.73E-05	0.003	0.003	1.78E-06	0.067	0.0745	4.92E-05	0.17	0.187	0.000126
14.8	126	3.12E-02	3.13E-02		24.5	0.017153		316.5	0.221583		8.5	0.005951		0.0345	2.42E-05		0.003	1.15E-06		0.0745	5.22E-05		0.187	0.000131
14.9	132	3.21E-02	3.16E-02		24.5	0.017361		316.5	0.22428		8.5	0.006023		0.0345	2.44E-05		0.003	1.17E-06		0.0745	5.28E-05		0.187	0.000133
15	138	3.32E-02	3.26E-02		24.5	0.017893		316.5	0.231146		8.5	0.006208		0.0345	2.52E-05		0.003	1.2E-06		0.0745	5.44E-05		0.187	0.000137
15.1	144	3.43E-02	3.37E-02		24.5	0.018499		316.5	0.238972		8.5	0.006418		0.0345	2.6E-05		0.003	1.24E-06		0.0745	5.63E-05		0.187	0.000141
15.2	150	3.53E-02	3.48E-02		24.5	0.019092		316.5	0.246635		8.5	0.006624		0.0345	2.69E-05		0.003	1.28E-06		0.0745	5.81E-05		0.187	0.000146
15.3	156	3.62E-02	3.58E-02		24.5	0.019633		316.5	0.25363		8.5	0.006812		0.0345	2.76E-05		0.003	1.32E-06		0.0745	5.97E-05		0.187	0.00015
15.4	162	3.63E-02	3.63E-02		24.5	0.019911		316.5	0.257213		8.5	0.006908		0.0345	2.8E-05		0.003	1.34E-06		0.0745	6.05E-05		0.187	0.000152
15.5	168	3.50E-02	3.57E-02		24.5	0.01958		316.5	0.252844		8.5	0.006793		0.0345	2.76E-05		0.003	1.32E-06		0.0745	5.95E-05		0.187	0.000149
15.6	174	3.28E-02	3.39E-02		24.5	0.018613		316.5	0.240455		8.5	0.006458		0.0345	2.62E-05		0.003	1.25E-06		0.0745	5.66E-05		0.187	0.000142
15.7	180	2.99E-02	3.14E-02		24.5	0.017212		316.5	0.222356		8.5	0.005972		0.0345	2.42E-05		0.003	1.16E-06		0.0745	5.23E-05		0.187	0.000131
15.8	186	2.67E-02	2.83E-02		24.5	0.015548		316.5	0.200835		8.5	0.005394		0.0345	2.19E-05		0.003	1.04E-06		0.0745	4.73E-05		0.187	0.000119
15.9	192	2.37E-02	2.52E-02		24.5	0.013829		316.5	0.178649		8.5	0.004798		0.0345	1.95E-05		0.003	9.29E-07		0.0745	4.21E-05		0.187	0.000106
16	198	2.11E-02	2.24E-02		24.5	0.012274		316.5	0.158559		8.5	0.004258		0.0345	1.73E-05		0.003	8.25E-07		0.0745	3.73E-05		0.187	9.37E-05
16.1	204	1.90E-02	2.00E-02		24.5	0.010981		316.5	0.141862		8.5	0.00381		0.0345	1.55E-05		0.003	7.38E-07		0.0745	3.34E-05		0.187	8.38E-05
18.2	210	1.77E-02	1.83E-02		24.5	0.010061		316.5	0.129977		8.5	0.003491		0.0345	1.42E-05		0.003	6.76E-07		0.0745	3.06E-05		0.187	7.68E-05
16.3	216	1.73E-02	1.75E-02		24.5	0.009601		316.5	0.124033		8.5	0.003331		0.0345	1.35E-05		0.003	6.45E-07		0.0745	2.92E-05		0.187	7.33E-05
16.4	222	1.73E-02	1.73E-02		24.5	0.009491		316.5	0.122608		8.5	0.003293		0.0345	1.34E-05		0.003	8.38E-07		0.0745	2.89E-05		0.187	7.24E-05
16.5	228	1.77E-02	1.75E-02		24.5	0.009592		316.5	0.123913		8.5	0.003328		0.0345	1.35E-05		0.003	6.44E-07		0.0745	2.92E-05		0.187	7.32E-05
16.6	234	1.81E-02	1.79E-02		24.5	0.009008		316.5	0.126697		8.5	0.003403		0.0345	1.38E-05		0.003	6.59E-07		0.0745	2.98E-05		0.187	7.49E-05
16.7	240	1.85E-02	1.83E-02	18	19.5	0.010044	264	207	0.129756	9	8	0.003485	0.032	0.029	1.41E-05	0.003	0.0025	6.75E-07	0.082	0.0705	3.05E-05	0.204	0.1835	7.87E-05
16.8	246	1.90E-02	1.87E-02		19.5	0.008182		207	0.086857		6	0.002518		0.029	1.22E-05		0.0025	4.58E-07		0.0705	2.98E-05		0.1835	7.7E-05
16.9	252	1.91E-02	1.91E-02		19.5	0.008319		207	0.088313		6	0.00256		0.029	1.24E-05		0.0025	4.66E-07		0.0705	3.01E-05		0.1835	7.83E-05
17	258	1.91E-02	1.91E-02		19.5	0.008341		207	0.088547		8	0.002587		0.029	1.24E-05		0.0025	4.67E-07		0.0705	3.02E-05		0.1835	7.85E-05
17.1	264	1.87E-02	1.89E-02		19.5	0.008239		207	0.087463		6	0.002535		0.029	1.23E-05		0.0025	4.61E-07		0.0705	2.98E-05		0.1835	7.75E-05
17.2	270	1.82E-02	1.84E-02		19.5	0.008054		207	0.0855		8	0.002478		0.029	1.2E-05		0.0025	4.51E-07		0.0705	2.91E-05		0.1835	7.58E-05
17.3	276	1.77E-02	1.80E-02		19.5	0.007851		207	0.083339		6	0.002416		0.029	1.17E-05		0.0025	4.4E-07		0.0705	2.84E-05		0.1835	7.39E-05

Conduit CSO 1005D

Time (hours)	Time (minutes)	Flow (ft^3/s)	Mean Flow	CBOD Conc.	CBOD Mean Conc.	CBOD Discharge lbs.	SS Conc. mg/l	SS Mean Conc.	SS Discharge lbs.	TKN Conc. mg/l	TKN Mean Conc.	TKN Discharge lbs.	Cu Conc. mg/l	Cu Mean Conc.	Cu Discharge lbs.	Cd Conc. mg/l	Cd Mean Conc.	Cd Discharge lbs.	Pb Conc. mg/l	Pb Mean Conc.	Pb Discharge lbs.	Zn Conc. mg/l	Zn Mean Conc.	Zn Discharge lbs.
17.4	282	1.71E-02	1.74E-02		19.5	0.007599		207	0.080664		6	0.002338		0.029	1.13E-05		0.0025	4.25E-07		0.0705	2.75E-05		0.1835	7.15E-05
17.5	288	1.60E-02	1.65E-02		19.5	0.007207		207	0.076509		6	0.002218		0.029	1.07E-05		0.0025	4.03E-07		0.0705	2.61E-05		0.1835	6.78E-05
17.6	294	1.46E-02	1.53E-02		19.5	0.006669		207	0.070792		6	0.002052		0.029	9.92E-06		0.0025	3.73E-07		0.0705	2.41E-05		0.1835	6.28E-05
17.7	300	1.32E-02	1.39E-02		19.5	0.006072		207	0.064458		6	0.001868		0.029	9.03E-06		0.0025	3.4E-07		0.0705	2.2E-05		0.1835	5.71E-05
17.8	306	1.20E-02	1.26E-02		19.5	0.005502		207	0.058403		6	0.001693		0.029	8.18E-06		0.0025	3.08E-07		0.0705	1.99E-05		0.1835	5.18E-05
17.9	312	1.10E-02	1.15E-02		19.5	0.005009		207	0.053174		6	0.001541		0.029	7.45E-06		0.0025	2.8E-07		0.0705	1.81E-05		0.1835	4.71E-05
18	318	1.01E-02	1.05E-02		19.5	0.004595		207	0.048782		6	0.001414		0.029	6.83E-06		0.0025	2.57E-07		0.0705	1.66E-05		0.1835	4.32E-05
18.1	324	9.05E-03	9.57E-03		19.5	0.004177		207	0.044345		6	0.001285		0.029	6.21E-06		0.0025	2.34E-07		0.0705	1.51E-05		0.1835	3.93E-05
18.2	330	8.34E-03	8.69E-03		19.5	0.003796		207	0.040299		6	0.001168		0.029	5.65E-06		0.0025	2.13E-07		0.0705	1.37E-05		0.1835	3.57E-05
18.3	336	7.76E-03	8.05E-03		19.5	0.003515		207	0.037308		6	0.001081		0.029	5.23E-06		0.0025	1.97E-07		0.0705	1.27E-05		0.1835	3.31E-05
18.4	342	7.35E-03	7.56E-03		19.5	0.0033		207	0.035026		6	0.001015		0.029	4.91E-06		0.0025	1.85E-07		0.0705	1.19E-05		0.1835	3.1E-05
18.5	348	7.20E-03	7.28E-03	21	21	0.003177	150	150	0.033724	3	3	0.000978	0.026	0.026	4.72E-06	0.002	0.002	1.78E-07	0.059	0.059	1.15E-05	0.163	0.163	2.99E-05
18.6	354	7.22E-03	7.21E-03		21	0.00339		150	0.024215		3	0.000484		0.026	4.2E-06		0.002	1.52E-07		0.059	9.52E-06		0.163	2.63E-05
18.7	360	7.36E-03	7.29E-03		21	0.003429		150	0.024484		3	0.00049		0.026	4.25E-06		0.002	1.54E-07		0.059	9.63E-06		0.163	2.66E-05
18.8	366	7.55E-03	7.46E-03		21	0.003507		150	0.025051		3	0.000501		0.026	4.34E-06		0.002	1.57E-07		0.059	9.85E-06		0.163	2.72E-05
18.9	372	7.57E-03	7.56E-03		21	0.003556		150	0.025397		3	0.000508		0.026	4.4E-06		0.002	1.59E-07		0.059	9.99E-06		0.163	2.76E-05
19	378	7.23E-03	7.40E-03		21	0.00348		150	0.024855		3	0.000497		0.026	4.31E-06		0.002	1.56E-07		0.059	9.78E-06		0.163	2.7E-05
19.1	384	6.60E-03	6.92E-03		21	0.003253		150	0.023233		3	0.000465		0.026	4.03E-06		0.002	1.46E-07		0.059	9.14E-06		0.163	2.52E-05
19.2	390	5.91E-03	6.26E-03		21	0.002941		150	0.021011		3	0.00042		0.026	3.64E-06		0.002	1.32E-07		0.059	8.26E-06		0.163	2.28E-05
19.3	396	5.20E-03	5.56E-03		21	0.002612		150	0.018659		3	0.000373		0.026	3.23E-06		0.002	1.17E-07		0.059	7.34E-06		0.163	2.03E-05
19.4	402	4.58E-03	4.89E-03		21	0.002301		150	0.016436		3	0.000329		0.026	2.85E-06		0.002	1.03E-07		0.059	6.46E-06		0.163	1.79E-05
19.5	408	4.07E-03	4.33E-03		21	0.002034		150	0.014531		3	0.000291		0.026	2.52E-06		0.002	9.11E-08		0.059	5.72E-06		0.163	1.58E-05
19.6	414	3.65E-03	3.86E-03		21	0.001815		150	0.012963		3	0.000259		0.026	2.25E-06		0.002	8.13E-08		0.059	5.1E-06		0.163	1.41E-05
19.7	420	3.29E-03	3.47E-03		21	0.001631		150	0.011647		3	0.000233		0.026	2.02E-06		0.002	7.3E-08		0.059	4.58E-06		0.163	1.27E-05
19.8	426	2.99E-03	3.14E-03		21	0.001476		150	0.010545		3	0.000211		0.026	1.83E-06		0.002	6.61E-08		0.059	4.15E-06		0.163	1.15E-05
19.9	432	2.72E-03	2.86E-03		21	0.001343		150	0.009591		3	0.000192		0.026	1.66E-06		0.002	6.01E-08		0.059	3.77E-06		0.163	1.04E-05
20	438	2.42E-03	2.57E-03		21	0.001208		150	0.008627		3	0.000173		0.026	1.5E-06		0.002	5.41E-08		0.059	3.39E-06		0.163	9.37E-06
20.1	444	2.11E-03	2.27E-03		21	0.001065		150	0.007609		3	0.000152		0.026	1.32E-06		0.002	4.77E-08		0.059	2.99E-06		0.163	8.27E-06
20.2	450	1.80E-03	1.96E-03		21	0.00092		150	0.006575		3	0.000131		0.026	1.14E-06		0.002	4.12E-08		0.059	2.59E-06		0.163	7.14E-06
20.3	456	1.50E-03	1.65E-03		21	0.000776		150	0.005642		3	0.000111		0.026	9.61E-07		0.002	3.48E-08		0.059	2.18E-06		0.163	6.02E-06
20.39972	462	1.23E-03	1.36E-03		21	0.00064		150	0.004575		3	9.15E-05		0.026	7.93E-07		0.002	2.87E-08		0.059	1.8E-06		0.163	4.97E-06
20.49972	468	9.76E-04	1.10E-03		21	0.000518		150	0.003698		3	7.4E-05		0.026	6.41E-07		0.002	2.32E-08		0.059	1.45E-06		0.163	4.02E-06
20.59972	474	7.48E-04	8.62E-04		21	0.000405		150	0.002895		3	5.79E-05		0.026	5.02E-07		0.002	1.81E-08		0.059	1.14E-06		0.163	3.15E-06
20.69944	480	5.56E-04	6.52E-04		21	0.000307		150	0.00219		3	4.38E-05		0.026	3.8E-07		0.002	1.37E-08		0.059	8.61E-07		0.163	2.38E-06
20.79944	486	3.87E-04	4.72E-04		21	0.000222		150	0.001584		3	3.17E-05		0.026	2.75E-07		0.002	9.93E-09		0.059	6.23E-07		0.163	1.72E-06
20.89972	492	2.46E-04	3.16E-04		21	0.000149		150	0.001063		3	2.13E-05		0.026	1.84E-07		0.002	6.68E-09		0.059	4.18E-07		0.163	1.16E-06
20.99972	498	1.24E-04	1.85E-04		21	8.71E-05		150	0.000622		3	1.24E-05		0.026	1.08E-07		0.002	3.9E-09		0.059	2.45E-07		0.163	6.78E-07
21.09972	504	3.13E-05	7.78E-05		21	3.66E-05		150	0.000261		3	5.23E-06		0.026	4.53E-08		0.002	1.64E-09		0.059	1.03E-07		0.163	2.84E-07
	510		1.56E-05		21	7.36E-06		150	5.25E-05		3	1.05E-06		0.026	9.11E-09		0.002	3.29E-10		0.059	2.07E-08		0.163	5.71E-08

Conduit CSO 1006 - S2CSO6.XLS

Summary Statistics

Total Discharge Volume (cf)	Duration (hr)	CBOD (lbs)	SS (lbs)	TKN (lbs)	Cu (lbs)	Cd (lbs)	Pb (lbs)	Zn (lbs)
6.48E+04	6.80	195.58	1179.44	46.37	0.17	0.01	0.35	0.83

Conduit CSO 1006

Time (hours)	Time (minutes)	Flow (ft^3/s)	Mean Flow	CBOD Conc.	CBOD Mean Conc.	CBOD Discharge lbs.	SS Conc. mg/l	SS Mean Conc.	SS Discharge lbs.	TKN Conc. mg/l	TKN Mean Conc.	TKN Discharge lbs.	Cu Conc. mg/l	Cu Mean Conc.	Cu Discharge lbs.	Cd Conc. mg/l	Cd Mean Conc.	Cd Discharge lbs.	Pb Conc. mg/l	Pb Mean Conc.	Pb Discharge lbs.	Zn Conc. mg/l	Zn Mean Conc.	Zn Discharge lbs.
12.8	0	5.902908		108	94.5		390	377.5		29	24.5		0.051	0.0525		0.003	0.003		0.135	0.112		0.227	0.238	
12.9	6	7.471725	6.69E+00		94.5	14.15149		377.5	56.5311		24.5	3.668906		0.0525	0.007662		0.003	0.000951		0.112	0.016772		0.238	0.035641
13	12	7.916876	7.69E+00		94.5	16.28244		377.5	65.04362		24.5	4.221374		0.0525	0.009046		0.003	0.001094		0.112	0.019298		0.238	0.041008
13.1	18	7.792106	7.85E+00	81	78.5	18.82143	365	334	66.39778	20	17	4.30926	0.054	0.054	0.009234	0.003	0.0035	0.001117	0.089	0.093	0.019699	0.249	0.2445	0.041861
13.2	24	7.435581	7.61E+00		78.5	13.04319		334	56.94676		17	2.898488		0.054	0.009207		0.0035	0.001022		0.093	0.015856		0.2445	0.041687
13.3	30	7.355269	7.40E+00	72	76.5	12.66902	303	289	55.31312	14	12.5	2.815339	0.054	0.0485	0.008943	0.004	0.0035	0.000993	0.097	0.0005	0.015402	0.24	0.23	0.040491
13.4	36	7.547225	7.45E+00		78.5	12.76465		289	48.22202		12.5	2.085727		0.0485	0.008093		0.0035	0.001		0.0905	0.015101		0.23	0.038377
13.5	42	7.62085	7.58E+00		76.5	12.99213		289	49.08139		12.5	2.122898		0.0485	0.008237		0.0035	0.001018		0.0905	0.01537		0.23	0.039061
13.6	48	7.435287	7.53E+00	45	41.5	12.89625	275	260	48.71918	11	9.5	2.107231	0.043	0.042	0.008176	0.003	0.003	0.001011	0.084	0.099	0.015256	0.22	0.214	0.038773
13.7	54	7.136323	7.29E+00		41.5	6.770866		260	42.41988		9.5	1.549957		0.042	0.006852		0.003	0.000455		0.099	0.018152		0.214	0.034915
13.8	60	8.890562	7.01E+00	38	40.5	6.517753	245	236.5	40.83412	8	8.5	1.492018	0.041	0.04	0.006596	0.003	0.003	0.000438	0.114	0.092	0.015548	0.208	0.194	0.03361
13.9	66	6.681981	8.79E+00		40.5	6.164671		236.5	35.94024		8.5	1.291721		0.04	0.006079		0.003	0.000413		0.092	0.013981		0.194	0.029482
14	72	6.282823	8.48E+00		40.5	5.879083		238.5	34.33094		8.5	1.233882		0.04	0.005807		0.003	0.000395		0.092	0.013355		0.194	0.028162
14.1	78	5.535158	5.91E+00		40.5	5.359039		236.5	31.29414		8.5	1.124737		0.04	0.005293		0.003	0.00036		0.092	0.012174		0.194	0.02567
14.2	84	4.676931	5.11E+00		40.5	4.630823		236.5	27.04172		8.5	0.971901		0.04	0.004574		0.003	0.000311		0.092	0.010519		0.194	0.022182
14.3	90	3.998158	4.34E+00	43	37	3.933848	228	298.5	22.97173	9	8.5	0.825622	0.039	0.038	0.003885	0.003	0.003	0.000264	0.07	0.0685	0.008936	0.18	0.175	0.018844
14.4	96	3.476257	3.74E+00		37	3.096475		298.5	24.98102		8.5	0.711352		0.038	0.00318		0.003	0.000208		0.0685	0.005733		0.175	0.014645
14.5	102	3.112612	3.29E+00		37	2.729614		298.5	22.02134		8.5	0.627073		0.036	0.002603		0.003	0.000183		0.0685	0.005053		0.175	0.01291
14.6	108	2.815216	2.96E+00		37	2.45576		298.5	19.81201		8.5	0.564181		0.038	0.002522		0.003	0.000165		0.0685	0.004546		0.175	0.011615
14.7	114	2.605319	2.71E+00		37	2.2456		298.5	18.11653		8.5	0.515881		0.038	0.002306		0.003	0.000151		0.0685	0.004157		0.175	0.010621
14.8	120	2.542853	2.57E+00	31	24.5	2.132767	369	316.5	17.20624	8	8.5	0.48996	0.037	0.0345	0.00219	0.003	0.003	0.000143	0.067	0.0745	0.003949	0.17	0.187	0.010087
14.9	126	2.658462	2.60E+00		24.5	1.426816		316.5	18.43213		8.5	0.495018		0.0345	0.002009		0.003	9.59E-05		0.0745	0.004339		0.187	0.01089
15	132	2.851473	2.75E+00		24.5	1.511476		318.5	19.5258		8.5	0.524389		0.0345	0.002128		0.003	0.000102		0.0745	0.004596		0.187	0.011537
15.1	138	3.007586	2.93E+00		24.5	1.607247		316.5	20.763		8.5	0.557616		0.0345	0.002263		0.003	0.000108		0.0745	0.004887		0.187	0.012268
15.2	144	3.111441	3.06E+00		24.5	1.678561		318.5	21.88426		8.5	0.582358		0.0345	0.002364		0.003	0.000113		0.0745	0.005104		0.187	0.012812
15.3	150	3.200624	3.16E+00		24.5	1.731514		316.5	22.38834		8.5	0.60073		0.0345	0.002438		0.003	0.000116		0.0745	0.005265		0.187	0.013216
15.4	156	3.265324	3.23E+00		24.5	1.773727		316.5	22.91368		8.5	0.615375		0.0345	0.002498		0.003	0.000119		0.0745	0.005394		0.187	0.013538
15.5	182	3.248564	3.26E+00		24.5	1.786878		316.5	23.08355		8.5	0.619937		0.0345	0.002516		0.003	0.00012		0.0745	0.005434		0.187	0.013639
15.6	168	3.081065	3.16E+00		24.5	1.736333		318.5	22.43058		8.5	0.602401		0.0345	0.002445		0.003	0.000117		0.0745	0.00528		0.187	0.013253
15.7	174	2.799166	2.94E+00		24.5	1.613055		316.5	20.83803		8.5	0.559631		0.0345	0.002271		0.003	0.000108		0.0745	0.004905		0.187	0.012312
15.8	160	2.475167	2.64E+00		24.5	1.446846		316.5	18.60088		8.5	0.501967		0.0345	0.002037		0.003	9.72E-05		0.0745	0.0044		0.187	0.011043
15.9	186	2.138515	2.31E+00		24.5	1.265617		316.5	16.34971		8.5	0.439092		0.0345	0.001782		0.003	8.5E-05		0.0745	0.003849		0.187	0.00966
16	192	1.824535	1.98E+00		24.5	1.087137		316.5	14.04403		8.5	0.37717		0.0345	0.001531		0.003	7.3E-05		0.0745	0.003306		0.187	0.008298
18.1	198	1.558141	1.69E+00		24.5	0.92793		316.5	11.98734		8.5	0.321935		0.0345	0.001307		0.003	8.23E-05		0.0745	0.002822		0.187	0.007083
16.2	204	1.362776	1.46E+00		24.5	0.801261		316.5	10.35090		8.5	0.277988		0.0345	0.001128		0.003	5.38E-05		0.0745	0.002436		0.187	0.006116
16.3	210	1.254045	1.31E+00		24.5	0.717842		316.5	9.273343		8.5	0.249047		0.0345	0.001011		0.003	4.82E-05		0.0745	0.002183		0.187	0.005479
16.4	216	1.249459	1.25E+00		24.5	0.688757		318.5	8.871778		8.5	0.238263		0.0345	0.000967		0.003	4.61E-05		0.0745	0.002088		0.187	0.005242
16.5	222	1.317878	1.28E+00		24.5	0.704267		316.5	9.097984		8.5	0.244338		0.0345	0.000992		0.003	4.73E-05		0.0745	0.002142		0.187	0.005375
16.6	228	1.389419	1.35E+00		24.5	0.742661		316.5	9.593967		8.5	0.257658		0.0345	0.001046		0.003	4.99E-05		0.0745	0.002258		0.187	0.005668
16.7	234	1.434829	1.41E+00		24.5	0.774743		318.5	10.00841		8.5	0.268788		0.0345	0.001091		0.003	5.2E-05		0.0745	0.002356		0.187	0.005913
18.8	240	1.465102	1.45E+00	18	19.5	0.795504	264	207	10.27861	9	8	0.275991	0.032	0.029	0.00112	0.003	0.0025	5.34E-05	0.082	0.0705	0.002419	0.204	0.1835	0.006072
16.9	246	1.491344	1.48E+00		19.5	0.645495		207	6.852182		6	0.198614		0.029	0.00096		0.0025	3.61E-05		0.0705	0.002334		0.1835	0.006074
17	252	1.497763	1.49E+00		19.5	0.652626		207	8.927881		6	0.200808		0.029	0.000971		0.0025	3.65E-05		0.0705	0.002359		0.1835	0.006141
17.1	258	1.46186	1.48E+00		19.5	0.646189		207	6.859545		8	0.198827		0.029	0.000961		0.0025	3.62E-05		0.0705	0.002336		0.1835	0.006081
17.2	264	1.388308	1.43E+00		19.5	0.622291		207	8.60586		6	0.191474		0.029	0.000925		0.0025	3.48E-05		0.0705	0.00225		0.1835	0.005856
17.3	270	1.30809	1.35E+00		19.5	0.588718		207	6.249466		6	0.181144		0.029	0.000878		0.0025	3.3E-05		0.0705	0.002128		0.1835	0.00554
17.4	276	1.237737	1.27E+00		19.5	0.555843		207	5.900488		8	0.171029		0.029	0.000827		0.0025	3.11E-05		0.0705	0.00201		0.1835	0.005231

Conduit CSO 1006

Time (hours)	Time (minutes)	Flow (ft^3/s)	Mean Flow	CBOD Conc.	CBOD Mean Conc.	CBOD Discharge lbs.	SS Conc. mg/l	SS Mean Conc.	SS Discharge lbs.	TKN Conc. mg/l	TKN Mean Conc.	TKN Discharge lbs.	Cu Conc. mg/l	Cu Mean Conc.	Cu Discharge lbs.	Cd Conc. mg/l	Cd Mean Conc.	Cd Discharge lbs.	Pb Conc. mg/l	Pb Mean Conc.	Pb Discharge lbs.	Zn Conc. mg/l	Zn Mean Conc.	Zn Discharge lbs.
17.5	282	1.157196	1.20E+00		19.5	0.522897		207	5.550758		6	0.160892		0.029	0.000778		0.0025	2.93E-05		0.0705	0.00189		0.1835	0.004921
17.6	288	1.026868	1.09E+00		19.5	0.476857		207	5.062025		6	0.146725		0.029	0.000709		0.0025	2.67E-05		0.0705	0.001724		0.1835	0.004487
17.7	294	0.851363	9.39E-01		19.5	0.410083		207	4.353193		6	0.12618		0.029	0.00061		0.0025	2.3E-05		0.0705	0.001483		0.1835	0.003859
17.8	300	0.669578	7.60E-01		19.5	0.332074		207	3.525098		6	0.102177		0.029	0.000494		0.0025	1.86E-05		0.0705	0.001201		0.1835	0.003125
17.9	306	0.51703	5.93E-01		19.5	0.259078		207	2.750212		6	0.079716		0.029	0.000385		0.0025	1.45E-05		0.0705	0.000937		0.1835	0.002438
18	312	0.402509	4.60E-01		19.5	0.200767		207	2.131224		6	0.061775		0.029	0.000299		0.0025	1.12E-05		0.0705	0.000726		0.1835	0.001889
18.1	318	0.315345	3.59E-01		19.5	0.156733		207	1.663776		6	0.048225		0.029	0.000233		0.0025	8.77E-06		0.0705	0.000567		0.1835	0.001475
18.2	324	0.247289	2.81E-01		19.5	0.122843		207	1.304021		6	0.037798		0.029	0.000183		0.0025	6.88E-06		0.0705	0.000444		0.1835	0.001156
18.3	330	0.193374	2.20E-01		19.5	0.096212		207	1.021327		6	0.029604		0.029	0.000143		0.0025	5.39E-06		0.0705	0.000348		0.1835	0.000905
18.4	336	0.151791	1.73E-01		19.5	0.075361		207	0.799991		6	0.023188		0.029	0.000112		0.0025	4.22E-06		0.0705	0.000272		0.1835	0.000709
18.5	342	0.126617	1.39E-01		19.5	0.060786		207	0.645268		6	0.018703		0.029	9.04E-05		0.0025	3.4E-06		0.0705	0.00022		0.1835	0.000572
18.6	348	0.126157	1.26E-01	21	21	0.05519	150	150	0.585858	3	3	0.016981	0.026	0.026	8.21E-05	0.002	0.002	3.09E-06	0.059	0.059	0.0002	0.163	0.163	0.000519
18.7	354	0.160643	1.43E-01		21	0.067435		150	0.48168		3	0.009634		0.026	6.35E-05		0.002	3.02E-06		0.059	0.000189		0.163	0.000523
18.8	360	0.227523	1.94E-01		21	0.091269		150	0.651924		3	0.013038		0.026	0.000113		0.002	4.09E-06		0.059	0.000256		0.163	0.000708
18.9	366	0.302315	2.65E-01		21	0.124581		150	0.889862		3	0.017797		0.026	0.000154		0.002	5.58E-06		0.059	0.00035		0.163	0.000967
19	372	0.350547	3.26E-01		21	0.153507		150	1.096481		3	0.02193		0.026	0.00019		0.002	6.88E-06		0.059	0.000431		0.163	0.001192
19.1	378	0.343494	3.47E-01		21	0.16319		150	1.165642		3	0.023313		0.026	0.000202		0.002	7.31E-06		0.059	0.000458		0.163	0.001267
19.2	384	0.27467	3.09E-01		21	0.145349		150	1.038207		3	0.020764		0.026	0.00018		0.002	6.51E-06		0.059	0.000408		0.163	0.001128
19.3	390	0.178476	2.27E-01		21	0.106548		150	0.761059		3	0.015221		0.026	0.000132		0.002	4.77E-06		0.059	0.000299		0.163	0.000827
19.4	396	9.50E-02	1.37E-01		21	0.064311		150	0.459366		3	0.009187		0.026	7.96E-05		0.002	2.86E-06		0.059	0.000181		0.163	0.000499
19.5	402	3.68E-02	6.59E-02		21	0.031001		150	0.221437		3	0.004429		0.026	3.84E-05		0.002	1.39E-06		0.059	8.71E-05		0.163	0.000241
19.6	408	3.44E-03	2.01E-02		21	0.009484		150	0.0676		3	0.001352		0.026	1.17E-05		0.002	4.24E-07		0.059	2.66E-05		0.163	7.35E-05
	414		1.72E-03		21	0.000809		150	0.005778		3	0.000116		0.026	1E-06		0.002	3.62E-08		0.059	2.27E-06		0.163	6.28E-06

Conduit CSO 1007 - S2CSO7.XLS

Summary Statistics

Total Discharge Volume (cf)	Duration (hr)	CBOD (lbs)	SS (lbs)	TKN (lbs)	Cu (lbs)	Cd (lbs)	Pb (lbs)	Zn (lbs)
2.54E+04	9.60	51.891	412.498	12.722	0.057	0.003	0.124	0.298

Conduit CSO 1007

Time (hours)	Time (minutes)	Flow (ft^3/s)	Mean Flow	CBOD Conc.	CBOD Mean Conc.	CBOD Discharge lbs.	SS Conc. mg/l	SS Mean Conc.	SS Discharge lbs.	TKN Conc. mg/l	TKN Mean Conc.	TKN Discharge lbs.	Cu Conc. mg/l	Cu Mean Conc.	Cu Discharge lbs.	Cd Conc. mg/l	Cd Mean Conc.	Cd Discharge lbs.	Pb Conc. mg/l	Pb Mean Conc.	Pb Discharge lbs.	Zn Conc. mg/l	Zn Mean Conc.	Zn Discharge lbs.
11.6	0	1.84E-02		108	94.5		390	377.5		29	24.5		0.051	0.0525		0.003	0.003		0.135	0.112		0.227	0.238	
11.7	6	0.130043	7.42E-02		94.5	0.157052		377.5	0.627376		24.5	0.040717		0.0525	8.73E-05		0.003	1.06E-05		0.112	0.000186		0.238	0.000396
11.8	12	0.173729	1.52E-01		94.5	0.321416		377.5	1.283962		24.5	0.08333		0.0525	0.000179		0.003	2.16E-05		0.112	0.000381		0.238	0.000809
11.9	18	0.294079	2.34E-01	61	76.5	0.49498	365	334	1.9773	20	17	0.128328	0.054	0.054	0.000275	0.003	0.0035	3.33E-05	0.089	0.093	0.000587	0.249	0.2445	0.001247
12	24	0.472989	3.84E-01		76.5	0.657028		334	2.868593		17	0.146006		0.054	0.000464		0.0035	5.15E-05		0.093	0.000799		0.2445	0.0021
12.1	30	0.547622	5.10E-01	72	78.5	0.8742	303	289	3.816767	14	12.5	0.194267	0.054	0.0485	0.000617	0.004	0.0035	6.85E-05	0.097	0.0905	0.001063	0.24	0.23	0.002794
12.2	36	0.569247	5.58E-01		76.5	0.956649		289	3.814006		12.5	0.158315		0.0485	0.000607		0.0035	7.5E-05		0.0905	0.001132		0.23	0.002876
12.3	42	0.760925	6.65E-01		76.5	1.139352		289	4.304219		12.5	0.186169		0.0485	0.000722		0.0035	8.93E-05		0.0905	0.001348		0.23	0.003426
12.4	48	1.753326	1.26E+00	45	41.5	2.153568	275	260	8.135703	11	9.5	0.35189	0.043	0.042	0.001365	0.003	0.003	0.000169	0.084	0.099	0.002548	0.22	0.214	0.006475
12.5	54	2.811819	2.28E+00		41.5	2.121247		260	13.28974		9.5	0.485587		0.042	0.002147		0.003	0.000143		0.099	0.00506		0.214	0.010938
12.6	60	3.239843	3.03E+00	38	40.5	2.811974	245	236.5	17.61719	8	8.5	0.643705	0.041	0.04	0.002846	0.003	0.003	0.000189	0.114	0.092	0.006708	0.208	0.194	0.0145
12.7	66	3.45022	3.35E+00		40.5	3.033708		236.5	17.71536		8.5	0.636704		0.04	0.002996		0.003	0.000204		0.092	0.006891		0.194	0.014532
12.8	72	3.446402	3.45E+00		40.5	3.127376		236.5	18.28233		8.5	0.656363		0.04	0.003089		0.003	0.00021		0.092	0.007104		0.194	0.014981
12.9	78	2.961031	3.20E+00		40.5	2.905545		236.5	18.96695		8.5	0.609806		0.04	0.00287		0.003	0.000195		0.092	0.0066		0.194	0.013918
13	84	2.41623	2.69E+00		40.5	2.438399		236.5	14.23904		8.5	0.511763		0.04	0.002408		0.003	0.000164		0.092	0.005539		0.194	0.01168
13.1	90	2.216241	2.32E+00	43	37	2.100663	228	298.5	12.26683	9	8.5	0.44088	0.039	0.038	0.002075	0.003	0.003	0.000141	0.07	0.0685	0.004772	0.18	0.175	0.010062
13.2	96	2.149709	2.18E+00		37	1.808711		298.5	14.59189		8.5	0.415515		0.038	0.001858		0.003	0.000122		0.0685	0.003349		0.175	0.008555
13.3	102	2.060811	2.12E+00		37	1.752605		298.5	14.13926		8.5	0.402625		0.038	0.0018		0.003	0.000118		0.0685	0.003245		0.175	0.008289
13.4	108	1.931225	2.01E+00		37	1.662092		298.5	13.40904		8.5	0.381832		0.038	0.001707		0.003	0.000112		0.0685	0.003077		0.175	0.007861
13.5	114	1.784114	1.86E+00		37	1.539178		298.5	12.41742		8.5	0.353595		0.036	0.001581		0.003	0.000103		0.0685	0.00285		0.175	0.00728
13.6	120	1.728513	1.76E+00	31	24.5	1.455199	369	316.5	11.73992	8	8.5	0.334302	0.037	0.0345	0.001495	0.003	0.003	9.78E-05	0.067	0.0745	0.002694	0.17	0.187	0.006883
13.7	126	1.708885	1.72E+00		24.5	0.942941		316.5	12.18126		8.5	0.327143		0.0345	0.001328		0.003	6.33E-05		0.0745	0.002867		0.187	0.007197
13.8	132	1.618005	1.66E+00		24.5	0.912627		316.5	11.78965		8.5	0.316626		0.0345	0.001285		0.003	6.13E-05		0.0745	0.002775		0.187	0.006966
13.9	138	1.282299	1.45E+00		24.5	0.795606		316.5	10.27793		8.5	0.276027		0.0345	0.00112		0.003	5.34E-05		0.0745	0.002419		0.187	0.006073
14	144	0.926949	1.10E+00		24.5	0.606037		316.5	7.829007		8.5	0.210258		0.0345	0.000853		0.003	4.07E-05		0.0745	0.001843		0.187	0.004626
14.1	150	0.774496	8.51E-01		24.5	0.486737		316.5	6.029482		8.5	0.161929		0.0345	0.000657		0.003	3.14E-05		0.0745	0.001419		0.187	0.003562
14.2	156	0.729826	7.52E-01		24.5	0.412663		316.5	5.33093		8.5	0.143169		0.0345	0.000581		0.003	2.77E-05		0.0745	0.001255		0.187	0.00315
14.3	182	0.701342	7.16E-01		24.5	0.392595		316.5	5.071693		8.5	0.136207		0.0345	0.000553		0.003	2.64E-05		0.0745	0.001194		0.187	0.002997
14.4	168	0.685084	6.93E-01		24.5	0.380322		316.5	4.913138		8.5	0.131948		0.0345	0.000536		0.003	2.56E-05		0.0745	0.001156		0.187	0.002903
14.5	174	0.676678	6.81E-01		24.5	0.373556		318.5	4.825735		8.5	0.129601		0.0345	0.000526		0.003	2.51E-05		0.0745	0.001136		0.187	0.002851
14.6	180	0.755529	7.16E-01		24.5	0.39268		316.5	5.075374		8.5	0.136305		0.0345	0.000553		0.003	2.64E-05		0.0745	0.001195		0.187	0.002999
14.7	186	0.885001	8.20E-01		24.5	0.450027		316.5	5.813615		8.5	0.156132		0.0345	0.000634		0.003	3.02E-05		0.0745	0.001368		0.187	0.003435
14.8	192	0.999338	9.42E-01		24.5	0.516908		316.5	6.677611		8.5	0.179336		0.0345	0.000728		0.003	3.47E-05		0.0745	0.001572		0.187	0.003945
14.9	198	1.022591	1.01E+00		24.5	0.554652		316.5	7.165196		8.5	0.19243		0.0345	0.000781		0.003	3.73E-05		0.0745	0.001687		0.187	0.004233
15	204	1.040852	1.03E+00		24.5	0.56604		316.5	7.312313		8.5	0.196381		0.0345	0.000797		0.003	3.8E-05		0.0745	0.001721		0.187	0.00432
15.1	210	1.053853	1.05E+00		24.5	0.574616		316.5	7.423098		8.5	0.199356		0.0345	0.000809		0.003	3.86E-05		0.0745	0.001747		0.187	0.004386
15.2	216	1.060782	1.06E+00		24.5	0.580083		316.5	7.493724		8.5	0.201253		0.0345	0.000817		0.003	3.9E-05		0.0745	0.001764		0.187	0.004428
15.3	222	1.037126	1.05E+00		24.5	0.575494		316.5	7.434448		8.5	0.199661		0.0345	0.00081		0.003	3.87E-05		0.0745	0.00175		0.187	0.004393
15.4	228	0.913083	9.75E-01		24.5	0.534978		316.5	6.911042		8.5	0.185605		0.0345	0.000753		0.003	3.59E-05		0.0745	0.001627		0.187	0.004083
15.5	234	0.778544	8.46E-01		24.5	0.464044		316.5	5.994694		8.5	0.160995		0.0345	0.000653		0.003	3.12E-05		0.0745	0.001411		0.187	0.003542
15.6	240	0.664558	7.22E-01	18	19.5	0.395869	264	207	5.113984	9	8	0.137342	0.032	0.029	0.000557	0.003	0.0025	2.66E-05	0.082	0.0705	0.001204	0.204	0.1835	0.003022
15.7	246	0.560803	6.13E-01		19.5	0.267539		207	2.840031		6	0.08232		0.029	0.000398		0.0025	1.5E-05		0.0705	0.000967		0.1835	0.002518
15.8	252	0.47148	5.16E-01		19.5	0.225383		207	2.392531		6	0.069349		0.029	0.000335		0.0025	1.26E-05		0.0705	0.000815		0.1835	0.002121
15.9	258	0.444524	4.58E-01		19.5	0.199995		207	2.123029		6	0.061537		0.029	0.000297		0.0025	1.12E-05		0.0705	0.000723		0.1835	0.001882
16	264	0.425788	4.35E-01		19.5	0.190019		207	2.017128		6	0.058467		0.029	0.000283		0.0025	1.06E-05		0.0705	0.000687		0.1835	0.001788
16.1	270	0.462706	4.44E-01		19.5	0.193989		207	2.059269		6	0.059689		0.029	0.000288		0.0025	1.09E-05		0.0705	0.000701		0.1835	0.001825
18.2	276	0.537553	5.00E-01		19.5	0.218391		207	2.318309		8	0.067197		0.029	0.000325		0.0025	1.22E-05		0.0705	0.00079		0.1835	0.002055

Conduit CSO 1007

Time (hours)	Time (minutes)	Flow (ft^3/s)	Mean Flow	CBOD Conc.	CBOD Mean Conc.	CBOD Discharge lbs.	SS Conc. mg/l	SS Mean Conc.	SS Discharge lbs.	TKN Conc. mg/l	TKN Mean Conc.	TKN Discharge lbs.	Cu Conc. mg/l	Cu Mean Conc.	Cu Discharge lbs.	Cd Conc. mg/l	Cd Mean Conc.	Cd Discharge lbs.	Pb Conc. mg/l	Pb Mean Conc.	Pb Discharge lbs.	Zn Conc. mg/l	Zn Mean Conc.	Zn Discharge lbs.
16.3	282	0.606236	5.72E-01		19.5	0.249729		207	2.65097		6	0.07684		0.029	0.000371		0.0025	1.4E-05		0.0705	0.000903		0.1835	0.00235
16.4	288	0.617586	6.12E-01		19.5	0.267203		207	2.836463		6	0.082216		0.029	0.000397		0.0025	1.5E-05		0.0705	0.000966		0.1835	0.002514
16.5	294	0.626177	6.22E-01		19.5	0.271557		207	2.882682		6	0.083558		0.029	0.000404		0.0025	1.52E-05		0.0705	0.000982		0.1835	0.002555
16.6	300	0.633287	6.30E-01		19.5	0.274985		207	2.919072		6	0.084611		0.029	0.000409		0.0025	1.54E-05		0.0705	0.000994		0.1835	0.002588
16.7	306	0.637903	6.36E-01		19.5	0.277545		207	2.946248		6	0.085398		0.029	0.000413		0.0025	1.55E-05		0.0705	0.001003		0.1835	0.002612
16.8	312	0.632986	6.35E-01		19.5	0.277479		207	2.945549		6	0.085378		0.029	0.000413		0.0025	1.55E-05		0.0705	0.001003		0.1835	0.002611
16.9	318	0.595145	6.14E-01		19.5	0.268144		207	2.84645		6	0.082506		0.029	0.000399		0.0025	1.5E-05		0.0705	0.000969		0.1835	0.002523
17	324	0.553023	5.74E-01		19.5	0.250685		207	2.661119		6	0.077134		0.029	0.000373		0.0025	1.4E-05		0.0705	0.000906		0.1835	0.002359
17.1	330	0.533596	5.43E-01		19.5	0.237247		207	2.518465		6	0.072999		0.029	0.000353		0.0025	1.33E-05		0.0705	0.000858		0.1835	0.002233
17.2	336	0.527658	5.31E-01		19.5	0.231709		207	2.459677		6	0.071296		0.029	0.000345		0.0025	1.3E-05		0.0705	0.000838		0.1835	0.00218
17.3	342	0.508209	5.18E-01		19.5	0.226166		207	2.400838		6	0.06959		0.029	0.000336		0.0025	1.27E-05		0.0705	0.000818		0.1835	0.002128
17.4	348	0.427887	4.66E-01	21	21	0.204382	150	150	2.169598	3	3	0.062887	0.026	0.026	0.000304	0.002	0.002	1.14E-05	0.059	0.059	0.000739	0.163	0.163	0.001923
17.5	354	0.341728	3.85E-01		21	0.18096		150	1.292569		3	0.025851		0.026	0.000224		0.002	8.1E-06		0.059	0.000508		0.163	0.001405
17.6	360	0.303322	3.23E-01		21	0.151671		150	1.083382		3	0.021667		0.026	0.000188		0.002	6.79E-06		0.059	0.000426		0.163	0.001177
17.7	366	0.287707	2.96E-01		21	0.138969		150	0.992633		3	0.019853		0.026	0.000172		0.002	6.22E-06		0.059	0.00039		0.163	0.001079
17.8	372	0.276199	2.82E-01		21	0.132591		150	0.94708		3	0.018942		0.026	0.000164		0.002	5.94E-06		0.059	0.000373		0.163	0.001029
17.9	378	0.26784	2.72E-01		21	0.12792		150	0.913712		3	0.018274		0.028	0.000158		0.002	5.73E-06		0.059	0.000359		0.163	0.000993
18	384	0.281652	2.65E-01		21	0.124499		150	0.88928		3	0.017786		0.028	0.006164		0.002	5.58E-06		0.059	0.00035		0.163	0.000966
18.1	390	0.25716	2.59E-01		21	0.121988		150	0.871344		3	0.017427		0.026	0.000151		0.002	5.46E-06		0.059	0.000343		0.163	0.000947
18.2	396	0.254151	2.56E-01		21	0.120225		150	0.858747		3	0.017175		0.028	0.000149		0.002	5.38E-06		0.059	0.000338		0.163	0.000933
18.3	402	0.256705	2.55E-01		21	0.120118		150	0.857982		3	0.01718		0.026	0.000149		0.002	5.38E-06		0.059	0.000337		0.163	0.000932
18.4	408	0.287176	2.72E-01		21	0.127883		150	0.913448		3	0.018269		0.026	0.000158		0.002	5.73E-06		0.059	0.000359		0.163	0.000993
18.5	414	0.326559	3.07E-01		21	0.144308		150	1.030768		3	0.020615		0.026	0.000179		0.002	8.46E-06		0.059	0.000405		0.163	0.00112
18.6	420	0.35162	3.39E-01		21	0.15946		150	1.139002		3	0.02278		0.026	0.000197		0.002	7.14E-06		0.059	0.000448		0.163	0.001238
18.7	426	0.357966	3.55E-01		21	0.166845		150	1.19175		3	0.023835		0.026	0.000207		0.002	7.47E-06		0.059	0.000469		0.163	0.001295
18.8	432	0.349778	3.54E-01		21	0.166412		150	1.188656		3	0.023773		0.028	0.000206		0.002	7.45E-06		0.059	0.000488		0.163	0.001292
18.9	438	0.290741	3.20E-01		21	0.150605		150	1.07575		3	0.021515		0.026	0.000188		0.002	6.75E-06		0.059	0.000423		0.163	0.001169
19	444	0.218364	2.55E-01		21	0.119706		150	0.855042		3	0.017101		0.028	0.000148		0.002	5.36E-06		0.059	0.000336		0.163	0.000929
19.1	450	0.173697	1.96E-01		21	0.092185		150	0.858466		3	0.013169		0.026	0.000114		0.002	4.13E-06		0.059	0.000259		0.163	0.000716
19.2	456	0.159514	1.87E-01		21	0.078348		150	0.559628		3	0.011193		0.026	9.7E-05		0.002	3.51E-06		0.059	0.00022		0.163	0.000608
19.3	462	0.150396	1.55E-01		21	0.072869		150	0.520492		3	0.01041		0.026	9.02E-05		0.002	3.26E-06		0.059	0.000205		0.163	0.000566
19.4	468	0.144059	1.47E-01		21	0.069235		150	0.494536		3	0.009891		0.026	8.57E-05		0.002	3.1E-06		0.059	0.000195		0.163	0.000537
19.5	474	0.139437	1.42E-01		21	0.066658		150	0.476131		3	0.009523		0.026	8.25E-05		0.002	2.99E-06		0.059	0.000187		0.163	0.000517
19.6	480	0.136121	1.38E-01		21	0.064792		150	0.4628		3	0.009256		0.026	8.02E-05		0.002	2.9E-06		0.059	0.000182		0.163	0.000503
19.7	486	0.133999	1.35E-01		21	0.063513		150	0.453667		3	0.009073		0.026	7.86E-05		0.002	2.84E-06		0.059	0.000178		0.163	0.000493
19.8	492	0.131301	1.33E-01		21	0.06238		150	0.445571		3	0.008911		0.028	7.72E-05		0.002	2.79E-06		0.059	0.000175		0.163	0.000484
19.9	498	0.121579	1.26E-01		21	0.05946		150	0.424711		3	0.008494		0.026	7.36E-05		0.002	2.66E-06		0.059	0.000167		0.163	0.000462
20	504	0.10934	1.15E-01		21	0.054298		150	0.387829		3	0.007757		0.026	6.72E-05		0.002	2.43E-06		0.059	0.000153		0.163	0.000421
20.1	510	9.65E-02	1.03E-01		21	0.048403		150	0.345737		3	0.006915		0.026	5.99E-05		0.002	2.17E-06		0.059	0.000136		0.163	0.000376
20.2	518	8.34E-02	9.00E-02		21	0.042313		150	0.302232		3	0.006045		0.026	5.24E-05		0.002	1.9E-06		0.059	0.000119		0.163	0.000328
20.3	522	7.02E-02	7.68E-02		21	0.036123		150	0.25802		3	0.00516		0.026	4.47E-05		0.002	1.62E-06		0.059	0.000101		0.163	0.00028
20.39972	528	5.89E-02	8.35E-02		21	0.02988		150	0.213429		3	0.004269		0.026	3.7E-05		0.002	1.34E-06		0.059	6.39E-05		0.163	0.000232
20.49972	534	4.39E-02	5.04E-02		21	0.023694		150	0.169242		3	0.003385		0.026	2.93E-05		0.002	1.06E-06		0.059	6.66E-05		0.163	0.000184
20.59972	640	3.15E-02	3.77E-02		21	0.017715		150	0.126534		3	0.002531		0.026	2.19E-05		0.002	7.93E-07		0.059	4.98E-05		0.163	0.000138
20.69944	546	1.96E-02	2.55E-02		21	0.012004		150	0.085742		3	0.001715		0.026	1.49E-05		0.002	5.38E-07		0.059	3.37E-05		0.163	9.32E-05
20.79944	552	9.15E-03	1.44E-02		21	0.006759		150	0.048278		3	0.000966		0.026	8.37E-06		0.002	3.03E-07		0.059	1.9E-05		0.163	5.25E-05
20.89972	558	2.54E-03	5.85E-03		21	0.002749		150	0.019639		3	0.000393		0.028	3.4E-06		0.002	1.23E-07		0.059	7.72E-06		0.163	2.13E-05
20.99972	564	1.33E-03	1.94E-03		21	0.00091		150	0.0065		3	0.00013		0.028	1.13E-06		0.002	4.08E-08		0.059	2.66E-06		0.163	7.06E-06
21.09972	570	3.53E-04	8.39E-04		21	0.000395		150	0.002819		3	5.64E-05		0.028	4.89E-07		0.002	1.77E-08		0.059	1.11E-06		0.163	3.06E-06
21.19972	576	1.23E-04	2.38E-04		21	0.000112		150	0.0008		3	1.6E-05		0.028	1.39E-07		0.002	5.01E-09		0.059	3.15E-07		0.163	8.69E-07
	582		6.17E-05		21	2.9E-05		150	0.000207		3	4.15E-06		0.028	3.59E-08		0.002	1.3E-09		0.059	8.16E-08		0.163	2.25E-07

Conduit CSO 1009 - S2CSO9.XLS

Summary Statistics

Total Discharge Volume (cf)	Duration (hr)	CBOD (lbs)	SS (lbs)	TKN (lbs)	Cu (lbs)	Cd (lbs)	Pb (lbs)	Zn (lbs)
8.00E+02	4.30	2.7144	14.7278	0.5934	0.0022	0.0002	0.0045	0.0107

Conduit CSO 1009

Time (hours)	Time (minutes)	Flow (ft^3/s)	Mean Flow	CBOD Conc.	CBOD Mean Conc.	CBOD Discharge lbs.	SS Conc. mg/l	SS Mean Conc.	SS Discharge lbs.	TKN Conc. mg/l	TKN Mean Conc.	TKN Discharge lbs.	Cu Conc. mg/l	Cu Mean Conc.	Cu Discharge lbs.	Cd Conc. mg/l	Cd Mean Conc.	Cd Discharge lbs.	Pb Conc. mg/l	Pb Mean Conc.	Pb Discharge lbs.	Zn Conc. mg/l	Zn Mean Conc.	Zn Discharge lbs.
13.1	0	1.11E-02		108	94.5		390	377.5		29	24.5		0.051	0.0525		0.003	0.003		0.135	0.112		0.227	0.238	
13.2	6	3.75E-02	2.43E-02		94.5	0.051386		377.5	0.205273		24.5	0.013322		0.0525	2.85E-05		0.003	3.45E-00		0.112	6.09E-05		0.238	0.000129
13.3	12	7.80E-02	5.77E-02		94.5	0.122105		377.5	0.487773		24.5	0.031657		0.0525	6.78E-05		0.003	8.2E-06		0.112	0.000145		0.238	0.000308
13.4	18	0.110018	9.40E-02	81	76.5	0.198887	365	334	0.794495	20	17	0.051563	0.054	0.054	0.00011	0.003	0.0035	1.34E-05	0.089	0.093	0.000236	0.249	0.2445	0.000501
13.5	24	0.134243	1.22E-01		76.5	0.20922		334	0.913458		17	0.046493		0.054	0.000148		0.0035	1.64E-05		0.093	0.000254		0.2445	0.000669
13.6	30	0.152289	1.43E-01	72	76.5	0.245427	303	289	1.071536	14	12.5	0.054539	0.054	0.0485	0.000173	0.004	0.0035	1.92E-05	0.097	0.0905	0.000298	0.24	0.23	0.000784
13.7	36	0.165641	1.59E-01		78.5	0.272321		289	1.028767		12.5	0.044497		0.0485	0.000173		0.0035	2.13E-05		0.0005	0.000322		0.23	0.000819
13.8	42	0.175438	1.71E-01		76.5	0.292149		289	1.103675		12.5	0.047737		0.0485	0.000185		0.0035	2.29E-05		0.0905	0.000346		0.23	0.000878
13.9	48	0.178363	1.77E-01	45	41.5	0.303046	275	260	1.144841	11	9.5	0.049517	0.043	0.042	0.000192	0.003	0.003	2.38E-05	0.084	0.099	0.000359	0.22	0.214	0.000911
14	54	0.16607	1.72E-01		41.5	0.160044		260	1.002688		9.5	0.036637		0.042	0.000162		0.003	1.08E-05		0.099	0.000382		0.214	0.000825
14.1	60	0.14233	1.54E-01	38	40.5	0.143302	245	236.5	0.897793	8	8.5	0.032804	0.041	0.04	0.000145	0.003	0.003	9.63E-06	0.114	0.092	0.000342	0.208	0.194	0.000739
14.2	66	0.116529	1.29E-01		40.5	0.117383		236.5	0.685461		8.5	0.024836		0.04	0.000116		0.003	7.89E-06		0.092	0.000267		0.194	0.000562
14.3	72	9.29E-02	1.05E-01		40.5	0.094955		236.5	0.554489		8.5	0.019929		0.04	9.38E-05		0.003	6.38E-06		0.092	0.000216		0.194	0.000455
14.4	78	6.77E-02	8.03E-02		40.5	0.072795		236.5	0.425087		8.5	0.015278		0.04	7.19E-05		0.003	4.89E-06		0.092	0.000165		0.194	0.000349
14.5	84	4.99E-02	5.88E-02		40.5	0.053288		238.5	0.311175		8.5	0.011184		0.04	5.26E-05		0.003	3.58E-00		0.092	0.000121		0.194	0.000255
14.6	90	3.70E-02	4.34E-02	43	37	0.039377	228	298.5	0.229939	9	8.5	0.008264	0.039	0.038	3.89E-05	0.003	0.003	2.65E-06	0.07	0.0685	8.94E-05	0.18	0.175	0.000189
14.7	96	2.85E-02	3.27E-02		37	0.027109		298.5	0.2187		8.5	0.006228		0.038	2.78E-05		0.003	1.82E-06		0.0685	5.02E-05		0.175	0.000128
14.8	102	2.41E-02	2.63E-02		37	0.021758		298.5	0.175532		8.5	0.004998		0.038	2.23E-05		0.003	1.46E-06		0.0685	4.03E-05		0.175	0.000103
14.9	108	2.21E-02	2.31E-02		37	0.019108		298.5	0.154158		8.5	0.00439		0.038	1.96E-05		0.003	1.28E-06		0.0685	3.54E-05		0.175	9.04E-05
15	114	2.13E-02	2.17E-02		37	0.017948		298.5	0.144797		8.5	0.004123		0.038	1.84E-05		0.003	1.21E-06		0.0685	3.32E-05		0.175	8.49E-05
15.1	120	2.10E-02	2.12E-02	31	24.5	0.017524	369	316.5	0.141379	8	8.5	0.004026	0.037	0.0345	1.8E-05	0.003	0.003	1.18E-06	0.067	0.0745	3.24E-05	0.17	0.187	8.29E-05
15.2	126	2.11E-02	2.11E-02		24.5	0.011565		316.5	0.149404		8.5	0.004012		0.0345	1.63E-05		0.003	7.77E-07		0.0745	3.52E-05		0.187	8.83E-05
15.3	132	2.14E-02	2.13E-02		24.5	0.011669		316.5	0.150748		8.5	0.004049		0.0345	1.64E-05		0.003	7.84E-07		0.0745	3.55E-05		0.187	8.91E-05
15.4	138	2.13E-02	2.14E-02		24.5	0.011724		316.5	0.151455		8.5	0.004068		0.0345	1.65E-05		0.003	7.88E-07		0.0745	3.57E-05		0.187	8.95E-05
15.5	144	1.97E-02	2.05E-02		24.5	0.01124		316.5	0.145207		8.5	0.0039		0.0345	1.58E-05		0.003	7.55E-07		0.0745	3.42E-05		0.187	8.58E-05
15.6	150	1.66E-02	1.81E-02		24.5	0.009935		316.5	0.128343		8.5	0.003447		0.0345	1.4E-05		0.003	8.67E-07		0.0745	3.02E-05		0.187	7.58E-05
15.7	156	1.26E-02	1.46E-02		24.5	0.008014		316.5	0.103528		8.5	0.00278		0.0345	1.13E-05		0.003	5.38E-07		0.0745	2.44E-05		0.187	6.12E-05
15.8	162	8.51E-03	1.06E-02		24.5	0.005805		316.5	0.07499		8.5	0.002014		0.0345	8.17E-06		0.003	3.9E-07		0.0745	1.77E-05		0.187	4.43E-05
15.9	168	4.92E-03	6.71E-03		24.5	0.003684		316.5	0.047592		8.5	0.001278		0.0345	5.19E-06		0.003	2.47E-07		0.0745	1.12E-05		0.187	2.81E-05
16	174	2.24E-03	3.58E-03		24.5	0.001963		316.5	0.025362		8.5	0.000681		0.0345	2.76E-06		0.003	1.32E-07		0.0745	5.97E-06		0.187	1.5E-05
16.1	180	5.03E-04	1.37E-03		24.5	0.000752		316.5	0.00972		8.5	0.000261		0.0345	1.06E-06		0.003	5.05E-08		0.0745	2.29E-06		0.187	5.74E-06
16.2	186	0	2.52E-04		24.5	0.000138		316.5	0.001784		8.5	4.79E-05		0.0345	1.94E-07		0.003	9.28E-09		0.0745	4.2E-07		0.187	1.05E-06
18.3	192	4.85E-02	2.33E-02		24.5	0.012761		316.5	0.164854		8.5	0.004427		0.0345	1.8E-05		0.003	8.57E-07		0.0745	3.88E-05		0.187	9.74E-05
16.4	198	0.209266	1.28E-01		24.5	0.070167		316.5	0.90644		8.5	0.024344		0.0345	9.88E-05		0.003	4.71E-06		0.0745	0.000213		0.187	0.000536
16.5	204	3.12E-02	1.20E-01		24.5	0.065965		316.5	0.852165		8.5	0.022886		0.0345	9.29E-05		0.003	4.43E-06		0.0745	0.000201		0.187	0.000503
16.6	210	0	1.56E-02		24.5	0.00856		316.5	0.110579		8.5	0.00297		0.0345	1.21E-05		0.003	5.75E-07		0.0745	2.6E-05		0.187	6.53E-05
18.7	216	0	0.00E+00		24.5	0		316.5	0		8.5	0		0.0345	0		0.003	0		0.0745	0		0.187	0
16.8	222	0	0.00E+00		24.5	0		316.5	0		8.5	0		0.0345	0		0.003	0		0.0745	0		0.187	0
18.9	228	0	0.00E+00		24.5	0		318.5	0		8.5	0		0.0345	0		0.003	0		0.0745	0		0.187	0
17	234	2.15E-04	1.08E-04		24.5	5.91E-05		316.5	0.000764		8.5	2.05E-05		0.0345	8.32E-08		0.003	3.97E-09		0.0745	1.8E-07		0.187	4.51E-07
17.1	240	0	1.08E-04	18	19.5	5.91E-05	284	207	0.000784	9	8	2.05E-05	0.032	0.029	8.32E-00	0.003	0.0025	3.97E-09	0.082	0.0705	1.8E-07	0.204	0.1835	4.51E-07
17.2	248	0	0.00E+00		19.5	0		207	0		8	0		0.029	0		0.0025	0		0.0705	0		0.1835	0
17.3	252	0	0.00E+00		19.5	0		207	0		8	0		0.029	0		0.0025	0		0.0705	0		0.1835	0
17.4	258	2.83E-03	1.42E-03		19.5	0.000618		207	0.006562		6	0.00019		0.029	9.19E-07		0.0025	3.46E-08		0.0705	2.23E-00		0.1835	5.82E-06
	264		1.42E-03		19.5	0.000618		207	0.006562		6	0.00019		0.029	9.19E-07		0.0025	3.46E-08		0.0705	2.23E-06		0.1835	5.82E-06

Conduit CSO 1033 - S2CSO33.XLS

Summary Statistics

Total Discharge Volume (cf)	Duration (hr)	CBOD (lbs)	SS (lbs)	TKN (lbs)	Cu (lbs)	Cd (lbs)	Pb (lbs)	Zn (lbs)
1.25E+03	3.10	5.1648	23.4147	1.1084	0.0037	0.0004	0.0074	0.0173

Conduit CSO 1033

Time (hours)	Time (minutes)	Flow (ft^3/s)	Mean Flow	CBOD Conc.	CBOD Mean Conc.	CBOD Discharge lbs.	SS Conc. mg/l	SS Mean Conc.	SS Discharge lbs.	TKN Conc. mg/l	TKN Mean Conc.	TKN Discharge lbs.	Cu Conc. mg/l	Cu Mean Conc.	Cu Discharge lbs.	Cd Conc. mg/l	Cd Mean Conc.	Cd Discharge lbs.	Pb Conc. mg/l	Pb Mean Conc.	Pb Discharge lbs.	Zn Conc. mg/l	Zn Mean Conc.	Zn Discharge lbs.
12.6	0	1.35E-02		108	94.5		390	377.5		29	24.5		0.051	0.0525		0.003	0.003		0.135	0.112		0.227	0.238	
12.7	6	0.113595	6.36E-02		94.5	0.134493		377.5	0.537259		24.5	0.034868		0.0525	7.47E-05		0.003	9.04E-06		0.112	0.000159		0.238	0.000339
12.8	12	0.277415	1.96E-01		94.5	0.413721		377.5	1.652695		24.5	0.107261		0.0525	0.00023		0.003	2.78E-05		0.112	0.00049		0.238	0.001042
12.9	18	0.397402	3.37E-01	81	76.5	0.714013	365	334	2.852274	20	17	0.185114	0.054	0.054	0.000397	0.003	0.0035	4.8E-05	0.089	0.093	0.000846	0.249	0.2445	0.001798
13	24	0.405051	4.01E-01		78.5	0.687337		334	3.00092		17	0.152741		0.054	0.000485		0.0035	5.39E-05		0.093	0.000836		0.2445	0.002197
13.1	30	0.351003	3.78E-01	72	76.5	0.647594	303	289	2.827404	14	12.5	0.14391	0.054	0.0485	0.000457	0.004	0.0035	5.08E-05	0.097	0.0905	0.000787	0.24	0.23	0.00207
13.2	36	0.304466	3.28E-01		76.5	0.561438		289	2.120988		12.5	0.091736		0.0485	0.000356		0.0035	4.4E-05		0.0905	0.000664		0.23	0.001688
13.3	42	0.271812	2.88E-01		76.5	0.493607		289	1.864739		12.5	0.080855		0.0485	0.000313		0.0035	3.87E-05		0.0905	0.000584		0.23	0.001484
13.4	48	0.244862	2.58E-01	45	41.5	0.442554	275	260	1.671871	11	9.5	0.072313	0.043	0.042	0.000281	0.003	0.003	3.47E-05	0.084	0.099	0.000524	0.22	0.214	0.001331
13.5	54	0.215895	2.30E-01		41.5	0.214096		260	1.341323		9.5	0.04901		0.042	0.000217		0.003	1.44E-05		0.099	0.000511		0.214	0.001104
13.8	60	0.186114	2.01E-01	38	40.5	0.186796	245	236.5	1.170299	8	8.5	0.042761	0.041	0.04	0.000189	0.003	0.003	1.25E-05	0.114	0.092	0.000446	0.208	0.194	0.000963
13.7	66	0.162591	1.74E-01		40.5	0.158125		236.5	0.923373		8.5	0.033187		0.04	0.000156		0.003	1.06E-05		0.092	0.000359		0.194	0.000757
13.8	72	0.14375	1.53E-01		40.5	0.138915		236.5	0.811194		8.5	0.029155		0.04	0.000137		0.003	9.33E-06		0.092	0.000316		0.194	0.000665
13.9	78	0.118352	1.31E-01		40.5	0.118864		236.5	0.694049		8.5	0.024945		0.04	0.000117		0.003	7.98E-06		0.092	0.00027		0.194	0.000569
14	84	7.79E-02	9.81E-02		40.5	0.089005		236.5	0.519744		8.5	0.01868		0.04	8.79E-05		0.003	5.98E-06		0.092	0.000202		0.194	0.000426
14.1	90	4.59E-02	6.19E-02	43	37	0.056171	228	298.5	0.328008	9	8.5	0.011789	0.039	0.038	5.55E-06	0.003	0.003	3.77E-06	0.07	0.0685	0.000128	0.18	0.175	0.000269
14.2	96	2.52E-02	3.56E-02		37	0.029482		298.5	0.237845		8.5	0.006773		0.038	3.03E-05		0.003	1.98E-06		0.0685	5.46E-05		0.175	0.000139
14.3	102	1.36E-02	1.94E-02		37	0.016069		298.5	0.129637		8.5	0.003692		0.038	1.65E-05		0.003	1.08E-06		0.0685	2.97E-05		0.175	7.8E-05
14.4	108	7.21E-03	1.04E-02		37	0.00861		298.5	0.069462		8.5	0.001978		0.036	8.84E-06		0.003	5.78E-07		0.0685	1.59E-05		0.175	4.07E-05
14.5	114	3.89E-03	5.55E-03		37	0.004602		298.5	0.03713		8.5	0.001057		0.038	4.73E-06		0.003	3.09E-07		0.0685	8.52E-06		0.175	2.18E-05
14.6	120	2.19E-03	3.04E-03	31	24.5	0.002521	369	316.5	0.020341	8	8.5	0.000579	0.037	0.0345	2.59E-06	0.003	0.003	1.69E-07	0.067	0.0745	4.67E-06	0.17	0.187	1.19E-05
14.7	126	1.84E-03	2.01E-03		24.5	0.001105		316.5	0.014272		8.5	0.000383		0.0345	1.56E-06		0.003	7.42E-08		0.0745	3.36E-06		0.187	8.43E-06
14.8	132	2.84E-03	2.34E-03		24.5	0.001282		316.5	0.016558		8.5	0.000445		0.0345	1.8E-06		0.003	8.61E-08		0.0745	3.9E-06		0.187	9.78E-06
14.9	138	5.07E-03	3.95E-03		24.5	0.002169		318.5	0.028017		8.5	0.000752		0.0345	3.05E-06		0.003	1.46E-07		0.0745	6.59E-06		0.187	1.66E-05
15	144	7.89E-03	6.48E-03		24.5	0.003555		316.5	0.045921		8.5	0.001233		0.0345	5.01E-06		0.003	2.39E-07		0.0745	1.08E-05		0.187	2.71E-05
15.1	150	1.06E-02	9.25E-03		24.5	0.005074		316.5	0.065554		8.5	0.001761		0.0345	7.15E-06		0.003	3.41E-07		0.0745	1.54E-05		0.187	3.87E-05
15.2	156	1.25E-02	1.16E-02		24.5	0.00634		316.5	0.081906		8.5	0.0022		0.0345	8.93E-06		0.003	4.26E-07		0.0745	1.93E-05		0.187	4.84E-05
15.3	162	1.33E-02	1.29E-02		24.5	0.007066		316.5	0.091284		8.5	0.002452		0.0345	9.95E-06		0.003	4.75E-07		0.0745	2.15E-05		0.187	5.39E-05
15.4	168	1.26E-02	1.29E-02		24.5	0.007096		316.5	0.091663		8.5	0.002462		0.0345	9.99E-06		0.003	4.77E-07		0.0745	2.16E-05		0.187	5.42E-05
15.5	174	9.76E-03	1.12E-02		24.5	0.006135		316.5	0.07926		8.5	0.002129		0.0345	8.64E-06		0.003	4.12E-07		0.0745	1.87E-05		0.187	4.68E-05
15.6	180	5.73E-03	7.75E-03		24.5	0.00425		316.5	0.054898		8.5	0.001474		0.0345	5.98E-06		0.003	2.85E-07		0.0745	1.29E-05		0.187	3.24E-05
15.7	186	2.05E-03	3.89E-03		24.5	0.002136		316.5	0.027588		8.5	0.000741		0.0345	3.01E-06		0.003	1.43E-07		0.0745	6.49E-06		0.187	1.63E-05
	192		1.03E-03		24.5	0.000562		316.5	0.007265		8.5	0.000195		0.0345	7.92E-07		0.003	3.78E-08		0.0745	1.71E-06		0.187	4.29E-06

SIMULATION #3

1.25 inches in 12 hours

Conduit CSO 1004 - S3CSO4.XLS

Summary Statistics

Total Discharge Volume (cf)	Duration (hr)	CBOD (lbs)	SS (lbs)	TKN (lbs)	Cu (lbs)	Cd (lbs)	Pb (lbs)	Zn (lbs)
4.72E+03	2.10	11.752	83.858	2.616	0.012	0.001	0.022	0.054

Conduit CSO 1004

Time (hours)	Time (minutes)	Flow (ft^3/s)	Mean Flow	CBOD Conc.	CBOD Mean Conc.	CBOD Discharge lbs.	SS Conc. mg/l	SS Mean Conc.	SS Discharge lbs.	TKN Conc. mg/l	TKN Mean Conc.	TKN Discharge lbs.	Cu Conc. mg/l	Cu Mean Conc.	Cu Discharge lbs.	Cd Conc. mg/l	Cd Mean Conc.	Cd Discharge lbs.	Pb Conc. mg/l	Pb Mean Conc.	Pb Discharge lbs.	Zn Conc. mg/l	Zn Mean Conc.	Zn Discharge lbs.
14.5	0	2.70E-03		108	94.5		390	377.5		29	24.5		0.051	0.0525		0.003	0.003		0.135	0.112		0.227	0.238	
14.6	6	1.66E-02	9.63E-03		94.5	0.020373		377.5	0.081384		24.5	0.005282		0.0525	1.13E-05		0.003	1.37E-06		0.112	2.41E-05		0.238	5.13E-05
14.7	12	4.34E-02	3.00E-02		94.5	0.063442		377.5	0.253434		24.5	0.016448		0.0525	3.52E-05		0.003	4.26E-06		0.112	7.52E-05		0.238	0.00016
14.8	18	7.11E-02	5.73E-02	81	76.5	0.121172	365	334	0.484047	20	17	0.031415	0.054	0.054	6.73E-05	0.003	0.0035	8.14E-06	0.089	0.093	0.000144	0.249	0.2445	0.000305
14.9	24	9.91E-02	8.51E-02		76.5	0.145778		334	0.636471		17	0.032395		0.054	0.000103		0.0035	1.14E-05		0.093	0.000177		0.2445	0.000466
15	30	0.125512	1.12E-01	72	76.5	0.192375	303	289	0.839912	14	12.5	0.04275	0.054	0.0485	0.000138	0.004	0.0035	1.51E-05	0.097	0.0905	0.000234	0.24	0.23	0.000615
15.1	36	0.149484	1.37E-01		76.5	0.235546		289	0.889841		12.5	0.038488		0.0485	0.000149		0.0035	1.85E-05		0.0905	0.000279		0.23	0.000708
15.2	42	0.161469	1.55E-01		76.5	0.266345		289	1.006192		12.5	0.04352		0.0485	0.000169		0.0035	2.09E-05		0.0905	0.000315		0.23	0.000801
15.3	48	0.159458	1.60E-01	45	41.5	0.274889	275	260	1.038468	11	9.5	0.044916	0.043	0.042	0.000174	0.003	0.003	2.15E-05	0.084	0.099	0.000325	0.22	0.214	0.000826
15.4	54	0.147468	1.53E-01		41.5	0.142617		260	0.893504		9.5	0.032647		0.042	0.000144		0.003	9.58E-06		0.099	0.00034		0.214	0.000735
15.5	60	0.129583	1.39E-01	38	40.5	0.128735	245	236.5	0.806532	8	8.5	0.029469	0.041	0.04	0.00013	0.003	0.003	8.65E-06	0.114	0.092	0.000307	0.208	0.194	0.000664
15.6	66	0.108717	1.19E-01		40.5	0.108061		236.5	0.63102		8.5	0.022679		0.64	0.000107		0.003	7.26E-06		0.092	0.000245		0.194	0.000518
15.7	72	8.70E-02	9.79E-02		40.5	0.088752		236.5	0.51827		8.5	0.018627		0.04	8.77E-05		0.003	5.96E-06		0.092	0.000202		0.194	0.000425
15.8	78	1.51E-02	5.11E-02		40.5	0.04632		236.5	0.270484		8.5	0.009721		0.04	4.57E-05		0.003	3.11E-06		0.092	0.000105		0.194	0.000222
15.9	84	1.418798	7.17E-01		40.5	0.650242		236.5	3.79709		8.5	0.13647		0.04	0.000642		0.003	4.37E-05		0.092	0.001477		0.194	0.003115
16	90	2.222106	1.82E+00	43	37	1.651022	228	298.5	9.641153	9	8.5	0.346511	0.039	0.038	0.001631	0.003	0.003	0.000111	0.07	0.0685	0.00375	0.18	0.175	0.007909
16.1	96	2.537118	2.38E+00		37	1.971635		298.5	15.9063		8.5	0.452943		0.038	0.002025		0.003	0.000132		0.0685	0.00365		0.175	0.009325
16.2	102	2.319795	2.43E+00		37	2.012105		298.5	16.23279		8.5	0.48224		0.038	0.002066		0.003	0.000135		0.0685	0.003725		0.175	0.009517
16.3	108	1.747102	2.03E+00		37	1.68482		298.5	13.5924		8.5	0.387053		0.036	0.00173		0.003	0.000113		0.0685	0.003119		0.175	0.007969
16.4	114	1.097684	1.42E+00		37	1.178528		298.5	9.507854		8.5	0.270743		0.038	0.00121		0.003	7.92E-05		0.0685	0.002182		0.175	0.005574
16.5	120	0.450437	7.74E-01	31	24.5	0.64135	369	316.5	5.174136	8	8.5	0.147337	0.037	0.0345	0.000659	0.003	0.603	4.31E-05	0.067	0.0745	0.001187	0.17	0.187	0.003033
16.6	126	8.57E-03	2.30E-01		24.5	0.125913		316.5	1.626595		8.5	0.043684		0.0345	0.000177		0.003	8.46E-06		0.0745	0.000383		0.187	0.000961
	132		4.28E-03		24.5	0.00235		316.5	0.030361		8.5	0.000815		0.0345	3.31E-06		0.003	1.58E-07		0.0745	7.15E-06		0.187	1.79E-05
	138		0.00E+00		24.5	0		316.5	0		8.5	0		0.0345	0		0.003	0		0.0745	0		0.187	0

Conduit CSO 1005A - S3CSO5A.XLS

Summary Statistics

Total Discharge Volume (cf)	Duration (hr)	CBOD (lbs)	SS (lbs)	TKN (lbs)	Cu (lbs)	Cd (lbs)	Pb (lbs)	Zn (lbs)
1.36E+03	2.60	4.6576	24.4568	0.9981	0.0037	0.0003	0.0076	0.0177

Conduit CSO 1005A

Time (hours)	Time (minutes)	Flow (ft^3/s)	Mean Flow	CBOD Conc.	CBOD Mean Conc.	CBOD Discharge lbs.	SS Conc. mg/l	SS Mean Conc.	SS Discharge lbs.	TKN Conc. mg/l	TKN Mean Conc.	TKN Discharge lbs.	Cu Conc. mg/l	Cu Mean Conc.	Cu Discharge lbs.	Cd Conc. mg/l	Cd Mean Conc.	Cd Discharge lbs.	Pb Conc. mg/l	Pb Mean Conc.	Pb Discharge lbs.	Zn Conc. mg/l	Zn Mean Conc.	Zn Discharge lbs.
15	0	1.98E-03		108	94.5		390	377.5		29	24.5		0.051	0.0525		0.003	0.003		0.135	0.112		0.227	0.238	
15.1	6	6.58E-02	3.39E-02		94.5	0.071702		377.5	0.28643		24.5	0.01859		0.0525	3.98E-05		0.003	4.82E-06		0.112	8.5E-05		0.238	0.000181
15.2	12	0.149872	1.08E-01		94.5	0.228183		377.5	0.911525		24.5	0.059159		0.0525	0.000127		0.003	1.53E-05		0.112	0.00027		0.238	0.000575
15.3	18	0.20646	1.78E-01	81	76.5	0.37703	365	334	1.506123	20	17	0.097748	0.054	0.054	0.000209	0.003	0.0035	2.53E-05	0.089	0.093	0.000447	0.249	0.2445	0.00095
15.4	24	0.234287	2.20E-01		76.5	0.37752		334	1.648256		17	0.083893		0.054	0.000266		0.0035	2.96E-05		0.093	0.000459		0.2445	0.001207
15.5	30	0.245779	2.40E-01	72	76.5	0.411198	303	289	1.795295	14	12.5	0.091377	0.054	0.0485	0.00029	0.004	0.0035	3.22E-05	0.097	0.0905	0.0005	0.24	0.23	0.001314
15.6	36	0.248521	2.47E-01		76.5	0.42339		289	1.599472		12.5	0.069181		0.0485	0.000268		0.0035	3.32E-05		0.0905	0.000501		0.23	0.001273
15.7	42	0.245615	2.47E-01		76.5	0.423421		289	1.59959		12.5	0.069186		0.0485	0.000268		0.0035	3.32E-05		0.0905	0.000501		0.23	0.001273
15.8	48	0.239182	2.42E-01	45	41.5	0.415422	275	200	1.569371	11	9.5	0.067879	0.043	0.042	0.000263	0.003	0.003	3.26E-05	0.084	0.099	0.000491	0.22	0.214	0.001249
15.9	54	0.229577	2.34E-01		41.5	0.217814		260	1.364618		9.5	0.049861		0.042	0.00022		0.003	1.46E-05		0.099	0.00052		0.214	0.001123
16	60	0.217895	2.24E-01	38	40.5	0.207923	245	236.5	1.30265	8	8.5	0.047597	0.041	0.04	0.00021	0.003	0.003	1.4E-05	0.114	0.092	0.000496	0.208	0.194	0.001072
16.1	66	0.204708	2.11E-01		40.5	0.191636		236.5	1.119057		8.5	0.04022		0.04	0.000189		0.003	1.29E-05		0.092	0.000435		0.194	0.000918
16.2	72	0.1911	1.98E-01		40.5	0.179485		236.5	1.048102		8.5	0.03767		0.04	0.000177		0.003	1.21E-05		0.092	0.000408		0.194	0.00086
16.3	78	0.178202	1.85E-01		40.5	0.167465		236.5	0.977916		8.5	0.035147		0.04	0.000165		0.003	1.13E-05		0.092	0.00038		0.194	0.000802
16.4	84	0.156559	1.72E-01		40.5	0.156337		238.5	0.912932		8.5	0.032812		0.04	0.000154		0.003	1.05E-05		0.092	0.000355		0.194	0.000749
16.5	90	0.156319	1.81E-01	43	37	0.146414	228	298.5	0.854984	9	8.5	0.030729	0.039	0.038	0.000145	0.003	0.003	9.84E-06	0.07	0.0685	0.000333	0.18	0.175	0.000701
18.6	96	0.147277	1.52E-01		37	0.125773		298.5	1.014679		8.5	0.028894		0.038	0.000129		0.003	8.45E-06		0.0685	0.000233		0.175	0.000595
16.7	102	0.137859	1.43E-01		37	0.118125		298.5	0.952983		8.5	0.027137		0.038	0.000121		0.003	7.94E-06		0.0685	0.000219		0.175	0.000559
16.8	108	0.126039	1.32E-01		37	0.109327		298.5	0.882		8.5	0.025118		0.038	0.000112		0.003	7.34E-06		0.0685	0.000202		0.175	0.000517
16.9	114	0.111003	1.19E-01		37	0.098201		298.5	0.79224		8.5	0.02256		0.038	0.000101		0.003	6.6E-06		0.0685	0.000182		0.175	0.000464
17	120	9.29E-02	1.02E-01	31	24.5	0.08447	369	316.5	0.681466	8	8.5	0.019405	0.037	0.0345	8.68E-05	0.003	0.003	5.67E-06	0.067	0.0745	0.000156	0.17	0.187	0.0004
17.1	126	7.43E-02	8.36E-02		24.5	0.045871		316.5	0.592584		8.5	0.015915		0.0345	6.48E-05		0.003	3.08E-06		0.0745	0.000139		0.187	0.00035
17.2	132	5.48E-02	8.46E-02		24.5	0.035429		316.5	0.457684		8.5	0.012292		0.0345	4.99E-05		0.003	2.38E-06		0.0745	0.000108		0.187	0.00027
17.3	138	3.28E-02	4.38E-02		24.5	0.024046		316.5	0.310635		8.5	0.008342		0.0345	3.39E-05		0.003	1.62E-06		0.0745	7.31E-05		0.187	0.000184
17.4	144	1.57E-02	2.42E-02		24.5	0.013304		316.5	0.171869		8.5	0.004616		0.0345	1.87E-05		0.003	8.94E-07		0.0745	4.05E-05		0.187	0.000102
17.5	150	6.28E-03	1.10E-02		24.5	0.006022		316.5	0.077801		8.5	0.002089		0.0345	8.48E-06		0.003	4.05E-07		0.0745	1.83E-05		0.187	4.6E-05
17.6	156	5.97E-04	3.44E-03		24.5	0.001888		316.5	0.024389		8.5	0.000655		0.0345	2.68E-06		0.003	1.27E-07		0.0745	5.74E-06		0.187	1.44E-05
	162		2.99E-04		24.5	0.000164		316.5	0.002117		8.5	5.69E-05		0.0345	2.31E-07		0.003	1.1E-08		0.0745	4.98E-07		0.187	1.25E-06

Conduit CSO 1005B - S3CSO5B.XLS

Summary Statistics

Total Discharge Volume (cf)	Duration (hr)	CBOD (lbs)	SS (lbs)	TKN (lbs)	Cu (lbs)	Cd (lbs)	Pb (lbs)	Zn (lbs)
4.55E+02	2.90	1.376454	8.080506	0.299493	0.001192	0.000099	0.002435	0.005752

Conduit CSO 1005B

Time (hours)	Time (minutes)	Flow (ft^3/s)	Mean Flow	CBOD Conc.	CBOD Mean Conc.	CBOD Discharge lbs.	SS Conc. mg/l	SS Mean Conc.	SS Discharge lbs.	TKN Conc. mg/l	TKN Mean Conc.	TKN Discharge lbs.	Cu Conc. mg/l	Cu Mean Conc.	Cu Discharge lbs.	Cd Conc. mg/l	Cd Mean Conc.	Cd Discharge lbs.	Pb Conc. mg/l	Pb Mean Conc.	Pb Discharge lbs.	Zn Conc. mg/l	Zn Mean Conc.	Zn Discharge lbs.
14.9	0	4.25E-04		108	94.5		390	377.5		29	24.5		0.051	0.0525		0.003	0.003		0.135	0.112		0.227	0.238	
15	6	4.34E-03	2.38E-03		94.5	0.005043		377.5	0.020147		24.5	0.001308		0.0525	2.8E-06		0.003	3.39E-07		0.112	5.98E-06		0.238	1.27E-05
15.1	12	2.08E-02	1.26E-02		94.5	0.02663		377.5	0.108377		24.5	0.006904		0.0525	1.48E-05		0.003	1.79E-06		0.112	3.16E-05		0.238	6.71E-05
15.2	18	4.09E-02	3.09E-02	81	76.5	0.065346	365	334	0.261039	20	17	0.016942	0.054	0.054	3.63E-05	0.003	0.0035	4.39E-06	0.089	0.093	7.74E-05	0.249	0.2445	0.000165
15.3	24	5.59E-02	4.84E-02		78.5	0.0829		334	0.361844		17	0.018422		0.054	5.85E-05		0.0035	6.5E-06		0.093	0.000101		0.2445	0.000265
15.4	30	6.40E-02	5.99E-02	72	76.5	0.102618	303	289	0.448029	14	12.5	0.022804	0.054	0.0485	7.24E-05	0.004	0.0035	8.04E-06	0.097	0.0905	0.000125	0.24	0.23	0.000328
15.5	36	6.84E-02	6.62E-02		76.5	0.113384		289	0.42834		12.5	0.018527		0.0485	7.19E-05		0.0035	8.89E-06		0.0905	0.000134		0.23	0.000341
15.6	42	7.08E-02	6.96E-02		76.5	0.119227		289	0.450415		12.5	0.018482		0.0485	7.56E-05		0.0035	9.34E-06		0.0905	0.000141		0.23	0.000358
15.7	48	7.13E-02	7.10E-02	45	41.5	0.121685	275	260	0.459697	11	9.5	0.019883	0.043	0.042	7.71E-05	0.003	0.003	9.54E-06	0.084	0.099	0.000144	0.22	0.214	0.000366
15.8	54	7.06E-02	7.09E-02		41.5	0.065921		260	0.413001		9.5	0.01509		0.042	6.67E-05		0.003	4.43E-06		0.099	0.000157		0.214	0.00034
15.9	60	6.92E-02	8.99E-02	38	40.5	0.064944	245	236.5	0.40688	8	8.5	0.014867	0.041	0.04	8.57E-05	0.003	0.003	4.36E-06	0.114	0.092	0.000155	0.208	0.194	0.000335
16	66	6.74E-02	6.83E-02		40.5	0.061935		238.5	0.361672		8.5	0.012999		0.04	6.12E-05		0.003	4.16E-06		0.092	0.000141		0.194	0.000297
16.1	72	6.54E-02	6.84E-02		40.5	0.060211		236.5	0.351601		8.5	0.012637		0.04	5.95E-05		0.003	4.04E-06		0.092	0.000137		0.194	0.000288
16.2	78	6.34E-02	6.44E-02		40.5	0.058383		238.5	0.340928		8.5	0.012253		0.04	5.77E-05		0.003	3.92E-06		0.092	0.000133		0.194	0.00028
18.3	84	6.14E-02	6.24E-02		40.5	0.056591		236.5	0.330461		8.5	0.011877		0.04	5.59E-05		0.003	3.8E-06		0.092	0.000129		0.194	0.000271
16.4	90	5.96E-02	8.05E-02	43	37	0.054889	228	298.5	0.320524	9	8.5	0.01152	0.039	0.038	5.42E-05	0.003	0.003	3.69E-06	0.07	0.0685	0.000125	0.18	0.175	0.000263
16.5	96	5.79E-02	5.98E-02		37	0.048689		298.5	0.392798		8.5	0.011185		0.036	5E-05		0.003	3.27E-06		0.0685	9.01E-05		0.175	0.00023
16.6	102	5.61E-02	5.70E-02		37	0.047215		296.5	0.380911		8.5	0.010847		0.038	4.85E-05		0.003	3.17E-06		0.0685	8.74E-05		0.175	0.000223
16.7	108	5.29E-02	5.45E-02		37	0.045134		298.5	0.364122		8.5	0.010369		0.038	4.64E-05		0.003	3.03E-06		0.0685	8.36E-05		0.175	0.000213
18.8	114	4.85E-02	5.07E-02		37	0.042023		298.5	0.339025		8.5	0.009654		0.038	4.32E-05		0.003	2.82E-06		0.0685	7.78E-05		0.175	0.000199
16.9	120	4.32E-02	4.59E-02	31	24.5	0.038016	369	318.5	0.306694	8	8.5	0.008733	0.037	0.0345	3.9E-05	0.003	0.003	2.55E-06	0.067	0.0745	7.04E-05	0.17	0.187	0.00018
17	126	3.77E-02	4.05E-02		24.5	0.0222		318.5	0.286787		8.5	0.007702		0.0345	3.13E-05		0.003	1.49E-06		0.0745	6.75E-05		0.187	0.000169
17.1	132	3.20E-02	3.49E-02		24.5	0.019133		316.5	0.247169		8.5	0.006638		0.0345	2.69E-05		0.003	1.29E-06		0.0745	5.82E-05		0.187	0.000146
17.2	138	2.63E-02	2.92E-02		24.5	0.016017		318.5	0.206911		8.5	0.005557		0.0345	2.26E-05		0.003	1.08E-06		0.0745	4.87E-05		0.187	0.000122
17.3	144	2.08E-02	2.36E-02		24.5	0.012928		316.5	0.167003		8.5	0.004485		0.0345	1.82E-05		0.003	8.68E-07		0.0745	3.93E-05		0.187	9.87E-05
17.4	150	1.55E-02	1.81E-02		24.5	0.00994		316.5	0.128411		8.5	0.003449		0.0345	1.4E-05		0.003	6.68E-07		0.0745	3.02E-05		0.187	7.59E-05
17.5	156	1.04E-02	1.29E-02		24.5	0.007086		316.5	0.091538		8.5	0.002458		0.0345	9.98E-06		0.003	4.76E-07		0.0745	2.15E-05		0.187	5.41E-05
17.6	162	6.14E-03	8.26E-03		24.5	0.00453		318.5	0.058522		8.5	0.001572		0.0345	6.38E-06		0.003	3.04E-07		0.0745	1.38E-05		0.187	3.46E-05
17.7	168	3.13E-03	4.64E-03		24.5	0.002544		316.5	0.032864		8.5	0.000883		0.0345	3.58E-06		0.003	1.71E-07		0.0745	7.74E-06		0.187	1.94E-05
17.8	174	7.90E-04	1.96E-03		24.5	0.001078		316.5	0.013896		8.5	0.000373		0.0345	1.51E-06		0.003	7.23E-08		0.0745	3.27E-06		0.187	8.21E-06
	180		3.95E-04		24.5	0.000217		316.5	0.0028		8.5	7.52E-05		0.0345	3.05E-07		0.003	1.46E-08		0.0745	6.59E-07		0.187	1.65E-06

Conduit CSO 1005C - S3CSO5C.XLS

Summary Statistics

Total Discharge Volume (cf)	Duration (hr)	CBOD (lbs)	SS (lbs)	TKN (lbs)	Cu (lbs)	Cd (lbs)	Pb (lbs)	Zn (lbs)
2.92E+03	3.90	7.626	54.132	1.854	0.007	0.001	0.015	0.036

Conduit CSO 1005C Time (hours)	Time (minutes)	Flow (ft^3/s)	Mean Flow	CBOD Conc.	CBOD Mean Conc.	CBOD Discharge lbs.	SS Conc. mg/l	SS Mean Conc.	SS Discharge lbs.	TKN Conc. mg/l	TKN Mean Conc.	TKN Discharge lbs.	Cu Conc. mg/l	Cu Mean Conc.	Cu Discharge lbs.	Cd Conc. mg/l	Cd Mean Conc.	Cd Discharge lbs.	Pb Conc. mg/l	Pb Mean Conc.	Pb Discharge lbs.	Zn Conc. mg/l	Zn Mean Conc.	Zn Discharge lbs.
14.8	0	1.75E-02		108	94.5		390	377.5		29	24.5		0.051	0.0525		0.003	0.003		0.135	0.112		0.227	0.238	
14.7	6	0.110611	6.41E-02		94.5	0.135604		377.5	0.541699		24.5	0.035157		0.0525	7.53E-05		0.003	9.11E-06		0.112	0.000161		0.238	0.000342
14.8	12	0.15618	1.33E-01		94.5	0.282266		377.5	1.127572		24.5	0.07318		0.0525	0.000157		0.003	1.9E-05		0.112	0.000335		0.238	0.000711
14.9	18	0.230713	1.93E-01	81	76.5	0.409345	365	334	1.635213	20	17	0.106128	0.054	0.054	0.000227	0.003	0.0035	2.75E-05	0.089	0.093	0.000485	0.249	0.2445	0.001031
15	24	0.252524	2.42E-01		78.5	0.413914		334	1.807155		17	0.091981		0.054	0.000292		0.0035	3.24E-05		0.093	0.000503		0.2445	0.001323
15.1	30	0.263635	2.58E-01	72	76.5	0.442113	303	289	1.930271	14	12.5	0.098247	0.054	0.0485	0.000312	0.004	0.0035	3.47E-05	0.097	0.0905	0.000537	0.24	0.23	0.001413
15.2	36	0.271473	2.68E-01		76.5	0.458343		289	1.731519		12.5	0.074893		0.0485	0.000291		0.0035	3.59E-05		0.0905	0.000542		0.23	0.001378
15.3	42	0.274999	2.73E-01		76.5	0.468077		289	1.768292		12.5	0.076483		0.0485	0.000297		0.0035	3.67E-05		0.0905	0.000554		0.23	0.001407
15.4	48	0.275519	2.75E-01	45	41.5	0.471543	275	260	1.781386	11	9.5	0.07705	0.043	0.042	0.000299	0.003	0.003	3.7E-05	0.084	0.099	0.000558	0.22	0.214	0.001418
15.5	54	0.274159	2.75E-01		41.5	0.255414		280	1.600184		9.5	0.058468		0.042	0.000258		0.003	1.72E-05		0.099	0.000609		0.214	0.001317
15.6	60	0.271713	2.73E-01	38	40.5	0.253645	245	236.5	1.589104	8	8.5	0.058063	0.041	0.04	0.000257	0.003	0.003	1.7E-05	0.114	0.092	0.000605	0.208	0.194	0.001308
15.7	66	0.2686	2.70E-01		40.5	0.245013		236.5	1.430755		8.5	0.051422		0.04	0.000242		0.003	1.65E-05		0.092	0.000557		0.194	0.001174
15.8	72	0.265366	2.67E-01		40.5	0.242135		236.5	1.413949		8.5	0.050818		0.04	0.000239		0.003	1.63E-05		0.092	0.00055		0.194	0.00116
15.9	78	0.262098	2.64E-01		40.5	0.239187		236.5	1.396731		8.5	0.0502		0.04	0.000236		0.003	1.61E-05		0.092	0.000543		0.194	0.001146
16	84	0.258924	2.61E-01		40.5	0.236265		236.5	1.379673		8.5	0.049587		0.04	0.000233		0.003	1.59E-05		0.092	0.000537		0.194	0.001132
16.1	90	0.255842	2.57E-01	43	37	0.233428	228	298.5	1.363106	9	8.5	0.048991	0.039	0.038	0.000231	0.003	0.003	1.57E-05	0.07	0.0685	0.00053	0.18	0.175	0.001118
16.2	96	0.253169	2.55E-01		37	0.210871		298.5	1.701218		8.5	0.048443		0.038	0.000217		0.003	1.42E-05		0.0665	0.00039		0.175	0.000997
16.3	102	0.251169	2.52E-01		37	0.208936		298.5	1.685602		8.5	0.047999		0.038	0.000215		0.003	1.4E-05		0.0685	0.000387		0.175	0.000988
18.4	108	0.249762	2.50E-01		37	0.207524		298.5	1.674214		8.5	0.047874		0.038	0.000213		0.003	1.39E-05		0.0685	0.000384		0.175	0.000982
16.5	114	0.248875	2.49E-01		37	0.206573		298.5	1.666544		8.5	0.047456		0.038	0.000212		0.003	1.39E-05		0.0685	0.000382		0.175	0.000977
16.6	120	0.248173	2.49E-01	31	24.5	0.205915	369	316.5	1.661235	8	8.5	0.047305	0.037	0.0345	0.000211	0.003	0.003	1.38E-05	0.067	0.0745	0.000381	0.17	0.187	0.000974
16.7	126	0.246632	2.47E-01		24.5	0.135734		316.5	1.753464		8.5	0.047091		0.0345	0.000191		0.003	9.12E-06		0.0745	0.000413		0.187	0.001036
16.8	132	0.243517	2.45E-01		24.5	0.134457		316.5	1.736962		8.5	0.046548		0.0345	0.000189		0.003	9.03E-06		0.0745	0.000409		0.187	0.001026
16.9	138	0.238918	2.41E-01		24.5	0.13234		316.5	1.709618		8.5	0.045914		0.0345	0.000186		0.003	8.89E-06		0.0745	0.000402		0.187	0.00101
17	144	0.23321	2.36E-01		24.5	0.129513		316.5	1.673092		8.5	0.044933		0.0345	0.000182		0.003	8.7E-06		0.0745	0.000394		0.187	0.000989
17.1	150	0.227174	2.30E-01		24.5	0.126292		316.5	1.631481		8.5	0.043815		0.0345	0.000178		0.003	8.48E-06		0.0745	0.000384		0.187	0.000964
17.2	158	0.221154	2.24E-01		24.5	0.122987		316.5	1.588796		8.5	0.042669		0.0345	0.000173		0.003	8.26E-06		0.0745	0.000374		0.187	0.000939
17.3	162	0.215153	2.18E-01		24.5	0.11969		316.5	1.546198		8.5	0.041525		0.0345	0.000169		0.003	8.04E-06		0.0745	0.000364		0.187	0.000914
17.4	168	0.209742	2.12E-01		24.5	0.116556		318.5	1.50572		8.5	0.040438		0.0345	0.000164		0.003	7.83E-06		0.0745	0.000354		0.187	0.00089
17.5	174	0.204715	2.07E-01		24.5	0.113693		316.5	1.48873		8.5	0.039445		0.0345	0.00016		0.003	7.84E-06		0.0745	0.000346		0.187	0.000868
17.6	180	0.199703	2.02E-01		24.5	0.110939		316.5	1.433154		8.5	0.038489		0.0345	0.000156		0.003	7.45E-06		0.0745	0.000337		0.187	0.000847
17.7	186	0.194657	1.97E-01		24.5	0.10818		316.5	1.397511		8.5	0.037532		0.0345	0.000152		0.003	7.27E-06		0.0745	0.000329		0.187	0.000826
17.8	192	0.189436	1.92E-01		24.5	0.105354		316.5	1.361127		8.5	0.036555		0.0345	0.000148		0.003	7.08E-06		0.0745	0.00032		0.187	0.000804
17.9	198	0.180746	1.85E-01		24.5	0.101548		316.5	1.311828		8.5	0.035231		0.0345	0.000143		0.003	6.82E-06		0.0745	0.000309		0.187	0.000775
18	204	0.141101	1.61E-01		24.5	0.088268		318.5	1.140543		8.5	0.030631		0.0345	0.000124		0.003	5.93E-06		0.0745	0.000268		0.187	0.000674
18.1	210	9.99E-02	1.21E-01		24.5	0.066121		316.5	0.854172		8.5	0.02294		0.0345	9.31E-05		0.003	4.44E-06		0.0745	0.000201		0.187	0.000505
18.2	216	7.54E-02	8.77E-02		24.5	0.0481		316.5	0.621379		8.5	0.016688		0.0345	6.77E-05		0.003	3.23E-06		0.0745	0.000146		0.187	0.000367
18.3	222	2.64E-02	5.09E-02		24.5	0.027939		316.5	0.360922		8.5	0.009693		0.0345	3.93E-05		0.003	1.88E-06		0.0745	8.5E-05		0.187	0.000213
18.4	228	7.31E-03	1.69E-02		24.5	0.009256		316.5	0.119578		8.5	0.003211		0.0345	1.3E-05		0.003	6.22E-07		0.0745	2.81E-05		0.187	7.07E-05
18.5	234	8.99E-04	4.10E-03		24.5	0.002251		316.5	0.029075		8.5	0.000781		0.0345	3.17E-06		0.003	1.51E-07		0.0745	8.84E-06		0.187	1.72E-05
	240		4.50E-04	18	19.5	0.000247	254	207	0.003186	9	6	8.56E-05	0.032	0.029	3.47E-07	0.003	0.0025	1.66E-08	0.082	0.0705	7.5E-07	0.204	0.1835	1.88E-06

Conduit CSO 1005D - S3CSO5D.XLS

Summary Statistics

Total Discharge Volume (cf)	Duration (hr)	CBOD (lbs)	SS (lbs)	TKN (lbs)	Cu (lbs)	Cd (lbs)	Pb (lbs)	Zn (lbs)
2.12E+03	9.00	4.0345	37.4327	1.0959	0.0047	0.0003	0.0101	0.0247

Conduit CSO 1005D

Time (hours)	Time (minutes)	Flow (ft^3/s)	Mean Flow	CBOD Conc.	CBOD Mean Conc.	CBOD Discharge lbs.	SS Conc. mg/l	SS Mean Conc.	SS Discharge lbs.	TKN Conc. mg/l	TKN Mean Conc.	TKN Discharge lbs.	Cu Conc. mg/l	Cu Mean Conc.	Cu Discharge lbs.	Cd Conc. mg/l	Cd Mean Conc.	Cd Discharge lbs.	Pb Conc. mg/l	Pb Mean Conc.	Pb Discharge lbs.	Zn Conc. mg/l	Zn Mean Conc.	Zn Discharge lbs.
13.1	0	5.40E-04		108	94.5		390	377.5		29	24.5		0.051	0.0525		0.003	0.003		0.135	0.112		0.227	0.238	
13.2	6	2.34E-03	1.44E-03		94.5	0.003044		377.5	0.012159		24.5	0.000789		0.0525	1.69E-08		0.003	2.04E-07		0.112	3.61E-06		0.238	7.67E-06
13.3	12	7.04E-03	4.69E-03		94.5	0.009927		377.5	0.039554		24.5	0.002574		0.0525	5.51E-08		0.003	6.67E-07		0.112	1.18E-05		0.238	2.5E-05
13.4	18	1.58E-02	1.14E-02	81	76.5	0.024148	365	334	0.096457	20	17	0.00626	0.054	0.054	1.34E-05	0.003	0.0035	1.62E-06	0.089	0.093	2.86E-05	0.249	0.2445	6.08E-05
13.5	24	2.64E-02	2.11E-02		76.5	0.036126		334	0.157726		17	0.008028		0.054	2.55E-05		0.0035	2.83E-06		0.093	4.39E-05		0.2445	0.000115
13.6	30	3.93E-02	3.28E-02	72	76.5	0.056265	303	289	0.245655	14	12.5	0.012503	0.054	0.0485	3.97E-05	0.004	0.0035	4.41E-06	0.097	0.0905	6.84E-05	0.24	0.23	0.00018
13.7	36	5.25E-02	4.59E-02		76.5	0.078614		289	0.296985		12.5	0.012645		0.0485	4.98E-05		0.0035	6.16E-06		0.0905	9.3E-05		0.23	0.000236
13.8	42	6.57E-02	5.91E-02		78.5	0.1012		289	0.38231		12.5	0.016538		0.0485	8.42E-05		0.0035	7.93E-08		0.0905	0.00012		0.23	0.000304
13.9	48	7.95E-02	7.26E-02	45	41.5	0.124292	275	260	0.469549	11	9.5	0.020309	0.043	0.042	7.88E-05	0.003	0.003	9.74E-06	0.084	0.099	0.000147	0.22	0.214	0.000374
14	54	9.36E-02	8.65E-02		41.5	0.080408		260	0.50376		9.5	0.018407		0.042	8.14E-05		0.003	5.4E-06		0.099	0.000192		0.214	0.000415
14.1	60	0.108512	1.01E-01	38	40.5	0.093911	245	236.5	0.588357	8	8.5	0.021498	0.041	0.94	9.5E-05	0.003	0.003	6.31E-06	0.114	0.092	0.000224	0.208	0.194	0.000484
14.2	66	0.121683	1.15E-01		40.5	0.104385		236.5	0.509558		8.5	0.021908		0.04	0.000103		0.003	7.01E-06		0.092	0.000237		0.194	0.0005
14.3	72	0.134595	1.28E-01		40.5	0.116213		236.5	0.678626		8.5	0.02439		0.04	0.000115		0.003	7.81E-06		0.092	0.000264		0.194	0.000557
14.4	78	0.14731	1.41E-01		40.5	0.127834		236.5	0.746486		8.5	0.026829		0.04	0.000126		0.003	8.59E-06		0.092	0.00029		0.194	0.000612
14.5	84	0.160384	1.54E-01		40.5	0.139528		238.5	0.814776		8.5	0.029284		0.04	0.000138		0.003	9.37E-06		0.092	0.000317		0.194	0.000668
14.8	90	0.173227	1.67E-01	43	37	0.151281	228	298.5	0.883405	9	8.5	0.03175	0.039	0.038	0.000149	0.003	0.003	1.02E-05	0.07	0.0685	0.000344	0.18	0.175	0.000725
14.7	96	0.183373	1.78E-01		37	0.147731		298.5	1.191827		8.5	0.033938		0.038	0.000152		0.003	9.92E-06		0.0685	0.000274		0.175	0.000699
14.8	102	0.190975	1.87E-01		37	0.155083		298.5	1.251145		8.5	0.035627		0.036	0.000159		0.003	1.04E-05		0.0685	0.000287		0.175	0.000734
14.9	108	0.19672	1.94E-01		37	0.160613		298.5	1.295755		8.5	0.036898		0.038	0.000165		0.003	1.08E-05		0.0685	0.000297		0.175	0.00076
15	114	0.202308	2.00E-01		37	0.165308		298.5	1.333634		8.5	0.037978		0.038	0.00017		0.003	1.11E-05		0.0685	0.000306		0.175	0.000782
15.1	120	0.20659	2.04E-01	31	24.5	0.169397	369	318.5	1.36662	8	8.5	0.038915	0.037	0.0345	0.000174	0.003	0.003	1.14E-05	0.067	0.0745	0.000314	0.17	0.187	0.000801
15.2	126	0.205168	2.06E-01		24.5	0.112953		316.5	1.459165		8.5	0.039188		0.0345	0.000159		0.003	7.59E-06		0.0745	0.000343		0.187	0.000862
15.3	132	0.199508	2.02E-01		24.5	0.11101		316.5	1.434071		8.5	0.038514		0.0345	0.000156		0.003	7.46E-06		0.0745	0.000338		0.187	0.000847
15.4	138	0.192132	1.96E-01		24.5	0.107434		316.5	1.387874		8.5	0.037273		0.0345	0.000151		0.003	7.22E-06		0.0745	0.000327		0.187	0.00082
15.5	144	0.183522	1.88E-01		24.5	0.103049		316.5	1.331222		8.5	0.035752		0.0345	0.000145		0.003	6.92E-06		0.0745	0.000313		0.187	0.000787
15.6	150	0.175064	1.79E-01		24.5	0.098367		316.5	1.270737		8.5	0.034127		0.0345	0.000139		0.003	6.61E-06		0.0745	0.000299		0.187	0.000751
15.7	156	0.167292	1.71E-01		24.5	0.093914		318.5	1.213221		8.5	0.032583		0.0345	0.000132		0.003	6.31E-06		0.0745	0.000286		0.187	0.000717
15.8	162	0.159794	1.64E-01		24.5	0.089726		316.5	1.159108		8.5	0.031129		0.0345	0.000126		0.003	6.03E-06		0.0745	0.000273		0.187	0.000685
15.9	168	0.152481	1.56E-01		24.5	0.085663		316.5	1.106624		8.5	0.02972		0.0345	0.000121		0.003	5.75E-06		0.0745	0.00026		0.187	0.000654
16	174	0.145328	1.49E-01		24.5	0.081695		316.5	1.055361		8.5	0.028343		0.0345	0.000115		0.003	5.49E-06		0.0745	0.000248		0.187	0.000624
16.1	180	0.138958	1.42E-01		24.5	0.077985		316.5	1.007437		8.5	0.027056		0.0345	0.00011		0.003	5.24E-06		0.0745	0.000237		0.187	0.000595
16.2	186	0.134793	1.37E-01		24.5	0.075095		316.5	0.970102		8.5	0.026053		0.0345	0.000106		0.003	5.04E-06		0.0745	0.000228		0.187	0.000573
16.3	192	0.132312	1.34E-01		24.5	0.073272		316.5	0.946552		8.5	0.025421		0.0345	0.000103		0.003	4.92E-06		0.0745	0.000223		0.187	0.000559
16.4	198	0.130621	1.31E-01		24.5	0.072127		318.5	0.931766		8.5	0.025024		0.0345	0.000102		0.003	4.85E-06		0.0745	0.000219		0.187	0.000551
18.5	204	0.129275	1.30E-01		24.5	0.071294		316.5	0.921002		8.5	0.024735		0.0345	0.0001		0.003	4.79E-06		0.0745	0.000217		0.187	0.000544
16.8	210	0.127016	1.28E-01		24.5	0.070305		316.5	0.908227		8.5	0.024392		0.0345	9.9E-05		0.003	4.72E-06		0.0745	0.000214		0.187	0.000537
16.7	216	0.120342	1.24E-01		24.5	0.067855		316.5	0.876572		8.5	0.023541		0.0345	9.56E-05		0.003	4.56E-06		0.0745	0.000206		0.187	0.000518
16.8	222	0.11021	1.15E-01		24.5	0.063245		318.5	0.817018		8.5	0.021942		0.0345	8.91E-05		0.003	4.25E-06		0.0745	0.000192		0.187	0.000483
16.9	228	9.76E-02	1.04E-01		24.5	0.057005		316.5	0.73641		8.5	0.019777		0.0345	8.03E-05		0.003	3.83E-06		0.0745	0.000173		0.187	0.000435
17	234	8.49E-02	9.12E-02		24.5	0.050061		316.5	0.648711		8.5	0.017388		0.0345	7.05E-05		0.003	3.36E-06		0.0745	0.000152		0.187	0.000382
17.1	240	7.33E-02	7.91E-02	18	19.5	0.043404	264	207	0.560704	9	8	0.015058	0.032	0.029	6.11E-05	0.003	0.0025	2.92E-06	0.082	0.0705	0.000132	0.204	0.1835	0.000331
17.2	248	6.46E-02	6.90E-02		19.5	0.030115		207	0.319688		8	0.009288		0.029	4.48E-05		0.0025	1.89E-06		0.0705	0.000109		0.1835	0.000283
17.3	252	5.81E-02	6.13E-02		19.5	0.028781		207	0.284291		8	0.00824		0.029	3.98E-05		0.0025	1.5E-06		0.0705	9.68E-05		0.1835	0.000252
17.4	258	5.27E-02	5.54E-02		19.5	0.024174		207	0.256615		8	0.007438		0.029	3.6E-05		0.0025	1.35E-06		0.0705	8.74E-05		0.1835	0.000227
17.5	264	4.79E-02	5.03E-02		19.5	0.021953		207	0.233035		8	0.006755		0.029	3.26E-05		0.0025	1.23E-06		0.0705	7.94E-05		0.1835	0.000207
17.8	270	4.31E-02	4.55E-02		19.5	0.019874		207	0.210966		6	0.006115		0.029	2.96E-05		0.0025	1.11E-06		0.0705	7.19E-05		0.1835	0.000187
17.7	278	3.94E-02	4.13E-02		19.5	0.01802		207	0.191287		6	0.005545		0.029	2.68E-05		0.0025	1.01E-06		0.0705	6.51E-05		0.1835	0.00017

Conduit CSO 1005D

Time (hours)	Time (minutes)	Flow (ft^3/s)	Mean Flow	CBOD Conc.	CBOD Mean Conc.	CBOD Discharge lbs.	SS Conc. mg/l	SS Mean Conc.	SS Discharge lbs.	TKN Conc. mg/l	TKN Mean Conc.	TKN Discharge lbs.	Cu Conc. mg/l	Cu Mean Conc.	Cu Discharge lbs.	Cd Conc. mg/l	Cd Mean Conc.	Cd Discharge lbs.	Pb Conc. mg/l	Pb Mean Conc.	Pb Discharge lbs.	Zn Conc. mg/l	Zn Mean Conc.	Zn Discharge lbs.
17.8	282	3.70E-02	3.82E-02		19.5	0.016671		207	0.17697		6	0.00513		0.029	2.48E-05		0.0025	9.33E-07		0.0705	6.03E-05		0.1835	0.000157
17.9	288	3.52E-02	3.61E-02		19.5	0.015784		207	0.167338		6	0.00485		0.029	2.34E-05		0.0025	8.83E-07		0.0705	5.7E-05		0.1835	0.000148
18	294	3.38E-02	3.45E-02		19.5	0.015073		207	0.160007		6	0.004638		0.029	2.24E-05		0.0025	8.44E-07		0.0705	5.45E-05		0.1835	0.000142
18.1	300	3.24E-02	3.31E-02		19.5	0.014446		207	0.153352		6	0.004445		0.029	2.15E-05		0.0025	8.09E-07		0.0705	5.22E-05		0.1835	0.000136
18.2	306	3.05E-02	3.14E-02		19.5	0.013728		207	0.145728		6	0.004224		0.029	2.04E-05		0.0025	7.69E-07		0.0705	4.96E-05		0.1835	0.000129
18.3	312	2.82E-02	2.84E-02		19.5	0.012818		207	0.136069		6	0.003944		0.029	1.91E-05		0.0025	7.18E-07		0.0705	4.63E-05		0.1835	0.000121
18.4	318	2.56E-02	2.69E-02		19.5	0.011746		207	0.124693		6	0.003614		0.029	1.75E-05		0.0025	6.58E-07		0.0705	4.25E-05		0.1835	0.000111
18.5	324	2.29E-02	2.43E-02		19.5	0.010598		207	0.112498		6	0.003261		0.029	1.58E-05		0.0025	5.93E-07		0.0705	3.83E-05		0.1835	9.97E-05
18.6	330	2.04E-02	2.16E-02		19.5	0.00945		207	0.100315		6	0.002908		0.029	1.41E-05		0.0025	5.29E-07		0.0705	3.42E-05		0.1835	8.89E-05
18.7	336	1.83E-02	1.93E-02		19.5	0.00843		207	0.089487		6	0.002584		0.029	1.25E-05		0.0025	4.72E-07		0.0705	3.05E-05		0.1835	7.93E-05
18.8	342	1.66E-02	1.75E-02		19.5	0.007622		207	0.08091		6	0.002345		0.029	1.13E-05		0.0025	4.27E-07		0.0705	2.76E-05		0.1835	7.17E-05
18.9	348	1.54E-02	1.60E-02	21	21	0.006992	150	150	0.074226	3	3	0.002151	0.026	0.028	1.04E-05	0.002	0.002	3.91E-07	0.059	0.059	2.53E-05	0.163	0.163	6.58E-05
19	354	1.43E-02	1.48E-02		21	0.006978		150	0.049841		3	0.000997		0.026	8.64E-06		0.002	3.13E-07		0.059	1.96E-05		0.163	5.42E-05
19.1	360	1.34E-02	1.38E-02		21	0.006508		150	0.046483		3	0.00093		0.026	8.06E-06		0.002	2.91E-07		0.059	1.83E-05		0.163	5.05E-05
19.2	366	1.26E-02	1.30E-02		21	0.006116		150	0.043685		3	0.000874		0.026	7.57E-06		0.002	2.74E-07		0.059	1.72E-05		0.163	4.75E-05
19.3	372	1.20E-02	1.23E-02		21	0.005001		150	0.041437		3	0.000829		0.026	7.18E-06		0.002	2.6E-07		0.059	1.63E-05		0.163	4.5E-05
19.4	378	1.16E-02	1.18E-02		21	0.005557		150	0.039695		3	0.000794		0.026	6.88E-06		0.002	2.49E-07		0.059	1.56E-05		0.163	4.31E-05
19.5	384	1.12E-02	1.14E-02		21	0.00537		150	0.038354		3	0.000767		0.026	6.65E-06		0.002	2.4E-07		0.059	1.51E-05		0.163	4.17E-05
19.6	390	1.09E-02	1.11E-02		21	0.005212		150	0.037232		3	0.000745		0.026	6.45E-06		0.002	2.33E-07		0.059	1.46E-05		0.163	4.05E-05
19.7	396	1.07E-02	1.08E-02		21	0.005079		150	0.03628		3	0.000726		0.026	6.29E-06		0.002	2.27E-07		0.059	1.43E-05		0.163	3.94E-05
19.8	402	1.05E-02	1.06E-02		21	0.004969		150	0.035496		3	0.00071		0.026	6.15E-06		0.002	2.23E-07		0.059	1.4E-05		0.163	3.86E-05
19.9	408	1.03E-02	1.04E-02		21	0.004879		150	0.03485		3	0.000697		0.026	6.04E-06		0.002	2.19E-07		0.059	1.37E-05		0.163	3.79E-05
20	414	1.00E-02	1.01E-02		21	0.00477		150	0.034069		3	0.000681		0.026	5.91E-06		0.002	2.14E-07		0.059	1.34E-05		0.163	3.7E-05
20.1	420	9.71E-03	9.85E-03		21	0.004633		150	0.03309		3	0.000662		0.026	5.74E-06		0.002	2.07E-07		0.059	1.3E-05		0.163	3.6E-05
20.2	426	9.13E-03	9.42E-03		21	0.004429		150	0.031635		3	0.000633		0.026	5.48E-06		0.002	1.98E-07		0.059	1.24E-05		0.163	3.44E-05
20.3	432	8.34E-03	8.74E-03		21	0.004109		150	0.029347		3	0.000587		0.026	5.09E-06		0.002	1.84E-07		0.059	1.15E-05		0.163	3.19E-05
20.4	438	7.42E-03	7.88E-03		21	0.003707		150	0.026478		3	0.00053		0.026	4.59E-06		0.002	1.66E-07		0.059	1.04E-05		0.163	2.88E-05
20.5	444	6.50E-03	6.96E-03		21	0.003273		150	0.023377		3	0.000468		0.026	4.05E-06		0.002	1.47E-07		0.059	9.19E-06		0.163	2.54E-05
20.6	450	5.61E-03	6.05E-03		21	0.002847		150	0.020332		3	0.000407		0.026	3.52E-06		0.002	1.27E-07		0.059	8E-06		0.163	2.21E-05
20.7	456	4.85E-03	5.23E-03		21	0.002459		150	0.017582		3	0.000351		0.026	3.04E-06		0.002	1.1E-07		0.059	6.91E-06		0.163	1.91E-05
20.8	462	4.26E-03	4.55E-03		21	0.002141		150	0.015295		3	0.000306		0.026	2.65E-06		0.002	9.59E-08		0.059	6.02E-06		0.163	1.66E-05
20.9	468	3.80E-03	4.03E-03		21	0.001896		150	0.013543		3	0.000271		0.026	2.35E-06		0.002	8.49E-08		0.059	5.33E-06		0.163	1.47E-05
21	474	3.41E-03	3.61E-03		21	0.001697		150	0.012123		3	0.000242		0.026	2.1E-06		0.002	7.6E-08		0.059	4.77E-06		0.163	1.32E-05
21.1	480	3.07E-03	3.24E-03		21	0.001524		150	0.010888		3	0.000218		0.026	1.89E-06		0.002	6.83E-08		0.059	4.28E-06		0.163	1.18E-05
21.2	486	2.68E-03	2.87E-03		21	0.001351		150	0.009651		3	0.000193		0.026	1.67E-06		0.002	6.05E-08		0.059	3.8E-06		0.163	1.05E-05
21.3	492	2.24E-03	2.46E-03		21	0.001155		150	0.008252		3	0.000165		0.026	1.43E-06		0.002	5.17E-08		0.059	3.25E-06		0.163	8.97E-06
21.39972	498	1.77E-03	2.00E-03		21	0.000943		150	0.006732		3	0.000135		0.026	1.17E-06		0.002	4.22E-08		0.059	2.65E-06		0.163	7.32E-06
21.5	504	1.33E-03	1.55E-03		21	0.00073		150	0.005216		3	0.000104		0.026	9.04E-07		0.002	3.27E-08		0.059	2.05E-06		0.163	5.67E-06
21.6	510	9.29E-04	1.13E-03		21	0.000532		150	0.0038		3	7.6E-05		0.026	6.59E-07		0.002	2.38E-08		0.059	1.49E-06		0.163	4.13E-06
21.7	516	6.15E-04	7.72E-04		21	0.000363		150	0.002594		3	5.19E-05		0.026	4.5E-07		0.002	1.63E-08		0.059	1.02E-06		0.163	2.82E-06
21.8	522	3.86E-04	5.01E-04		21	0.000236		150	0.001682		3	3.36E-05		0.026	2.92E-07		0.002	1.05E-08		0.059	6.62E-07		0.163	1.83E-06
21.9	528	2.30E-04	3.08E-04		21	0.000145		150	0.001035		3	2.07E-05		0.026	1.79E-07		0.002	6.49E-09		0.059	4.07E-07		0.163	1.12E-06
22	534	1.12E-04	1.71E-04		21	8.03E-05		150	0.000574		3	1.15E-05		0.026	9.94E-08		0.002	3.6E-09		0.059	2.26E-07		0.163	6.23E-07
22.1	540	2.83E-05	6.99E-05		21	3.29E-05		150	0.000235		3	4.7E-06		0.026	4.07E-08		0.002	1.47E-09		0.059	9.24E-08		0.163	2.55E-07
	548		1.42E-05		21	6.66E-06		150	4.76E-05		3	9.52E-07		0.026	8.25E-09		0.002	2.98E-10		0.059	1.87E-08		0.163	5.17E-08

Conduit CSO 1006 - S3CSO6.XLS

Summary Statistics

Total Discharge Volume (cf)	Duration (hr)	CBOD (lbs)	SS (lbs)	TKN (lbs)	Cu (lbs)	Cd (lbs)	Pb (lbs)	Zn (lbs)
1.51E+05	7.90	317.79	2685.62	83.57	0.35	0.02	0.73	1.79

Conduit CSO 1006

Time (hours)	Time (minutes)	Flow (ft^3/s)	Mean Flow	CBOD Conc.	CBOD Mean Conc.	CBOD Discharge lbs.	SS Conc. mg/l	SS Mean Conc.	SS Discharge lbs.	TKN Conc. mg/l	TKN Mean Conc.	TKN Discharge lbs.	Cu Conc. mg/l	Cu Mean Conc.	Cu Discharge lbs.	Cd Conc. mg/l	Cd Mean Conc.	Cd Discharge lbs.	Pb Conc. mg/l	Pb Mean Conc.	Pb Discharge lbs.	Zn Conc. mg/l	Zn Mean Conc.	Zn Discharge lbs.
13.3	0	2.666695		108	94.5		390	377.5		29	24.5		0.051	0.0525		0.003	0.003		0.135	0.112		0.227	0.238	
13.4	6	3.289378	2.98E+00		94.5	6.302029		377.5	25.17477		24.5	1.633859		0.0525	0.003501		0.003	0.000423		0.112	0.007469		0.238	0.015872
13.5	12	3.706688	3.50E+00		94.5	7.402409		377.5	29.57047		24.5	1.919143		0.0525	0.004112		0.003	0.000497		0.112	0.008773		0.238	0.018643
13.6	18	4.081033	3.89E+00	81	78.5	8.240046	365	334	32.91659	20	17	2.136308	0.054	0.054	0.004578	0.003	0.0035	0.000554	0.089	0.093	0.009766	0.249	0.2445	0.020753
13.7	24	4.556611	4.32E+00		76.5	7.398528		334	32.30207		17	1.644117		0.054	0.005222		0.0035	0.00058		0.093	0.008994		0.2445	0.023646
13.8	30	5.16032	4.86E+00	72	76.5	8.322985	303	289	36.33826	14	12.5	1.849552	0.054	0.0485	0.005875	0.004	0.0035	0.000652	0.097	0.0905	0.010118	0.24	0.23	0.026601
13.9	36	5.903587	5.53E+00		76.5	9.476731		289	35.80098		12.5	1.548485		0.0485	0.006008		0.0035	0.000743		0.0905	0.011211		0.23	0.028492
14	42	6.73746	6.32E+00		76.5	10.82762		289	40.90435		12.5	1.769219		0.0485	0.006865		0.0035	0.000849		0.0905	0.012809		0.23	0.032554
14.1	48	7.588434	7.16E+00	45	41.5	12.27077	275	260	46.35624	11	9.5	2.005027	0.043	0.042	0.00778	0.003	0.003	0.000962	0.084	0.099	0.014516	0.22	0.214	0.036893
14.2	54	8.419016	8.00E+00		41.5	7.438046		260	46.5998		9.5	1.702685		0.042	0.007528		0.003	0.0005		0.099	0.017744		0.214	0.038355
14.3	60	9.202669	8.81E+00	38	40.5	8.188118	245	236.5	51.29906	8	8.5	1.874389	0.041	0.04	0.008287	0.003	0.003	0.00055	0.114	0.092	0.019533	0.208	0.194	0.042223
14.4	66	9.94242	9.57E+00		40.5	8.681624		236.5	50.6964		8.5	1.822069		0.04	0.008574		0.003	0.000583		0.092	0.019721		0.194	0.041586
14.5	72	10.64749	1.03E+01		40.5	9.3368		236.5	54.5223		8.5	1.959575		0.04	0.009222		0.003	0.000627		0.092	0.02121		0.194	0.044724
14.6	78	11.31808	1.10E+01		40.5	9.960613		236.5	58.16506		8.5	2.090499		0.04	0.009838		0.003	0.000669		0.092	0.022627		0.194	0.047713
14.7	84	11.90966	1.16E+01		40.5	10.53296		238.5	61.5073		8.5	2.210622		0.04	0.010403		0.003	0.000708		0.092	0.023927		0.194	0.050454
14.8	90	12.39705	1.22E+01	43	37	11.02224	228	298.5	64.36443	9	8.5	2.313309	0.039	0.038	0.010886	0.003	0.003	0.00074	0.07	0.0685	0.025038	0.18	0.175	0.052798
14.9	96	12.78365	1.26E+01		37	10.43177		298.5	84.15903		8.5	2.396488		0.038	0.010714		0.003	0.000701		0.0685	0.019313		0.175	0.049339
15	102	13.10882	1.29E+01		37	10.72664		298.5	86.53791		8.5	2.464229		0.038	0.011017		0.003	0.000721		0.0685	0.019859		0.175	0.050734
15.1	108	13.38248	1.32E+01		37	10.97472		298.5	88.53932		8.5	2.52122		0.038	0.011271		0.003	0.000737		0.0685	0.020318		0.175	0.051907
15.2	114	13.50345	1.34E+01		37	11.13821		298.5	89.85826		8.5	2.558778		0.038	0.011439		0.003	0.000748		0.0685	0.020621		0.175	0.052681
15.3	120	13.38589	1.34E+01	31	24.5	11.13962	369	316.5	89.86985	8	8.5	2.559102	0.037	0.0345	0.011441	0.003	0.003	0.000748	0.067	0.0745	0.020623	0.17	0.187	0.052687
15.4	126	13.09429	1.32E+01		24.5	7.263996		316.5	93.83897		8.5	2.520162		0.0345	0.010229		0.003	0.000488		0.0745	0.022088		0.187	0.055444
15.5	132	12.69964	1.29E+01		24.5	7.075745		316.5	91.40708		8.5	2.45485		0.0345	0.009964		0.003	0.000475		0.0745	0.021516		0.187	0.054007
15.6	138	12.23783	1.25E+01		24.5	6.840803		316.5	88.372		8.5	2.37334		0.0345	0.009633		0.003	0.00046		0.0745	0.020802		0.187	0.052213
15.7	144	11.75499	1.20E+01		24.5	6.501668		318.5	85.0244		8.5	2.283436		0.0345	0.009268		0.003	0.000442		0.0745	0.020014		0.187	0.050236
15.8	150	11.28345	1.15E+01		24.5	6.319864		316.5	81.64233		8.5	2.192606		0.0345	0.008899		0.003	0.000425		0.0745	0.019218		0.187	0.048237
15.9	156	10.82327	1.11E+01		24.5	6.064276		316.5	78.34055		8.5	2.103933		0.0345	0.008539		0.003	0.000407		0.0745	0.01844		0.187	0.046287
18	162	10.37919	1.06E+01		24.5	5.816221		316.5	75.13606		8.5	2.017873		0.0345	0.00819		0.003	0.000391		0.0745	0.017886		0.187	0.044393
16.1	168	9.946001	1.02E+01		24.5	5.57557		316.5	72.02727		8.5	1.934382		0.0345	0.007851		0.003	0.000375		0.0745	0.016954		0.187	0.042556
16.2	174	9.57013	9.76E+00		24.5	5.35363		316.5	69.15017		8.5	1.857382		0.0345	0.007539		0.003	0.00036		0.0745	0.016279		0.187	0.040862
16.3	180	9.298284	9.43E+00		24.5	5.17595		316.5	66.86482		8.5	1.795738		0.0345	0.007289		0.003	0.000348		0.0745	0.015739		0.187	0.039506
16.4	186	9.111473	9.20E+00		24.5	5.050132		316.5	65.23948		8.5	1.752087		0.0345	0.007111		0.003	0.000339		0.0745	0.015357		0.187	0.038546
16.5	192	8.976209	9.04E+00		24.5	4.961781		316.5	64.09811		8.5	1.721434		0.0345	0.006967		0.003	0.000333		0.0745	0.015088		0.187	0.037872
16.6	198	8.865376	8.92E+00		24.5	4.894272		316.5	63.226		8.5	1.698013		0.0345	0.006892		0.003	0.000329		0.0745	0.014883		0.187	0.037356
16.7	204	8.659294	8.76E+00		24.5	4.807336		316.5	62.10294		8.5	1.687851		0.0345	0.00677		0.003	0.000323		0.0745	0.014618		0.187	0.036693
16.8	210	8.233166	8.45E+00		24.5	4.63391		316.5	59.86255		8.5	1.607683		0.0345	0.006525		0.003	0.000311		0.0745	0.014091		0.187	0.035369
16.9	216	7.621368	7.93E+00		24.5	4.349188		316.5	56.1844		8.5	1.508902		0.0345	0.006124		0.003	0.000292		0.0745	0.013225		0.187	0.033196
17	222	6.906085	7.26E+00		24.5	3.985145		316.5	51.48157		8.5	1.382601		0.0345	0.005012		0.003	0.000268		0.0745	0.012118		0.187	0.030417
17.1	228	6.134137	6.52E+00		24.5	3.577171		316.5	46.2112		8.5	1.241059		0.0345	0.005037		0.003	0.00024		0.0745	0.010878		0.187	0.027303
17.2	234	5.387934	5.76E+00		24.5	3.150714		316.5	40.83127		8.5	1.096574		0.0345	0.004451		0.003	0.000212		0.0745	0.009611		0.187	0.024125
17.3	240	4.751519	5.07E+00	18	19.5	2.781437	264	207	35.93162	9	6	0.964988	0.032	0.029	0.003917	0.003	0.0025	0.000187	0.082	0.0705	0.008458	0.204	0.1835	0.02123
17.4	246	4.228376	4.49E+00		19.5	1.960625		207	20.81278		8	0.603269		0.029	0.002916		0.0025	0.00011		0.0705	0.007088		0.1835	0.01845
17.5	252	3.794754	4.01E+00		19.5	1.751729		207	18.59528		8	0.538994		0.029	0.002605		0.0025	9.81E-05		0.0705	0.006333		0.1835	0.016484
17.6	258	3.385154	3.58E+00		19.5	1.563258		207	18.59458		8	0.481002		0.029	0.002325		0.0025	8.75E-05		0.0705	0.005652		0.1835	0.014711
17.7	264	3.043774	3.20E+00		19.5	1.399293		207	14.85403		6	0.430552		0.029	0.002081		0.0025	7.83E-05		0.0705	0.005059		0.1835	0.013168
17.8	270	2.796603	2.92E+00		19.5	1.275150		207	13.5363		6	0.392350		0.029	0.001896		0.0025	7.14E-05		0.0705	0.00461		0.1835	0.012
17.9	276	2.614174	2.71E+00		19.5	1.181362		207	12.54061		6	0.363496		0.029	0.801757		0.0025	8.61E-05		0.0705	0.004271		0.1835	0.011117

Conduit CSO 1006

Time (hours)	Time (minutes)	Flow (ft^3/s)	Mean Flow	CBOD Conc.	CBOD Mean Conc.	CBOD Discharge lbs.	SS Conc. mg/l	SS Mean Conc.	SS Discharge lbs.	TKN Conc. mg/l	TKN Mean Conc.	TKN Discharge lbs.	Cu Conc. mg/l	Cu Mean Conc.	Cu Discharge lbs.	Cd Conc. mg/l	Cd Mean Conc.	Cd Discharge lbs.	Pb Conc. mg/l	Pb Mean Conc.	Pb Discharge lbs.	Zn Conc. mg/l	Zn Mean Conc.	Zn Discharge lbs.
18	282	2.481119	2.55E+00		19.5	1.11248		207	11.80941		6	0.342302		0.029	0.001654		0.0025	6.23E-05		0.0705	0.004022		0.1835	0.010469
18.1	288	2.380255	2.43E+00		19.5	1.061408		207	11.26725		6	0.326587		0.029	0.001579		0.0025	5.94E-05		0.0705	0.003837		0.1835	0.009988
18.2	294	2.287876	2.33E+00		19.5	1.019216		207	10.81937		6	0.313605		0.029	0.001516		0.0025	5.71E-05		0.0705	0.003685		0.1835	0.009591
18.3	300	2.168678	2.23E+00		19.5	0.973021		207	10.329		6	0.299391		0.029	0.001447		0.0025	5.45E-05		0.0705	0.003518		0.1835	0.009156
18.4	306	2.009012	2.09E+00		19.5	0.912136		207	9.68267		6	0.280657		0.029	0.001357		0.0025	5.11E-05		0.0705	0.003298		0.1835	0.008583
18.5	312	1.816858	1.91E+00		19.5	0.835103		207	8.864936		6	0.256955		0.029	0.001242		0.0025	4.68E-05		0.0705	0.003019		0.1835	0.007859
18.6	318	1.502372	1.71E+00		19.5	0.746319		207	7.922463		6	0.229637		0.029	0.00111		0.0025	4.18E-05		0.0705	0.002698		0.1835	0.007023
18.7	324	1.392532	1.50E+00		19.5	0.653892		207	6.941316		6	0.201198		0.029	0.000972		0.0025	3.66E-05		0.0705	0.002364		0.1835	0.006153
18.8	330	1.215054	1.30E+00		19.5	0.569327		207	6.043626		8	0.175178		0.029	0.000847		0.0025	3.19E-05		0.0705	0.002058		0.1835	0.005358
18.9	336	1.075026	1.15E+00		19.5	0.500004		207	5.307739		6	0.153848		0.029	0.000744		0.0025	2.8E-05		0.0705	0.001808		0.1835	0.004705
19	342	0.971463	1.02E+00		19.5	0.44682		207	4.743166		6	0.137483		0.029	0.000665		0.0025	2.5E-05		0.0705	0.001615		0.1835	0.004205
19.1	348	0.894802	9.33E-01	21	21	0.407471	150	150	4.325459	3	3	0.125376	0.026	0.026	0.000606	0.002	0.002	2.28E-05	0.059	0.059	0.001473	0.163	0.163	0.003834
19.2	354	0.837558	8.66E-01		21	0.40733		150	2.909497		3	0.05819		0.026	0.000504		0.002	1.82E-05		0.059	0.001144		0.163	0.003162
19.3	360	0.794878	8.16E-01		21	0.383834		150	2.741674		3	0.054833		0.026	0.000475		0.002	1.72E-05		0.059	0.001078		0.163	0.002979
19.4	366	0.763123	7.79E-01		21	0.366333		150	2.616661		3	0.052333		0.026	0.000454		0.002	1.64E-05		0.059	0.001029		0.163	0.002843
19.5	372	0.740788	7.52E-01		21	0.353615		150	2.525818		3	0.050518		0.026	0.000438		0.002	1.58E-05		0.059	0.000993		0.163	0.002745
19.6	378	0.725138	7.33E-01		21	0.344863		150	2.462021		3	0.94924		0.026	0.000427		0.002	1.54E-05		0.059	0.000968		0.163	0.002675
19.7	384	0.715307	7.20E-01		21	0.338692		150	2.419227		3	0.048385		0.026	0.000419		0.002	1.52E-05		0.059	0.000952		0.163	0.002629
19.8	390	0.708024	7.12E-01		21	0.334668		150	2.390484		3	0.04781		0.026	0.000414		0.002	1.5E-05		0.059	0.00094		0.163	0.002598
19.9	396	0.702361	7.05E-01		21	0.331624		150	2.368741		3	0.047375		0.026	0.000411		0.002	1.49E-05		0.059	0.000932		0.163	0.002574
20	402	0.697591	7.00E-01		21	0.329171		150	2.351218		3	0.047024		0.026	0.000408		0.002	1.47E-05		0.059	0.000925		0.163	0.002555
20.1	408	0.691961	6.95E-01		21	0.326725		150	2.333752		3	0.046675		0.026	0.000405		0.002	1.46E-05		0.059	0.000918		0.163	0.002536
20.2	414	0.680026	6.86E-01		21	0.322595		150	2.304251		3	0.046085		0.026	0.000399		0.002	1.44E-05		0.059	0.000906		0.163	0.002504
20.3	420	0.646771	6.63E-01		21	0.311969		150	2.228353		3	0.044567		0.026	0.000386		0.002	1.4E-05		0.059	0.000876		0.163	0.002421
20.4	426	0.585859	8.16E-01		21	0.289828		150	2.0702		3	0.041404		0.028	0.000359		0.002	1.3E-05		0.059	0.000814		0.163	0.00225
20.5	432	0.500059	5.43E-01		21	0.255332		150	1.823798		3	0.036476		0.026	0.000316		0.002	1.14E-05		0.059	0.000717		0.163	0.001982
20.6	438	0.398599	4.49E-01		21	0.211301		150	1.509296		3	0.030186		0.026	0.000262		0.002	9.46E-06		0.059	0.000594		0.163	0.00164
20.7	444	0.292485	3.46E-01		21	0.162494		150	1.160675		3	0.023213		0.026	0.000201		0.002	7.28E-06		0.059	0.000457		0.163	0.001261
20.8	450	0.197936	2.45E-01		21	0.115313		150	0.823662		3	0.018473		0.028	0.000143		0.002	5.16E-06		0.059	0.000324		0.163	0.000895
20.9	456	0.125223	1.62E-01		21	0.075984		150	0.542746		3	0.010855		0.026	9.41E-05		0.002	3.4E-06		0.059	0.000213		0.163	0.00059
21	462	7.20E-02	9.86E-02		21	0.046365		150	0.331176		3	0.006624		0.026	5.74E-05		0.002	2.08E-06		0.059	0.00013		0.163	0.00036
21.1	468	3.34E-02	5.27E-02		21	0.024763		150	0.176881		3	0.003538		0.026	3.07E-05		0.002	1.11E-06		0.059	8.96E-05		0.163	0.000192
21.2	474	6.72E-03	2.00E-02		21	0.009423		150	0.067307		3	0.001348		0.028	1.17E-05		0.002	4.22E-07		0.059	2.65E-05		0.163	7.31E-05
	480		3.36E-03		21	0.001581		150	0.01129		3	0.000226		0.028	1.96E-06		0.002	7.08E-08		0.059	4.44E-06		0.163	1.23E-05

Conduit CSO 1007 - S3CSO7.XLS

Summary Statistics

Total Discharge Volume (cf)	Duration (hr)	CBOD (lbs)	SS (lbs)	TKN (lbs)	Cu (lbs)	Cd (lbs)	Pb (lbs)	Zn (lbs)
4.63E+04	10.00	74.584	757.704	21.294	0.095	0.005	0.210	0.530

Conduit CSO 1007

Time (hours)	Time (minutes)	Flow (ft^3/s)	Mean Flow	CBOD Conc.	CBOD Mean Conc.	CBOD Discharge lbs.	SS Conc. mg/l	SS Mean Conc.	SS Discharge lbs.	TKN Conc. mg/l	TKN Mean Conc.	TKN Discharge lbs.	Cu Conc. mg/l	Cu Mean Conc.	Cu Discharge lbs.	Co Conc. mg/l	Cd Mean Conc.	Cd Discharge lbs.	Pb Conc. mg/l	Pb Mean Conc.	Pb Discharge lbs.	Zn Conc. mg/l	Zn Mean Conc.	Zn Discharge lbs.
11.7	0	0.136754		108	94.5		390	377.5		29	24.5		0.051	0.0525		0.003	0.003		0.135	0.112		0.227	0.238	
11.8	6	0.210272	1.74E-01		94.5	0.367183		377.5	1.46679		24.5	0.095196		0.0525	0.000204		0.003	2.47E-05		0.112	0.000435		0.238	0.000925
11.9	12	0.245911	2.28E-01		94.5	0.48268		377.5	1.928166		24.5	0.125139		0.0525	0.000268		0.003	3.24E-05		0.112	0.000572		0.238	0.001216
12	18	0.275932	2.61E-01	81	76.5	0.552153	385	334	2.205691	20	17	0.143151	0.054	0.054	0.000307	0.003	0.0035	3.71E-05	0.089	0.093	0.000664	0.249	0.2445	0.001391
12.1	24	0.307988	2.92E-01		78.5	0.500136		334	2.183598		17	0.111141		0.054	0.000353		0.0035	3.92E-05		0.093	0.000608		0.2445	0.001598
12.2	30	0.343535	3.26E-01	72	78.5	0.558041	303	289	2.436416	14	12.5	0.124009	0.064	0.0485	0.000394	0.004	0.0035	4.37E-05	0.097	0.0005	0.000678	0.24	0.23	0.001784
12.3	36	0.384018	3.64E-01		76.5	0.62318		289	2.354236		12.5	0.101827		0.0485	0.000395		0.0035	4.88E-05		0.0905	0.000737		0.23	0.001874
12.4	42	0.420642	4.02E-01		76.5	0.689225		289	2.60374		12.5	0.112619		0.0485	0.000437		0.0035	5.4E-05		0.0905	0.000815		0.23	0.002072
12.5	48	0.457498	4.39E-01	45	41.5	0.752166	275	260	2.841515	11	9.5	0.122903	0.543	0.042	0.000477	0.003	0.003	5.9E-05	0.084	0.099	0.00089	0.22	0.214	0.002261
12.6	54	0.614844	5.36E-01		41.5	0.498276		260	3.121729		9.5	0.114063		0.042	0.000504		0.003	3.35E-05		0.099	0.001189		0.214	0.002569
12.7	60	0.852398	7.34E-01	38	40.5	0.681771	245	236.5	4.271338	8	8.5	0.156068	0.041	0.04	0.00069	0.003	0.003	4.58E-05	0.114	0.092	0.001626	0.208	0.194	0.003516
12.8	66	1.102948	9.78E-01		40.5	0.886681		236.5	5.177777		8.5	0.186093		0.04	0.000878		0.003	5.96E-05		0.092	0.002014		0.194	0.004247
12.9	72	1.363612	1.23E+00		40.5	1.118498		238.5	6.531477		8.5	0.234747		0.04	0.001105		0.003	7.51E-05		0.092	0.002541		0.194	0.005356
13	78	1.640622	1.50E+00		40.5	1.362314		236.5	7.955244		8.5	0.285918		0.04	0.001345		0.003	9.15E-05		0.092	0.003095		0.194	0.006526
13.1	84	1.748688	1.69E+00		40.5	1.536933		236.5	8.974929		8.5	0.322566		0.04	0.001518		0.003	0.000103		0.092	0.003491		0.194	0.007362
13.2	90	1.78722	1.77E+00	43	37	1.60341	228	298.5	9.363122	9	8.5	0.336518	0.039	0.038	0.001584	0.003	0.003	0.000108	0.07	0.0685	0.003642	0.18	0.175	0.007881
13.3	96	1.808743	1.80E+00		37	1.489723		298.5	12.01844		8.5	0.342234		0.038	0.00153		0.003	0.0001		0.0685	0.002758		0.175	0.007046
13.4	102	1.82058	1.81E+00		37	1.503543		298.5	12.12994		8.5	0.345409		0.038	0.001544		0.003	0.000101		0.0685	0.002784		0.175	0.007111
13.5	108	1.82621	1.82E+00		37	1.510779		298.5	12.18832		8.5	0.347071		0.038	0.001552		0.003	0.000101		0.0685	0.002797		0.175	0.007148
13.6	114	1.922164	1.87E+00		37	1.552883		298.5	12.52783		8.5	0.356739		0.038	0.001595		0.003	0.000104		0.0685	0.002875		0.175	0.007345
13.7	120	2.054952	1.99E+00	31	24.5	1.547626	369	316.5	13.29233	8	8.5	0.378509	0.037	0.0345	0.001692	0.003	0.003	0.000111	0.067	0.0745	0.00305	0.17	0.187	0.007793
13.8	126	2.195985	2.13E+00		24.5	1.16611		316.5	15.06423		8.5	0.404589		0.0345	0.001542		0.003	7.83E-05		0.0745	0.003546		0.187	0.008901
13.9	132	2.3416	2.27E+00		24.5	1.244742		318.5	16.08004		8.5	0.431549		0.0345	0.001753		0.003	8.36E-05		0.0745	0.003785		0.187	0.009501
14	138	2.489949	2.42E+00		24.5	1.325382		316.5	17.12177		8.5	0.459828		0.0345	0.001866		0.003	8.9E-05		0.0745	0.00403		0.187	0.010116
14.1	144	2.640852	2.57E+00		24.5	1.407472		318.5	18.18224		8.5	0.488307		0.0345	0.001982		0.003	9.46E-05		0.0745	0.00428		0.187	0.010743
14.2	150	2.795396	2.72E+00		24.5	1.491262		316.5	19.26487		8.5	0.517377		0.0345	0.0021		0.003	0.0001		0.0745	0.004535		0.187	0.011382
14.3	156	2.952097	2.87E+00		24.5	1.576642		318.5	20.36764		8.5	0.546998		0.0345	0.00222		0.003	0.000106		0.0745	0.004794		0.187	0.012034
14.4	162	3.109755	3.03E+00		24.5	1.662877		316.5	21.48165		8.5	0.576916		0.0345	0.002342		0.003	0.000112		0.0745	0.005057		0.187	0.012692
14.5	168	3.267902	3.19E+00		24.5	1.749508		316.5	22.60078		8.5	0.606972		0.0345	0.002464		0.003	0.000118		0.0745	0.00532		0.187	0.013353
14.6	174	3.367093	3.32E+00		24.5	1.8201		316.5	23.51272		8.5	0.631463		0.0345	0.002563		0.003	0.000122		0.0745	0.005535		0.187	0.013892
14.7	180	3.444519	3.41E+00		24.5	1.868549		316.5	24.13861		8.5	0.648272		0.0345	0.002631		0.003	0.000126		0.0745	0.005682		0.187	0.014262
14.8	186	3.499015	3.47E+00		24.5	1.904738		316.5	24.6061		8.5	0.660827		0.0345	0.002682		0.003	0.000128		0.0745	0.005792		0.187	0.014538
14.9	192	3.5316	3.52E+00		24.5	1.928626		316.5	24.9147		8.5	0.669115		0.0345	0.002716		0.003	0.00013		0.0745	0.005865		0.187	0.014721
15	198	3.550944	3.54E+00		24.5	1.942871		316.5	25.09872		8.5	0.874057		0.0345	0.982736		0.003	0.000131		0.0745	0.005988		0.187	0.014829
15.1	204	3.485003	3.52E+00		24.5	1.930089		316.5	24.93359		8.5	0.669623		0.0345	0.002718		0.003	0.00013		0.0745	0.005869		0.187	0.014732
15.2	210	3.371452	3.43E+00		24.5	1.880851		316.5	24.29752		8.5	0.65254		0.0345	0.002649		0.003	0.000126		0.0745	0.005719		0.187	0.014356
15.3	216	3.248186	3.31E+00		24.5	1.815887		316.5	23.4583		8.5	0.830002		0.0345	0.002557		0.003	0.000122		0.0745	0.005522		0.187	0.01386
15.4	222	3.105915	3.18E+00		24.5	1.743048		316.5	22.51731		8.5	0.60473		0.0345	0.002454		0.003	0.000117		0.0745	0.0053		0.187	0.013304
15.5	228	2.953773	3.03E+00		24.5	1.662283		316.5	21.47398		8.5	0.57671		0.0345	0.002341		0.003	0.000112		0.0745	0.005055		0.187	0.012688
15.6	234	2.83065	2.89E+00		24.5	1.586773		316.5	20.49851		8.5	0.550513		0.0345	0.002234		0.003	0.000107		0.0745	0.004825		0.187	0.012111
15.7	240	2.709449	2.77E+00	18	19.5	1.51975	264	207	19.83269	9	8	0.52728	0.032	0.029	0.00214	0.003	0.0025	0.000102	0.082	0.0705	0.004821	0.204	0.1835	0.0116
15.8	246	2.586778	2.85E+00		19.5	1.156351		207	12.27511		6	0.3558		0.029	0.00172		0.0025	6.47E-05		0.0705	0.004181		0.1835	0.010882
15.9	252	2.456467	2.52E+00		19.5	1.101116		207	11.68877		6	0.338805		0.029	0.001638		0.0025	6.16E-05		0.0705	0.003981		0.1835	0.010362
16	258	2.338608	2.40E+00		19.5	1.046932		207	11.11359		8	0.322133		0.029	0.001557		0.0025	5.86E-05		0.0705	0.003785		0.1835	0.009852
18.1	264	2.276613	2.31E+00		19.5	1.007664		207	10.69874		6	0.31005		0.029	0.001499		0.0025	5.64E-05		0.0705	0.003643		0.1835	0.009482
16.2	270	2.258083	2.27E+00		19.5	0.990082		207	10.51011		6	0.304641		0.029	0.001472		0.0025	5.54E-05		0.0705	0.00358		0.1835	0.009317
18.3	276	2.263478	2.28E+00		19.5	0.987215		207	10.47968		8	0.303758		0.029	0.001468		0.0025	5.53E-05		0.0705	0.003569		0.1835	0.00928

Conduit CSO 1007

Time (hours)	Time (minutes)	Flow (ft^3/s)	Mean Flow	CBOD Conc.	CBOD Mean Conc.	CBOD Discharge lbs.	SS Conc. mg/l	SS Mean Conc.	SS Discharge lbs.	TKN Conc. mg/l	TKN Mean Conc.	TKN Discharge lbs.	Cu Conc. mg/l	Cu Mean Conc.	Cu Discharge lbs.	Cd Conc. mg/l	Cd Mean Conc.	Cd Discharge lbs.	Pb Conc. mg/l	Pb Mean Conc.	Pb Discharge lbs.	Zn Conc. mg/l	Zn Mean Conc.	Zn Discharge lbs.
16.4	282	2.278413	2.27E+00		19.5	0.991653		207	10.52678		6	0.305124		0.029	0.001475		0.0025	5.55E-05		0.0705	0.003585		0.1835	0.009332
16.5	288	2.294554	2.29E+00		19.5	0.998438		207	10.59881		6	0.307212		0.029	0.001485		0.0025	5.59E-05		0.0705	0.00361		0.1835	0.009396
16.6	294	2.148084	2.22E+00		19.5	0.969983		207	10.29674		6	0.298456		0.029	0.001443		0.0025	5.43E-05		0.0705	0.003507		0.1835	0.009128
16.7	300	1.934658	2.04E+00		19.5	0.891405		207	9.462608		6	0.274279		0.029	0.001326		0.0025	4.99E-05		0.0705	0.003223		0.1835	0.008388
16.8	306	1.699816	1.82E+00		19.5	0.793533		207	8.423654		6	0.244164		0.029	0.00118		0.0025	4.44E-05		0.0705	0.002869		0.1835	0.007467
16.9	312	1.447782	1.57E+00		19.5	0.687231		207	7.295217		6	0.211456		0.029	0.001022		0.0025	3.85E-05		0.0705	0.002485		0.1835	0.006467
17	318	1.201724	1.32E+00		19.5	0.57848		207	6.140784		6	0.177994		0.029	0.00086		0.0025	3.24E-05		0.0705	0.002091		0.1835	0.005444
17.1	324	1.07051	1.14E+00		19.5	0.496108		207	5.266377		6	0.152649		0.029	0.000738		0.0025	2.78E-05		0.0705	0.001794		0.1835	0.004669
17.2	330	0.994696	1.03E+00		19.5	0.450906		207	4.766546		6	0.13874		0.029	0.000671		0.0025	2.52E-05		0.0705	0.00163		0.1835	0.004243
17.3	336	0.928954	9.62E-01		19.5	0.42		207	4.45846		6	0.129231		0.029	0.000625		0.0025	2.35E-05		0.0705	0.001518		0.1835	0.003952
17.4	342	0.868982	8.99E-01		19.5	0.392552		207	4.187093		6	0.120785		0.029	0.000584		0.0025	2.2E-05		0.0705	0.001419		0.1835	0.003894
17.5	348	0.811913	8.40E-01	21	21	0.366998	150	150	3.895827	3	3	0.112923	0.026	0.026	0.000546	0.002	0.002	2.05E-05	0.059	0.059	0.001327	0.163	0.163	0.003454
17.6	354	0.784671	7.98E-01		21	0.375405		150	2.681462		3	0.053629		0.026	0.000465		0.002	1.68E-05		0.059	0.001055		0.163	0.002914
17.7	360	0.773793	7.79E-01		21	0.366441		150	2.817438		3	0.052349		0.026	0.000454		0.002	1.64E-05		0.059	0.00103		0.163	0.002844
17.8	366	0.76598	7.70E-01		21	0.362047		150	2.586047		3	0.051721		0.026	0.000448		0.002	1.62E-05		0.059	0.001017		0.163	0.00281
17.9	372	0.760227	7.63E-01		21	0.358857		150	2.563262		3	0.051265		0.026	0.000444		0.002	1.61E-05		0.059	0.001008		0.163	0.002785
18	378	0.758166	7.58E-01		21	0.356549		150	2.546781		3	0.050936		0.026	0.000441		0.002	1.6E-05		0.059	0.001002		0.163	0.002768
18.1	384	0.711767	7.34E-01		21	0.345155		150	2.465393		3	0.049308		0.026	0.000427		0.002	1.55E-05		0.059	0.00097		0.163	0.002679
18.2	390	0.646115	6.79E-01		21	0.319279		150	2.280561		3	0.045611		0.026	0.000395		0.002	1.43E-05		0.059	0.000897		0.163	0.002478
18.3	396	0.577704	6.12E-01		21	0.287756		150	2.055403		3	0.041108		0.026	0.000356		0.002	1.29E-05		0.059	0.000808		0.163	0.002234
18.4	402	0.507445	5.43E-01		21	0.255151		150	1.822506		3	0.03645		0.026	0.000316		0.002	1.14E-05		0.059	0.000717		0.163	0.00198
18.5	408	0.436147	4.72E-01		21	0.221867		150	1.584781		3	0.031695		0.026	0.000275		0.002	9.94E-06		0.059	0.000623		0.163	0.001722
18.6	414	0.401679	4.19E-01		21	0.196998		150	1.407128		3	0.028143		0.026	0.000244		0.002	8.82E-06		0.059	0.000553		0.163	0.001529
18.7	420	0.390936	3.96E-01		21	0.186367		150	1.331195		3	0.026624		0.026	0.000231		0.002	8.35E-06		0.059	0.000524		0.163	0.001447
18.8	426	0.383708	3.87E-01		21	0.182142		150	1.301014		3	0.02602		0.026	0.000226		0.002	8.16E-06		0.059	0.000512		0.163	0.001414
18.9	432	0.378665	3.81E-01		21	0.179257		150	1.280405		3	0.025608		0.026	0.000222		0.002	8.03E-06		0.059	0.000504		0.163	0.001391
19	438	0.375335	3.77E-01		21	0.177288		150	1.266343		3	0.025327		0.026	0.000219		0.002	7.94E-06		0.059	0.000498		0.163	0.001376
19.1	444	0.373734	3.75E-01		21	0.176129		150	1.258061		3	0.025161		0.026	0.000218		0.002	7.89E-06		0.059	0.000495		0.163	0.001367
19.2	450	0.37249	3.73E-01		21	0.17546		150	1.253282		3	0.025066		0.026	0.000217		0.002	7.86E-06		0.059	0.000493		0.163	0.001362
19.3	456	0.371831	3.72E-01		21	0.175012		150	1.250086		3	0.025002		0.026	0.000217		0.002	7.84E-06		0.059	0.000492		0.163	0.001358
19.4	462	0.371411	3.72E-01		21	0.174758		150	1.248275		3	0.024965		0.026	0.000216		0.002	7.83E-06		0.059	0.000491		0.163	0.001356
19.5	468	0.371187	3.71E-01		21	0.174607		150	1.247192		3	0.024944		0.026	0.000216		0.002	7.82E-06		0.059	0.000491		0.163	0.001355
19.6	474	0.371214	3.71E-01		21	0.174561		150	1.246662		3	0.024937		0.026	0.000216		0.002	7.82E-06		0.059	0.00049		0.163	0.001355
19.7	480	0.371023	3.71E-01		21	0.174522		150	1.246587		3	0.024932		0.026	0.000216		0.002	7.82E-06		0.059	0.00049		0.163	0.001355
19.8	486	0.370793	3.71E-01		21	0.174423		150	1.245879		3	0.024918		0.026	0.000216		0.002	7.81E-06		0.059	0.00049		0.163	0.001354
19.9	492	0.370859	3.71E-01		21	0.174385		150	1.245604		3	0.024912		0.026	0.000216		0.002	7.81E-06		0.059	0.00049		0.163	0.001354
20	498	0.370917	3.71E-01		21	0.174414		150	1.245813		3	0.024916		0.026	0.000216		0.002	7.81E-06		0.059	0.00049		0.163	0.001354
20.1	504	0.348401	3.59E-01		21	0.168663		150	1.204736		3	0.024095		0.026	0.000209		0.002	7.55E-06		0.059	0.000474		0.163	0.001309
20.2	510	0.311424	3.29E-01		21	0.154674		150	1.104818		3	0.022096		0.026	0.000192		0.002	6.93E-06		0.059	0.000435		0.163	0.001201
20.3	516	0.27085	2.91E-01		21	0.13891		150	0.977929		3	0.019559		0.026	0.00017		0.002	6.13E-06		0.059	0.000385		0.163	0.001063
20.4	522	0.228321	2.50E-01		21	0.11737		150	0.838358		3	0.016767		0.026	0.000145		0.002	5.26E-06		0.059	0.00033		0.163	0.000911
20.5	528	0.185229	2.07E-01		21	0.097238		150	0.694557		3	0.013891		0.026	0.00012		0.002	4.35E-06		0.059	0.000273		0.163	0.000755
20.6	534	0.158617	1.72E-01		21	0.080848		150	0.577488		3	0.01155		0.026	0.0001		0.002	3.62E-06		0.059	0.000227		0.163	0.000628
20.7	540	0.149274	1.54E-01		21	0.072394		150	0.517102		3	0.010342		0.026	8.96E-05		0.002	3.24E-06		0.059	0.000203		0.163	0.000562
20.8	546	0.14383	1.46E-01		21	0.068871		150	0.491933		3	0.009839		0.026	8.53E-05		0.002	3.08E-06		0.059	0.000193		0.163	0.000535
20.9	552	0.139739	1.42E-01		21	0.066629		150	0.475918		3	0.009518		0.026	8.25E-05		0.002	2.98E-06		0.059	0.000187		0.163	0.000517
21	558	0.136823	1.38E-01		21	0.065028		150	0.464486		3	0.00929		0.026	8.05E-05		0.002	2.91E-06		0.059	0.000183		0.163	0.000505
21.1	564	0.119954	1.28E-01		21	0.060376		150	0.431257		3	0.008625		0.026	7.48E-05		0.002	2.7E-06		0.059	0.00017		0.163	0.000469
21.2	570	8.68E-02	1.03E-01		21	0.04862		150	0.347283		3	0.006946		0.026	6.02E-05		0.002	2.18E-06		0.059	0.000137		0.163	0.000377
21.3	576	5.19E-02	6.94E-02		21	0.03263		150	0.23307		3	0.004661		0.026	4.04E-05		0.002	1.46E-06		0.059	9.17E-05		0.163	0.000253
21.39972	582	2.05E-02	3.62E-02		21	0.017026		150	0.121615		3	0.002432		0.026	2.11E-05		0.002	7.63E-07		0.059	4.78E-05		0.163	0.000132
21.5	588	2.63E-03	1.15E-02		21	0.00543		150	0.038788		3	0.000776		0.026	8.72E-06		0.002	2.43E-07		0.059	1.53E-05		0.163	4.21E-05
21.6	594	4.63E-04	1.55E-03		21	0.000728		150	0.0052		3	0.000104		0.026	9.01E-07		0.002	3.26E-08		0.059	2.05E-06		0.163	5.65E-06
21.7	600	1.52E-04	3.08E-04		21	0.000145		150	0.001033		3	2.07E-05		0.026	1.79E-07		0.002	6.48E-09		0.059	4.06E-07		0.163	1.12E-06
	606		7.59E-05		21	3.57E-05		150	0.000255		3	5.1E-08		0.026	4.42E-08		0.002	1.6E-09		0.059	1E-07		0.163	2.77E-07

Conduit CSO 1009 - S3CSO9.XLS

Summary Statistics

Total Discharge Volume (cf)	Duration (hr)	CBOD (lbs)	SS (lbs)	TKN (lbs)	Cu (lbs)	Cd (lbs)	Pb (lbs)	Zn (lbs)
1.29E+04	4.50	25.320	239.710	7.015	0.029	0.002	0.062	0.151

Conduit CSO 1009

Time (hours)	Time (minutes)	Flow (ft^3/s)	Mean Flow	CBOD Conc.	CBOD Mean Conc.	CBOD Discharge lbs.	SS Conc. mg/l	SS Mean Conc.	SS Discharge lbs.	TKN Conc. mg/l	TKN Mean Conc.	TKN Discharge lbs.	Cu Conc. mg/l	Cu Mean Conc.	Cu Discharge lbs.	Cd Conc. mg/l	Cd Mean Conc.	Cd Discharge lbs.	Pb Conc. mg/l	Pb Mean Conc.	Pb Discharge lbs.	Zn Conc. mg/l	Zn Mean Conc.	Zn Discharge lbs.
13.7	0	5.26E-04		108	94.5		390	377.5		29	24.5		0.051	0.0525		0.003	0.003		0.135	0.112		0.227	0.238	
13.8	6	1.02E-02	5.36E-03		94.5	0.011341		377.5	0.045304		24.5	0.00294		0.0525	6.3E-06		0.003	7.62E-07		0.112	1.34E-05		0.238	2.86E-05
13.9	12	3.63E-02	2.32E-02		94.5	0.049199		377.5	0.198536		24.5	0.012755		0.0525	2.73E-05		0.003	3.31E-06		0.112	5.83E-05		0.238	0.000124
14	18	8.76E-02	6.19E-02	81	76.5	0.131067	365	334	0.523574	20	17	0.03398	0.054	0.054	7.28E-05	0.003	0.0035	8.81E-06	0.089	0.093	0.000155	0.249	0.2445	0.00033
14.1	24	0.13978	1.14E-01		76.5	0.194732		334	0.850201		17	0.043274		0.054	0.000137		0.0035	1.53E-05		0.093	0.000237		0.2445	0.000622
14.2	30	0.204997	1.72E-01	72	78.5	0.295316	303	289	1.289355	14	12.5	0.005626	0.054	0.0485	0.000208	0.004	0.0035	2.31E-05	0.097	0.0905	0.000359	0.24	0.23	0.000944
14.3	36	0.290233	2.48E-01		76.5	0.424168		289	1.602481		12.5	0.069311		0.0485	0.000269		0.0035	3.32E-05		0.0905	0.000502		0.23	0.001275
14.4	42	0.39969	3.45E-01		76.5	0.590949		289	2.232475		12.5	0.09656		0.0485	0.000375		0.0035	4.63E-05		0.0905	0.000699		0.23	0.001777
14.5	48	0.518913	4.59E-01	45	41.5	0.786824	275	260	2.972448	11	9.5	0.128566	0.043	0.042	0.000499	0.003	0.003	6.17E-05	0.084	0.099	0.000931	0.22	0.214	0.002366
14.6	54	0.640858	5.80E-01		41.5	0.538901		280	3.376245		9.5	0.123363		0.042	0.000545		0.003	3.62E-05		0.099	0.001286		0.214	0.002779
14.7	60	0.758591	7.00E-01	38	40.5	0.65027	245	236.5	4.073981	8	8.5	0.148857	0.841	0.04	0.000658	0.003	0.003	4.37E-05	0.114	0.092	0.001551	0.208	0.194	0.003353
14.8	68	0.866321	8.12E-01		40.5	0.736841		236.5	4.302785		8.5	0.154646		0.04	0.000728		0.003	4.95E-05		0.092	0.001674		0.194	0.00353
14.9	72	0.986775	9.27E-01		40.5	0.840314		236.5	4.007017		8.5	0.176382		0.04	0.00083		0.003	5.65E-05		0.092	0.001909		0.194	0.004025
15	78	1.098706	1.04E+00		40.5	0.945692		236.5	5.522376		8.5	0.198479		0.04	0.000934		0.003	6.35E-05		0.092	0.002148		0.194	0.00453
15.1	84	1.173164	1.14E+00		40.5	1.036213		236.5	6.015936		8.5	0.216218		0.04	0.001017		0.003	6.92E-05		0.092	0.00234		0.194	0.004935
15.2	90	1.220527	1.20E+00	43	37	1.085455	228	298.5	6.338519	9	8.5	0.227811	0.039	0.038	0.001072	0.003	0.003	7.29E-05	0.07	0.0685	0.002466	0.18	0.175	0.005199
15.3	96	1.23174	1.23E+00		37	1.015917		298.5	8.195978		8.5	0.233386		0.038	0.001043		0.003	6.82E-05		0.0685	0.001881		0.175	0.004805
15.4	102	1.220651	1.23E+00		37	1.015968		298.5	8.19639		8.5	0.233398		0.038	0.001043		0.003	6.83E-05		0.0685	0.001881		0.175	0.004805
15.5	108	1.197487	1.21E+00		37	1.001778		298.5	8.08191		8.5	0.236138		0.038	0.001029		0.003	6.73E-05		0.0685	0.001855		0.175	0.004738
15.8	114	1.187729	1.18E+00		37	0.979853		298.5	7.905034		8.5	0.225101		0.038	0.001006		0.003	8.58E-05		0.0685	0.001814		0.175	0.004634
15.7	120	1.131336	1.15E+00	31	24.5	0.952449	369	316.5	7.683944	8	8.5	0.218806	0.037	0.0345	0.000978	0.003	0.003	6.4E-05	0.067	0.0745	0.001763	0.17	0.187	0.004505
15.8	126	1.133572	1.13E+00		24.5	0.621306		316.5	8.026253		8.5	0.215555		0.0345	0.000875		0.003	4.17E-05		0.0745	0.001889		0.187	0.004742
15.9	132	1.669748	1.40E+00		24.5	0.789001		318.5	9.93424		8.5	0.266798		0.0345	0.001083		0.003	5.17E-05		0.0745	0.002338		0.187	0.00587
16	138	2.476609	2.07E+00		24.5	1.137421		316.5	14.89362		8.5	0.394615		0.0345	0.001602		0.003	7.64E-05		0.0745	0.003459		0.187	0.008682
16.1	144	2.641036	2.51E+00		24.5	1.376431		316.5	17.78125		8.5	0.477537		0.0345	0.001938		0.003	9.25E-05		0.0745	0.004185		0.187	0.010506
18.2	150	2.11461	2.33E+00		24.5	1.277129		316.5	16.49842		8.5	0.443085		0.0345	0.001798		0.003	8.58E-05		0.0745	0.003884		0.187	0.009748
18.3	156	1.781088	1.95E+00		24.5	1.068661		316.5	13.80536		8.5	0.37076		0.0345	0.001505		0.003	7.18E-05		0.0745	0.00325		0.187	0.008157
16.4	162	1.60288	1.69E+00		24.5	0.928284		316.5	11.99192		8.5	0.322058		0.0345	0.001307		0.003	6.24E-05		0.0745	0.002823		0.187	0.007085
16.5	168	1.374004	1.49E+00		24.5	0.816614		318.5	10.54931		8.5	0.283315		0.0345	0.00115		0.003	5.49E-05		0.0745	0.002483		0.187	0.006233
16.6	174	1.214175	1.29E+00		24.5	0.709985		318.5	9.171843		8.5	0.246321		0.0345	0.001		0.003	4.77E-05		0.0745	0.002159		0.187	0.005419
16.7	180	1.053964	1.13E+00		24.5	0.622192		316.5	8.037703		8.5	0.215862		0.0345	0.000876		0.003	4.18E-05		0.0745	0.001892		0.187	0.004749
18.8	186	0.915765	9.85E-01		24.5	0.540333		318.5	6.980214		8.5	0.187462		0.0345	0.000761		0.003	3.63E-05		0.0745	0.001643		0.187	0.004124
16.9	192	0.780452	8.48E-01		24.5	0.465363		318.5	6.010959		8.5	0.181432		0.0345	0.000655		0.003	3.13E-05		0.0745	0.001415		0.187	0.003551
17	198	0.65433	7.17E-01		24.5	0.393587		316.5	5.0845		8.5	0.136551		0.0345	0.000554		0.003	2.64E-05		0.0745	0.001197		0.187	0.003004
17.1	204	0.533714	5.94E-01		24.5	0.325002		316.5	4.210121		8.5	0.113068		0.0345	0.000459		0.003	2.19E-05		0.0745	0.000991		0.187	0.002487
17.2	210	0.423672	4.79E-01		24.5	0.282628		316.5	3.39273		8.5	0.091118		0.0345	0.00037		0.003	1.76E-05		0.0745	0.000799		0.187	0.002005
17.3	216	0.33214	3.78E-01		24.5	0.207333		316.5	2.678404		8.5	0.071932		0.0345	0.000292		0.003	1.39E-05		0.0745	0.00063		0.187	0.001583
17.4	222	0.255604	2.94E-01		24.5	0.161229		316.5	2.082814		8.5	0.055937		0.0345	0.000227		0.003	1.08E-05		0.0745	0.00049		0.187	0.001231
17.5	228	0.195296	2.25E-01		24.5	0.12369		316.5	1.597876		8.5	0.042913		0.0345	0.000174		0.003	8.31E-06		0.0745	0.000376		0.187	0.000944
17.6	234	0.143761	1.70E-01		24.5	0.09301		318.5	1.201534		8.5	0.032269		0.0345	0.000131		0.003	6.25E-06		0.0745	0.000283		0.187	0.00071
17.7	240	0.101294	1.23E-01	18	19.5	0.067223	264	207	0.868412	9	8	0.023322	0.032	0.029	9.47E-05	0.003	0.0025	4.52E-06	0.082	0.0705	0.000204	0.204	0.1835	0.000513
17.8	246	5.76E-02	7.95E-02		19.5	0.034698		207	0.368329		8	0.010678		0.029	5.16E-05		0.0025	1.04E-06		0.0705	0.000125		0.1835	0.000327
17.9	252	3.28E-02	4.52E-02		19.5	0.019742		207	0.20957		8	0.006074		0.029	2.94E-05		0.0025	1.11E-06		0.0705	7.14E-05		0.1835	0.000166
18	258	2.04E-02	2.66E-02		19.5	0.011613		207	0.123279		8	0.003573		0.029	1.73E-05		0.0025	6.5E-07		0.0705	4.2E-05		0.1835	0.000109
18.1	264	8.95E-03	1.47E-02		19.5	0.006406		207	0.068004		8	0.001971		0.029	9.53E-06		0.0025	3.59E-07		0.0705	2.32E-05		0.1835	6.03E-05
18.2	270	2.22E-03	5.58E-03		19.5	0.002438		207	0.025804		8	0.00075		0.029	3.83E-06		0.0025	1.37E-07		0.0705	8.82E-06		0.1835	2.29E-05
	278		1.11E-03		19.5	0.000485		207	0.005149		8	0.000149		0.029	7.21E-07		0.0025	2.72E-08		0.0705	1.75E-06		0.1838	4.58E-06

Conduit CSO 1033 - S3CSO33.XLS

Summary Statistics

Total Discharge Volume (cf)	Duration (hr)	CBOD (lbs)	SS (lbs)	TKN (lbs)	Cu (lbs)	Cd (lbs)	Pb (lbs)	Zn (lbs)
4.81E+03	5.30	9.6271	89.3850	2.6340	0.0110	0.0007	0.0230	0.0563

Conduit CSO 1033

Time (hours)	Time (minutes)	Flow (ft^3/s)	Mean Flow	CBOD Conc.	CBOD Mean Conc.	CBOD Discharge lbs.	SS Conc. mg/l	SS Mean Conc.	SS Discharge lbs.	TKN Conc. mg/l	TKN Mean Conc.	TKN Discharge lbs.	Cu Conc. mg/l	Cu Mean Conc.	Cu Discharge lbs.	Cd Conc. mg/l	Cd Mean Conc.	Cd Discharge lbs.	Pb Conc. mg/l	Pb Mean Conc.	Pb Discharge lbs.	Zn Conc. mg/l	Zn Mean Conc.	Zn Discharge lbs.
13	0	3.74E-03		108	94.5		390	377.5		29	24.5		0.051	0.0525		0.003	0.003		0.135	0.112		0.227	0.238	
13.1	6	1.95E-02	1.16E-02		94.5	0.024546		377.5	0.098053		24.5	0.006364		0.0525	1.38E-05		0.003	1.65E-06		0.112	2.91E-05		0.238	6.18E-05
13.2	12	4.09E-02	3.02E-02		94.5	0.06384		377.5	0.255022		24.5	0.016551		0.0525	3.55E-05		0.003	4.29E-06		0.112	7.57E-05		0.238	0.000161
13.3	18	5.96E-02	5.02E-02	81	76.5	0.106311	365	334	0.424681	20	17	0.027562	0.054	0.054	5.91E-05	0.003	0.0035	7.14E-06	0.089	0.093	0.000128	0.249	0.2445	0.000268
13.4	24	7.66E-02	6.81E-02		76.5	0.116672		334	0.50939		17	0.025927		0.054	8.24E-05		0.0035	9.14E-06		0.093	0.000142		0.2445	0.000373
13.5	30	9.32E-02	8.49E-02	72	76.5	0.145485	303	289	0.635189	14	12.5	0.03233	0.054	0.0485	0.000103	0.004	0.0035	1.14E-05	0.097	0.0905	0.000177	0.24	0.23	0.000465
13.6	36	0.109755	1.01E-01		76.5	0.173869		289	0.656838		12.5	0.02841		0.0485	0.00011		0.0035	1.36E-05		0.0905	0.000206		0.23	0.000523
13.7	42	0.13367	1.22E-01		76.5	0.208505		289	0.787684		12.5	0.034069		0.0485	0.000132		0.0035	1.63E-05		0.0905	0.000247		0.23	0.000627
13.8	48	0.16314	1.48E-01	45	41.5	0.254231	275	260	0.960429	11	9.5	0.041541	0.043	0.042	0.000161	0.003	0.003	1.99E-05	0.084	0.099	0.000301	0.22	0.214	0.000784
13.9	54	0.193205	1.78E-01		41.5	0.16558		260	1.037368		9.5	0.037904		0.042	0.000168		0.003	1.11E-05		0.099	0.000395		0.214	0.000854
14	60	0.227348	2.10E-01	38	40.5	0.195415	245	236.5	1.224285	8	8.5	0.044733	0.041	0.04	0.000198	0.003	0.003	1.31E-05	0.114	0.092	0.000466	0.208	0.194	0.001008
14.1	66	0.264716	2.46E-01		40.5	0.223134		236.5	1.302991		8.5	0.046831		0.04	0.00022		0.003	1.5E-05		0.092	0.000507		0.194	0.001069
14.2	72	0.307386	2.86E-01		40.5	0.259428		236.5	1.514934		8.5	0.054448		0.04	0.000256		0.003	1.74E-05		0.092	0.000589		0.194	0.001243
14.3	78	0.355367	3.31E-01		40.5	0.300535		236.5	1.754977		8.5	0.063075		0.04	0.000297		0.003	2.02E-05		0.092	0.000683		0.194	0.00144
14.4	84	0.412467	3.84E-01		40.5	0.348186		236.5	2.033232		8.5	0.073078		0.04	0.000344		0.003	2.34E-05		0.092	0.000791		0.194	0.001668
14.5	90	0.47124	4.42E-01	43	37	0.40073	228	298.5	2.340065	9	8.5	0.084104	0.039	0.038	0.000396	0.003	0.003	2.69E-05	0.07	0.0685	0.00091	0.18	0.175	0.00192
14.6	96	0.529014	5.00E-01		37	0.414381		298.5	3.343051		8.5	0.095196		0.038	0.000426		0.003	2.78E-05		0.0685	0.000767		0.175	0.00196
14.7	102	0.574571	5.52E-01		37	0.457189		298.5	3.686403		8.5	0.10503		0.038	0.00047		0.003	3.07E-05		0.0685	0.000846		0.175	0.002162
14.8	108	0.608346	5.91E-01		37	0.490054		298.5	3.953548		8.5	0.11258		0.038	0.000503		0.003	3.29E-05		0.0685	0.000907		0.175	0.002318
14.9	114	0.634726	6.22E-01		37	0.514976		298.5	4.1548		8.5	0.118305		0.038	0.000529		0.003	3.46E-05		0.0685	0.000953		0.175	0.002436
15	120	0.660525	6.48E-01	31	24.5	0.536592	369	316.5	4.328995	8	8.5	0.123271	0.037	0.0345	0.000551	0.003	0.003	3.6E-05	0.067	0.0745	0.000993	0.17	0.187	0.002538
15.1	126	0.680829	6.71E-01		24.5	0.367958		316.5	4.753417		8.5	0.127859		0.0345	0.000518		0.003	2.47E-05		0.0745	0.001119		0.187	0.002808
15.2	132	0.688989	6.85E-01		24.5	0.37028		316.5	4.783408		8.5	0.128484		0.0345	0.000521		0.003	2.49E-05		0.0745	0.001126		0.187	0.002826
15.3	138	0.631178	6.50E-01		24.5	0.356659		316.5	4.607457		8.5	0.123739		0.0345	0.000502		0.003	2.4E-05		0.0745	0.001085		0.187	0.002722
15.4	144	0.580776	6.06E-01		24.5	0.332461		316.5	4.294854		8.5	0.115344		0.0345	0.000468		0.003	2.23E-05		0.0745	0.001011		0.187	0.002538
15.5	150	0.526402	5.54E-01		24.5	0.303719		316.5	3.923554		8.5	0.105372		0.0345	0.000428		0.003	2.04E-05		0.0745	0.000924		0.187	0.002318
15.6	156	0.474513	5.00E-01		24.5	0.274569		316.5	3.546987		8.5	0.095259		0.0345	0.000387		0.003	1.84E-05		0.0745	0.000835		0.187	0.002096
15.7	162	0.427911	4.51E-01		24.5	0.247551		316.5	3.19796		8.5	0.085885		0.0345	0.000349		0.003	1.66E-05		0.0745	0.000753		0.187	0.001889
15.8	168	0.386092	4.07E-01		24.5	0.223296		316.5	2.884618		8.5	0.07747		0.0345	0.000314		0.003	1.5E-05		0.0745	0.000679		0.187	0.001704
15.9	174	0.348495	3.67E-01		24.5	0.201511		316.5	2.603189		8.5	0.069912		0.0345	0.000284		0.003	1.35E-05		0.0745	0.000613		0.187	0.001538
16	180	0.314529	3.32E-01		24.5	0.18188		316.5	2.349586		8.5	0.063101		0.0345	0.000256		0.003	1.22E-05		0.0745	0.000553		0.187	0.001388
16.1	186	0.283177	2.99E-01		24.5	0.163962		316.5	2.118118		8.5	0.056885		0.0345	0.000231		0.003	1.1E-05		0.0745	0.000499		0.187	0.001251
16.2	192	0.263947	2.74E-01		24.5	0.150086		316.5	1.938869		8.5	0.052071		0.0345	0.000211		0.003	1.01E-05		0.0745	0.000456		0.187	0.001146
16.3	198	0.255424	2.60E-01		24.5	0.142473		316.5	1.840516		8.5	0.049429		0.0345	0.000201		0.003	9.57E-06		0.0745	0.000433		0.187	0.001087
16.4	204	0.252118	2.54E-01		24.5	0.139228		316.5	1.798596		8.5	0.048304		0.0345	0.000196		0.003	9.35E-06		0.0745	0.000423		0.187	0.001063
16.5	210	0.250842	2.51E-01		24.5	0.137971		316.5	1.78238		8.5	0.047867		0.0345	0.000194		0.003	9.27E-06		0.0745	0.00042		0.187	0.001053
16.6	216	0.247137	2.49E-01		24.5	0.136605		316.5	1.764711		8.5	0.047393		0.0345	0.000192		0.003	9.18E-06		0.0745	0.000415		0.187	0.001043
16.7	222	0.224929	2.36E-01		24.5	0.129496		316.5	1.67288		8.5	0.044927		0.0345	0.000182		0.003	8.7E-06		0.0745	0.000394		0.187	0.000988
16.8	228	0.187156	2.06E-01		24.5	0.113042		316.5	1.460321		8.5	0.039219		0.0345	0.000159		0.003	7.59E-06		0.0745	0.000344		0.187	0.000863
16.9	234	0.14275	1.65E-01		24.5	0.090499		316.5	1.169102		8.5	0.031398		0.0345	0.000127		0.003	6.08E-06		0.0745	0.000275		0.187	0.000691
17	240	9.11E-02	1.17E-01	18	19.5	0.084144	264	207	0.828831	9	8	0.022254	0.032	0.029	8.03E-05	0.003	0.0025	4.31E-06	0.082	0.0705	0.000195	0.204	0.1835	0.00049
17.1	246	5.67E-02	7.39E-02		19.5	0.032275		207	0.342609		8	0.009931		0.029	4.8E-05		0.0025	1.81E-06		0.0705	0.000117		0.1835	0.000304
17.2	252	3.83E-02	4.75E-02		19.5	0.020754		207	0.220309		8	0.006386		0.029	3.09E-05		0.0025	1.16E-06		0.0705	7.5E-05		0.1835	0.000195
17.3	258	2.67E-02	3.25E-02		19.5	0.014203		207	0.15077		8	0.00437		0.029	2.11E-05		0.0025	7.95E-07		0.0705	5.13E-05		0.1835	0.000134
17.4	264	1.90E-02	2.29E-02		19.5	0.009982		207	0.105959		8	0.003071		0.029	1.48E-05		0.0025	5.59E-07		0.0705	3.61E-05		0.1835	9.39E-05
17.5	270	1.32E-02	1.61E-02		19.5	0.007033		207	0.074659		8	0.002164		0.029	1.05E-05		0.0025	3.94E-07		0.0705	2.54E-05		0.1835	6.62E-05
17.6	276	8.82E-03	1.10E-02		19.5	0.004818		207	0.051124		8	0.001482		0.029	7.18E-06		0.0025	2.7E-07		0.0705	1.74E-05		0.1835	4.53E-05

Conduit CSO 1033

Time (hours)	Time (minutes)	Flow (ft^3/s)	Mean Flow	CBOD Conc.	CBOD Mean Conc.	CBOD Discharge lbs.	SS Conc. mg/l	SS Mean Conc.	SS Discharge lbs.	TKN Conc. mg/l	TKN Mean Conc.	TKN Discharge lbs.	Cu Conc. mg/l	Cu Mean Conc.	Cu Discharge lbs.	Cd Conc. mg/l	Cd Mean Conc.	Cd Discharge lbs.	Pb Conc. mg/l	Pb Mean Conc.	Pb Discharge lbs.	Zn Conc. mg/l	Zn Mean Conc.	Zn Discharge lbs.
17.7	282	5.97E-03	7.40E-03		19.5	0.00323		207	0.034287		6	0.000994		0.029	4.8E-06		0.0025	1.81E-07		0.0705	1.17E-05		0.1835	3.04E-05
17.8	288	4.36E-03	5.16E-03		19.5	0.002255		207	0.023941		6	0.000694		0.029	3.35E-06		0.0025	1.26E-07		0.0705	8.15E-06		0.1835	2.12E-05
17.9	294	3.42E-03	3.89E-03		19.5	0.001699		207	0.018037		6	0.000523		0.029	2.53E-06		0.0025	9.51E-08		0.0705	6.14E-06		0.1835	1.6E-05
18	300	2.81E-03	3.12E-03		19.5	0.001361		207	0.014442		6	0.000419		0.029	2.02E-06		0.0025	7.62E-08		0.0705	4.92E-06		0.1835	1.28E-05
18.1	306	2.28E-03	2.54E-03		19.5	0.001111		207	0.011795		6	0.000342		0.029	1.65E-06		0.0025	6.22E-08		0.0705	4.02E-06		0.1835	1.05E-05
18.2	312	1.47E-03	1.88E-03		19.5	0.00082		207	0.0087		6	0.000252		0.029	1.22E-06		0.0025	4.59E-08		0.0705	2.96E-06		0.1835	7.71E-06
18.3	318	4.53E-04	9.63E-04		19.5	0.00042		207	0.004464		6	0.000129		0.029	6.25E-07		0.0025	2.35E-08		0.0705	1.52E-06		0.1835	3.96E-06
	324		2.27E-04		19.5	9.89E-05		207	0.00105		6	3.04E-05		0.029	1.47E-07		0.0025	5.54E-09		0.0705	3.58E-07		0.1835	9.31E-07

SIMULATION #4

2.40 inches in 11.5 hours

Conduit CSO 1004 - S4CSO4.XLS

Summary Statistics

Total Discharge

Volume (cf)	Duration (hr)	CBOD (lbs)	SS (lbs)	TKN (lbs)	Cu (lbs)	Cd (lbs)	Pb (lbs)	Zn (lbs)
8.06E+03	3.50	16.033	152.279	4.513	0.018	0.001	0.039	0.096

Conduit CSO 1004

Time (hours)	Time (minutes)	Flow (ft^3/s)	Mean Flow	CBOD Conc.	CBOD Mean Conc.	CBOD Discharge lbs.	SS Conc. mg/l	SS Mean Conc.	SS Discharge lbs.	TKN Conc. mg/l	TKN Mean Conc.	TKN Discharge lbs.	Cu Conc. mg/l	Cu Mean Conc.	Cu Discharge lbs.	Cd Conc. mg/l	Cd Mean Conc.	Cd Discharge lbs.	Pb Conc. mg/l	Pb Mean Conc.	Pb Discharge lbs.	Zn Conc. mg/l	Zn Mean Conc.	Zn Discharge lbs.
13.1	0	6.99E-04		108	94.5		390	377.5		29	24.5		0.051	0.0525		0.003	0.003		0.135	0.112		0.227	0.238	
13.2	6	1.04E-02	5.53E-03		94.5	0.011701		377.5	0.046742		24.5	0.003034		0.0525	6.5E-06		0.003	7.86E-07		0.112	1.39E-05		0.238	2.95E-05
13.3	12	4.94E-02	2.99E-02		94.5	0.063222		377.5	0.252554		24.5	0.016391		0.0525	3.51E-05		0.003	4.25E-06		0.112	7.49E-05		0.238	0.000159
13.4	18	0.117347	8.34E-02	81	76.5	0.176424	365	334	0.704761	20	17	0.045739	0.054	0.054	9.8E-05	0.003	0.0035	1.19E-05	0.089	0.093	0.000209	0.249	0.2445	0.000444
13.5	24	0.208479	1.63E-01		76.5	0.279085		334	1.218487		17	0.062019		0.054	0.000197		0.0035	2.19E-05		0.093	0.000339		0.2445	0.000892
13.6	30	0.313031	2.61E-01	72	76.5	0.446697	303	289	1.950284	14	12.5	0.099266	0.054	0.0485	0.000315	0.004	0.0035	3.5E-05	0.097	0.0905	0.000543	0.24	0.23	0.001428
13.7	36	0.374687	3.44E-01		76.5	0.689061		289	2.225342		12.5	0.096252		0.0485	0.000373		0.0035	4.62E-05		0.0905	0.000697		0.23	0.001771
13.8	42	0.437385	4.06E-01		76.5	0.695575		289	2.627729		12.5	0.113656		0.0485	0.000441		0.0035	5.45E-05		0.0905	0.000823		0.23	0.002091
13.9	48	0.467832	4.53E-01	45	41.5	0.775359	275	260	2.929132	11	9.5	0.126693	0.043	0.042	0.000492	0.003	0.003	6.08E-05	0.084	0.099	0.000917	0.22	0.214	0.002331
14	54	0.473534	4.71E-01		41.5	0.437417		260	2.740442		9.5	0.100132		0.042	0.000443		0.003	2.94E-05		0.099	0.001043		0.214	0.002256
14.1	60	0.466594	4.71E-01	38	40.5	0.437771	245	236.5	2.742659	8	8.5	0.100213	0.041	0.04	0.000443	0.003	0.003	2.94E-05	0.114	0.092	0.001044	0.208	0.194	0.002257
14.2	66	0.461684	4.85E-01		40.5	0.421848		236.5	2.463386		8.5	0.088536		0.04	0.000417		0.003	2.83E-05		0.092	0.000958		0.194	0.002021
14.3	72	0.468117	4.59E-01		40.5	0.41619		236.5	2.430348		8.5	0.087349		0.04	0.000411		0.003	2.8E-05		0.092	0.000945		0.194	0.001994
14.4	78	0.452085	4.54E-01		40.5	0.411837		236.5	2.404928		8.5	0.086435		0.04	0.000407		0.003	2.77E-05		0.092	0.000936		0.194	0.001973
14.5	84	0.449121	4.51E-01		40.5	0.408665		236.5	2.386403		8.5	0.085769		0.04	0.000404		0.003	2.75E-05		0.092	0.000928		0.194	0.001958
14.6	90	0.445151	4.47E-01	43	37	0.405521	228	298.5	2.368043	9	8.5	0.085109	0.039	0.038	0.000401	0.003	0.003	2.72E-05	0.07	0.0685	0.000921	0.18	0.175	0.001942
14.7	96	0.426973	4.36E-01		37	0.361301		298.5	2.914817		8.5	0.083002		0.038	0.000371		0.003	2.43E-05		0.0685	0.000669		0.175	0.001709
14.8	102	0.390373	4.09E-01		37	0.338607		298.5	2.731737		8.5	0.077788		0.038	0.000348		0.003	2.27E-05		0.0685	0.000627		0.175	0.001602
14.9	108	0.341389	3.68E-01		37	0.303144		298.5	2.445631		8.5	0.069641		0.038	0.000311		0.003	2.04E-05		0.0685	0.000561		0.175	0.001434
15	114	0.285564	3.13E-01		37	0.259724		298.5	2.095338		8.5	0.059666		0.038	0.000267		0.003	1.74E-05		0.0685	0.000481		0.175	0.001228
15.1	120	0.212669	2.49E-01	31	24.5	0.206406	369	318.5	1.665197	8	8.5	0.047418	0.037	0.0345	0.000212	0.003	0.003	1.39E-05	0.067	0.0745	0.000382	0.17	0.187	0.000976
15.2	126	1.40E-02	1.13E-01		24.5	0.062174		316.5	0.803186		8.5	0.021571		0.0345	8.76E-05		0.003	4.18E-06		0.0745	0.000189		0.187	0.000475
15.3	132	3.98E-03	8.98E-03		24.5	0.004927		316.5	0.063648		8.5	0.001709		0.0345	6.94E-06		0.003	3.31E-07		0.0745	1.5E-05		0.187	3.76E-05
15.4	138	3.01E-02	1.70E-02		24.5	0.009337		316.5	0.120612		8.5	0.003239		0.0345	1.31E-05		0.003	6.27E-07		0.0745	2.84E-05		0.187	7.13E-05
15.5	144	4.12E-02	3.56E-02		24.5	0.019546		316.5	0.252499		8.5	0.006781		0.0345	2.75E-05		0.003	1.31E-06		0.0745	5.94E-05		0.187	0.000149
15.6	150	0.233593	1.37E-01		24.5	0.07538		318.5	0.973788		8.5	0.026152		0.0345	0.000106		0.003	5.06E-06		0.0745	0.000229		0.187	0.000575
15.7	156	0.731704	4.83E-01		24.5	0.264799		316.5	3.420765		8.5	0.091669		0.0345	0.000373		0.003	1.78E-05		0.0745	0.000805		0.187	0.002021
15.8	162	1.470966	1.10E+00		24.5	0.604232		316.5	7.805696		8.5	0.209632		0.0345	0.000851		0.003	4.06E-05		0.0745	0.001837		0.187	0.004612
15.9	168	2.045411	1.76E+00		24.5	0.964606		316.5	12.48114		8.5	0.334859		0.0345	0.001358		0.003	6.48E-05		0.0745	0.002933		0.187	0.007363
16	174	2.526605	2.29E+00		24.5	1.254187		316.5	16.20205		8.5	0.435126		0.0345	0.001766		0.003	8.43E-05		0.0745	0.003814		0.187	0.009573
16.1	180	2.675378	2.60E+00		24.5	1.426999		316.5	18.43449		8.5	0.495081		0.0345	0.002009		0.003	9.59E-05		0.0745	0.004339		0.187	0.010892
16.2	186	2.373589	2.52E+00		24.5	1.385024		318.5	17.89224		8.5	0.460518		0.0345	0.00195		0.003	9.3E-05		0.0745	0.004212		0.187	0.010571
16.3	192	1.781521	2.08E+00		24.5	1.139822		316.5	14.72464		8.5	0.395449		0.0345	0.001605		0.003	7.68E-05		0.0745	0.003466		0.187	0.0087
18.4	198	1.125482	1.45E+00		24.5	0.797444		316.5	10.38167		8.5	0.276664		0.0345	0.001123		0.003	5.38E-05		0.0745	0.002425		0.187	0.006087
18.5	204	0.473497	7.99E-01		24.5	0.438629		316.5	5.666371		8.5	0.152177		0.0345	0.000618		0.003	2.95E-05		0.0745	0.001334		0.187	0.003348
16.6	210	1.90E-02	2.48E-01		24.5	0.13509		316.5	1.745148		8.5	0.046868		0.0345	0.00019		0.003	9.08E-06		0.0745	0.000411		0.187	0.001031
	216		9.48E-03		24.5	0.005202		316.5	0.067197		8.5	0.001805		0.0345	7.32E-06		0.003	3.49E-07		0.0745	1.58E-05		0.187	3.97E-05

Conduit CSO 1005A - S4CSO5A.XLS

Summary Statistics

Total Discharge Volume (cf)	Duration (hr)	CBOD (lbs)	SS (lbs)	TKN (lbs)	Cu (lbs)	Cd (lbs)	Pb (lbs)	Zn (lbs)
4.82E+03	5.50	13.2665	86.1705	3.1370	0.0121	0.0009	0.0252	0.0602

Conduit CSO 1005A

Time (hours)	Time (minutes)	Flow (ft^3/s)	Mean Flow	CBOD Conc.	CBOD Mean Conc.	CBOD Discharge lbs.	SS Conc. mg/l	SS Mean Conc.	SS Discharge lbs.	TKN Conc. mg/l	TKN Mean Conc.	TKN Discharge lbs.	Cu Conc. mg/l	Cu Mean Conc.	Cu Discharge lbs.	Cd Conc. mg/l	Cd Mean Conc.	Cd Discharge lbs.	Pb Conc. mg/l	Pb Mean Conc.	Pb Discharge lbs.	Zn Conc. mg/l	Zn Mean Conc.	Zn Discharge lbs.
13.7	0	8.49E-02		108	94.5		300	377.5		29	24.5		0.051	0.0525		0.003	0.003		0.135	0.112		0.227	0.238	
13.8	6	0.288504	1.87E-01		94.5	0.395081		377.5	1.578232		24.5	0.102428		0.0525	0.000219		0.003	2.65E-05		0.112	0.000468		0.238	0.000995
13.9	12	0.346473	3.17E-01		94.5	0.671859		377.5	2.683883		24.5	0.174186		0.0525	0.000373		0.003	4.51E-05		0.112	0.000796		0.238	0.001692
14	18	0.406672	3.77E-01	81	76.5	0.796891	365	334	3.183349	20	17	0.206601	0.054	0.054	0.000443	0.003	0.0035	5.35E-05	0.089	0.093	0.000944	0.249	0.2445	0.002007
14.1	24	0.457318	4.32E-01		76.5	0.740046		334	3.231051		17	0.164455		0.054	0.000522		0.0035	5.8E-05		0.093	0.0009		0.2445	0.002365
14.2	30	0.493498	4.75E-01	72	76.5	0.814417	303	289	3.555753	14	12.5	0.180981	0.054	0.0485	0.000575	0.004	0.0035	6.38E-05	0.097	0.0905	0.00099	0.24	0.23	0.002603
14.3	36	0.517184	5.05E-01		76.5	0.865894		289	3.270399		12.5	0.141453		0.0485	0.000549		0.0035	6.79E-05		0.0005	0.001024		0.23	0.002603
14.4	42	0.531817	5.25E-01		76.5	0.898516		289	3.394394		12.5	0.146816		0.0485	0.00057		0.0035	7.04E-05		0.0005	0.001063		0.23	0.002701
14.5	48	0.540101	5.36E-01	45	41.5	0.918146	275	260	3.468552	11	9.5	0.150024	0.043	0.042	0.000582	0.003	0.003	7.2E-05	0.084	0.099	0.001086	0.22	0.214	0.00276
14.6	54	0.54388	5.42E-01		41.5	0.503684		260	3.155611		9.5	0.115301		0.042	0.00051		0.003	3.38E-05		0.099	0.001202		0.214	0.002597
14.7	60	0.541395	5.43E-01	38	40.5	0.504285	245	236.5	3.159378	8	8.5	0.115439	0.041	0.04	0.00051	0.003	0.003	3.39E-05	0.114	0.092	0.001203	0.208	0.194	0.0026
14.8	66	0.530488	5.36E-01		40.5	0.486061		236.5	2.838357		8.5	0.102013		0.04	0.00048		0.003	3.27E-05		0.092	0.001104		0.194	0.002328
14.9	72	0.511628	5.21E-01		40.5	0.472563		236.5	2.759535		8.5	0.09918		0.04	0.000487		0.003	3.17E-05		0.092	0.001073		0.194	0.002264
15	78	0.486001	4.99E-01		40.5	0.45239		236.5	2.641732		8.5	0.094948		0.04	0.000447		0.003	3.04E-05		0.092	0.001028		0.194	0.002167
15.1	84	0.454773	4.70E-01		40.5	0.426608		236.5	2.491178		8.5	0.089535		0.04	0.000421		0.003	2.87E-05		0.092	0.000969		0.194	0.002044
15.2	90	0.421471	4.38E-01	43	37	0.397346	228	298.5	2.320304	9	8.5	0.083394	0.039	0.038	0.000392	0.003	0.003	2.67E-05	0.07	0.0685	0.000903	0.18	0.175	0.001903
15.3	96	0.389987	4.06E-01		37	0.336158		298.5	2.712059		8.5	0.077228		0.038	0.000345		0.003	2.26E-05		0.0685	0.000622		0.175	0.00159
15.4	102	0.361305	3.76E-01		37	0.311242		298.5	2.510969		8.5	0.071502		0.038	0.00032		0.003	2.09E-05		0.0685	0.000576		0.175	0.001472
15.5	108	0.335683	3.48E-01		37	0.288746		298.5	2.329475		8.5	0.066333		0.038	0.000297		0.003	1.94E-05		0.0685	0.000535		0.175	0.001366
15.6	114	0.313436	3.25E-01		37	0.268915		298.5	2.16949		8.5	0.061778		0.038	0.000278		0.003	1.81E-05		0.0685	0.000498		0.175	0.001272
15.7	120	0.296047	3.05E-01	31	24.5	0.252495	369	316.5	2.037017	8	8.5	0.058006	0.037	0.0345	0.000259	0.003	0.003	1.7E-05	0.067	0.0745	0.000467	0.17	0.187	0.001194
15.8	126	0.279461	2.88E-01		24.5	0.157872		316.5	2.039452		8.5	0.054772		0.0345	0.000222		0.003	1.06E-05		0.0745	0.00048		0.187	0.001205
15.9	132	0.262921	2.71E-01		24.5	0.148785		316.5	1.922063		8.5	0.051819		0.0345	0.00021		0.003	1E-05		0.0745	0.000452		0.187	0.001136
16	138	0.247068	2.55E-01		24.5	0.139899		316.5	1.80727		8.5	0.048538		0.0345	0.000197		0.003	9.4E-06		0.0745	0.000425		0.187	0.001068
16.1	144	0.231943	2.40E-01		24.5	0.131401		316.5	1.897491		8.5	0.045588		0.0345	0.000185		0.003	8.83E-06		0.0745	0.0004		0.187	0.001003
16.2	150	0.217702	2.25E-01		24.5	0.123346		316.5	1.593426		8.5	0.042793		0.0345	0.000174		0.003	8.29E-06		0.0745	0.000375		0.187	0.000941
16.3	156	0.204434	2.11E-01		24.5	0.115799		316.5	1.495939		8.5	0.040175		0.0345	0.000163		0.003	7.78E-06		0.0745	0.000352		0.187	0.000884
16.4	162	0.192111	1.98E-01		24.5	0.108779		316.5	1.405253		8.5	0.03774		0.0345	0.000153		0.003	7.31E-06		0.0745	0.000331		0.187	0.00083
16.5	168	0.180671	1.86E-01		24.5	0.102261		316.5	1.321046		8.5	0.035478		0.0345	0.000144		0.003	6.87E-06		0.0745	0.000311		0.187	0.000781
16.6	174	0.17006	1.75E-01		24.5	0.096212		316.5	1.242902		8.5	0.03338		0.0345	0.000135		0.003	6.46E-06		0.0745	0.000293		0.187	0.000734
16.7	180	0.16054	1.65E-01		24.5	0.09069		316.5	1.171562		8.5	0.031464		0.0345	0.000128		0.003	6.09E-06		0.0745	0.000276		0.187	0.000692
16.8	186	0.1524	1.56E-01		24.5	0.085845		316.5	1.108979		8.5	0.029783		0.0345	0.000121		0.003	5.77E-06		0.0745	0.000261		0.187	0.000655
16.9	192	0.145709	1.49E-01		24.5	0.081777		316.5	1.056422		8.5	0.028372		0.0345	0.000115		0.003	5.49E-06		0.0745	0.000249		0.187	0.000624
17	198	0.140357	1.43E-01		24.5	0.078473		316.5	1.013745		8.5	0.027225		0.0345	0.000111		0.003	5.27E-06		0.0745	0.000239		0.187	0.000599
17.1	204	0.136181	1.38E-01		24.5	0.075859		316.5	0.979979		8.5	0.026319		0.0345	0.000107		0.003	5.1E-06		0.0745	0.000231		0.187	0.000579
17.2	210	0.132869	1.35E-01		24.5	0.073805		316.5	0.953443		8.5	0.025606		0.0345	0.000104		0.003	4.96E-06		0.0745	0.000224		0.187	0.000563
17.3	216	0.130148	1.32E-01		24.5	0.07215		316.5	0.932065		8.5	0.025032		0.0345	0.000102		0.003	4.85E-06		0.0745	0.000219		0.187	0.000551
17.4	222	0.127668	1.29E-01		24.5	0.070724		316.5	0.913633		8.5	0.024537		0.0345	9.96E-05		0.003	4.75E-06		0.0745	0.000215		0.187	0.00054
17.5	228	0.125271	1.26E-01		24.5	0.069386		316.5	0.896351		8.5	0.024073		0.0345	9.77E-05		0.003	4.66E-06		0.0745	0.000211		0.187	0.00053
17.6	234	0.122833	1.24E-01		24.5	0.068059		316.5	0.879217		8.5	0.023612		0.0345	9.58E-05		0.003	4.57E-06		0.0745	0.000207		0.187	0.000519
17.7	240	0.12038	1.22E-01	18	19.5	0.066718	284	207	0.861881	9	6	0.023147	0.032	0.029	9.39E-05	0.003	0.0025	4.48E-06	0.082	0.0705	0.000203	0.204	0.1835	0.000509
17.8	246	0.118046	1.19E-01		19.5	0.052057		207	0.552601		6	0.016017		0.029	7.74E-05		0.0025	2.91E-06		0.0705	0.000188		0.1835	0.00049
17.9	252	0.115905	1.17E-01		19.5	0.05106		207	0.54223		6	0.015717		0.029	7.6E-05		0.0025	2.86E-06		0.0705	0.000185		0.1835	0.000481
18	258	0.113972	1.15E-01		19.5	0.05019		207	0.532788		6	0.015443		0.029	7.46E-05		0.0025	2.81E-06		0.0705	0.000181		0.1835	0.000472
18.1	264	0.112196	1.13E-01		19.5	0.04938		207	0.524193		6	0.015194		0.029	7.34E-05		0.0025	2.76E-06		0.0705	0.000179		0.1835	0.000465
18.2	270	0.109533	1.11E-01		19.5	0.048411		207	0.513905		6	0.014896		0.029	7.2E-05		0.0025	2.71E-06		0.0705	0.000175		0.1835	0.000456
18.3	276	0.104686	1.07E-01		19.5	0.046772		207	0.496498		6	0.014391		0.029	6.96E-05		0.0025	2.62E-06		0.0705	0.000169		0.1835	0.00044

Conduit CSO 1005A

Time (hours)	Time (minutes)	Flow (ft^3/s)	Mean Flow	CBOD Conc.	CBOD Mean Conc.	CBOD Discharge lbs.	SS Conc. mg/l	SS Mean Conc.	SS Discharge lbs.	TKN Conc. mg/l	TKN Mean Conc.	TKN Discharge lbs.	Cu Conc. mg/l	Cu Mean Conc.	Cu Discharge lbs.	Cd Conc. mg/l	Cd Mean Conc.	Cd Discharge lbs.	Pb Conc. mg/l	Pb Mean Conc.	Pb Discharge lbs.	Zn Conc. mg/l	Zn Mean Conc.	Zn Discharge lbs.
18.4	282	9.71E-02	1.01E-01		19.5	0.044056		207	0.467671		6	0.013556		0.029	6.55E-05		0.0025	2.47E-06		0.0705	0.000159		0.1835	0.000415
18.5	288	8.71E-02	9.21E-02		19.5	0.040224		207	0.426994		6	0.012377		0.029	5.98E-05		0.0025	2.25E-06		0.0705	0.000145		0.1835	0.000379
18.6	294	7.56E-02	8.14E-02		19.5	0.035536		207	0.37723		6	0.010934		0.029	5.28E-05		0.0025	1.99E-06		0.0705	0.000128		0.1835	0.000334
18.7	300	6.23E-02	6.90E-02		19.5	0.030118		207	0.31969		6	0.009266		0.029	4.48E-05		0.0025	1.69E-06		0.0705	0.000109		0.1835	0.000283
18.8	306	4.69E-02	5.46E-02		19.5	0.023836		207	0.253027		6	0.007334		0.029	3.54E-05		0.0025	1.33E-06		0.0705	8.62E-05		0.1835	0.000224
18.9	312	3.07E-02	3.88E-02		19.5	0.016939		207	0.179814		6	0.005212		0.029	2.52E-05		0.0025	9.48E-07		0.0705	6.12E-05		0.1835	0.000159
19	318	1.68E-02	2.38E-02		19.5	0.010379		207	0.110175		6	0.003193		0.029	1.54E-05		0.0025	5.81E-07		0.0705	3.75E-05		0.1835	9.77E-05
19.1	324	8.63E-03	1.27E-02		19.5	0.005554		207	0.058963		6	0.001709		0.029	8.26E-06		0.0025	3.11E-07		0.0705	2.01E-05		0.1835	5.23E-05
19.2	330	2.57E-03	5.60E-03		19.5	0.002444		207	0.025947		6	0.000752		0.029	3.64E-06		0.0025	1.37E-07		0.0705	8.84E-06		0.1835	2.3E-05
	336		1.29E-03		19.5	0.000561		207	0.005957		6	0.000173		0.029	8.34E-07		0.0025	3.14E-08		0.0705	2.03E-06		0.1835	5.28E-06

Conduit CSO 1005B - S4CSO5B.XLS

Summary Statistics

Total Discharge Volume (cf)	Duration (hr)	CBOD (lbs)	SS (lbs)	TKN (lbs)	Cu (lbs)	Cd (lbs)	Pb (lbs)	Zn (lbs)
1.53E+03	6.00	3.6319	26.8561	0.8976	0.0036	0.0003	0.0077	0.0186

Conduit CSO 1005B

Time (hours)	Time (minutes)	Flow (ft^3/s)	Mean Flow	CBOD Conc.	CBOD Mean Conc.	CBOD Discharge lbs.	SS Conc. mg/l	SS Mean Conc.	SS Discharge lbs.	TKN Conc. mg/l	TKN Mean Conc.	TKN Discharge lbs.	Cu Conc. mg/l	Cu Mean Conc.	Cu Discharge lbs.	Cd Conc. mg/l	Cd Mean Conc.	Cd Discharge lbs.	Pb Conc. mg/l	Pb Mean Conc.	Pb Discharge lbs.	Zn Conc. mg/l	Zn Mean Conc.	Zn Discharge lbs.
13.6	0	2.81E-03		108	94.5		390	377.5		29	24.5		0.051	0.0525		0.003	0.003		0.135	0.112		0.227	0.238	
13.7	6	2.27E-02	1.28E-02		94.5	0.027029		377.5	0.107974		24.5	0.007008		0.0525	1.5E-05		0.003	1.82E-06		0.112	3.2E-05		0.238	6.81E-05
13.8	12	6.14E-02	4.21E-02		94.5	0.088992		377.5	0.356498		24.5	0.023072		0.0525	4.94E-05		0.003	5.98E-06		0.112	0.000105		0.238	0.000224
13.9	18	8.56E-02	7.35E-02	81	76.5	0.155551	365	334	0.621382	20	17	0.040328	0.054	0.054	8.64E-05	0.003	0.0035	1.04E-05	0.089	0.093	0.000184	0.249	0.2445	0.000392
14	24	0.100815	9.32E-02		76.5	0.159709		334	0.697291		17	0.035491		0.054	0.000113		0.0035	1.25E-05		0.093	0.000194		0.2445	0.00051
14.1	30	0.112502	1.07E-01	72	76.5	0.182715	303	289	0.797737	14	12.5	0.040603	0.054	0.0485	0.000129	0.004	0.0035	1.43E-05	0.097	0.0905	0.000222	0.24	0.23	0.000584
14.2	36	0.121191	1.17E-01		76.5	0.200168		289	0.756191		12.5	0.032707		0.0485	0.000127		0.0035	1.57E-05		0.0905	0.000237		0.23	0.000602
14.3	42	0.127659	1.24E-01		76.5	0.213151		289	0.805239		12.5	0.034829		0.0485	0.000135		0.0035	1.67E-05		0.0905	0.000252		0.23	0.000641
14.4	48	0.13291	1.30E-01	45	41.5	0.223189	275	260	0.843159	11	9.5	0.036469	0.043	0.042	0.000141	0.003	0.003	1.75E-06	0.084	0.099	0.000264	0.22	0.214	0.000671
14.5	54	0.137448	1.35E-01		41.5	0.125625		260	0.787049		9.5	0.028758		0.042	0.000127		0.003	8.44E-06		0.099	0.0003		0.214	0.000648
14.6	60	0.140683	1.39E-01	38	40.5	0.129237	245	236.5	0.809676	8	8.5	0.029584	0.041	0.04	0.000131	0.003	0.003	8.86E-06	0.114	0.092	0.000308	0.208	0.194	0.000666
14.7	66	0.140584	1.41E-01		40.5	0.127545		236.5	0.744798		8.5	0.026769		0.04	0.000126		0.003	8.57E-06		0.092	0.00029		0.194	0.000611
14.8	72	0.13787	1.39E-01		40.5	0.126269		236.5	0.73735		8.5	0.026501		0.04	0.000125		0.003	8.48E-06		0.092	0.000287		0.194	0.000605
14.9	78	0.133781	1.38E-01		40.5	0.123184		236.5	0.719334		8.5	0.025853		0.04	0.000122		0.003	8.28E-06		0.092	0.00028		0.194	0.00059
15	84	0.128919	1.31E-01		40.5	0.119125		236.5	0.695633		8.5	0.025002		0.04	0.000118		0.003	8E-06		0.092	0.000271		0.194	0.000571
15.1	90	0.123726	1.26E-01	43	37	0.114566	228	298.5	0.669007	9	8.5	0.024045	0.039	0.038	0.000113	0.003	0.003	7.7E-06	0.07	0.0685	0.00026	0.18	0.175	0.000549
15.2	96	0.118981	1.21E-01		37	0.100548		298.5	0.811174		8.5	0.023099		0.038	0.000103		0.003	6.75E-06		0.0685	0.000186		0.175	0.000476
15.3	102	0.11467	1.17E-01		37	0.096796		298.5	0.780908		8.5	0.022237		0.038	9.94E-05		0.003	6.5E-06		0.0685	0.000179		0.175	0.000458
15.4	108	0.110642	1.13E-01		37	0.093341		298.5	0.753038		8.5	0.021443		0.038	9.59E-05		0.003	6.27E-06		0.0685	0.000173		0.175	0.000441
15.5	114	0.106915	1.09E-01		37	0.090129		298.5	0.727118		8.5	0.020705		0.038	9.26E-05		0.003	6.05E-06		0.0685	0.000167		0.175	0.000426
15.6	120	0.103381	1.05E-01	31	24.5	0.00712	369	316.5	0.702849	8	8.5	0.020014	0.037	0.0345	8.95E-05	0.003	0.003	5.85E-06	0.067	0.0745	0.000161	0.17	0.187	0.000412
15.7	126	9.96E-02	1.02E-01		24.5	0.055687		316.5	0.719387		8.5	0.01932		0.0345	7.64E-05		0.003	3.74E-06		0.0745	0.000169		0.187	0.000425
15.8	132	9.58E-02	9.77E-02		24.5	0.053604		316.5	0.69247		8.5	0.018597		0.0345	7.55E-05		0.003	3.6E-06		0.0745	0.000163		0.187	0.000409
15.9	138	9.18E-02	9.38E-02		24.5	0.051471		316.5	0.664928		8.5	0.017857		0.0345	7.25E-05		0.003	3.46E-06		0.0745	0.000157		0.187	0.000393
16	144	8.79E-02	8.99E-02		24.5	0.049296		316.5	0.636826		8.5	0.017103		0.0345	6.94E-05		0.003	3.31E-06		0.0745	0.00015		0.187	0.000376
16.1	150	8.40E-02	8.59E-02		24.5	0.047131		316.5	0.608853		8.5	0.016352		0.0345	6.04E-05		0.003	3.17E-06		0.0745	0.000143		0.187	0.00036
16.2	156	8.04E-02	8.22E-02		24.5	0.045077		316.5	0.582327		8.5	0.015639		0.0345	6.35E-05		0.003	3.03E-06		0.0745	0.000137		0.187	0.000344
16.3	162	7.70E-02	7.87E-02		24.5	0.043183		316.5	0.55785		8.5	0.014982		0.0345	6.08E-05		0.003	2.9E-06		0.0745	0.000131		0.187	0.00033
16.4	168	7.39E-02	7.55E-02		24.5	0.041407		316.5	0.534909		8.5	0.014386		0.0345	5.83E-05		0.003	2.78E-06		0.0745	0.000126		0.187	0.000316
16.5	174	7.09E-02	7.24E-02		24.5	0.039717		316.5	0.513082		8.5	0.013779		0.0345	5.59E-05		0.003	2.67E-06		0.0745	0.000121		0.187	0.000303
16.6	180	6.80E-02	6.94E-02		24.5	0.038102		316.5	0.492215		8.5	0.013219		0.0345	5.37E-05		0.003	2.56E-06		0.0745	0.000116		0.187	0.000291
16.7	186	6.55E-02	6.68E-02		24.5	0.036634		316.5	0.473248		8.5	0.01271		0.0345	5.16E-05		0.003	2.46E-06		0.0745	0.000111		0.187	0.00028
16.8	192	6.34E-02	6.45E-02		24.5	0.035374		316.5	0.456978		8.5	0.012273		0.0345	4.98E-05		0.003	2.38E-06		0.0745	0.000108		0.187	0.00027
16.9	198	6.16E-02	6.25E-02		24.5	0.034204		316.5	0.442895		8.5	0.011894		0.0345	4.83E-05		0.003	2.3E-06		0.0745	0.000104		0.187	0.000262
17	204	5.99E-02	6.07E-02		24.5	0.033313		316.5	0.430356		8.5	0.011558		0.0345	4.69E-05		0.003	2.24E-06		0.0745	0.000101		0.187	0.000254
17.1	210	5.84E-02	5.91E-02		24.5	0.032437		316.5	0.419039		8.5	0.011254		0.0345	4.57E-05		0.003	2.18E-06		0.0745	9.86E-05		0.187	0.000248
17.2	216	5.70E-02	5.77E-02		24.5	0.031646		316.5	0.408817		8.5	0.010979		0.0345	4.46E-05		0.003	2.13E-06		0.0745	9.62E-05		0.187	0.000242
17.3	222	5.57E-02	5.64E-02		24.5	0.030921		316.5	0.399451		8.5	0.010728		0.0345	4.35E-05		0.003	2.08E-06		0.0745	9.4E-05		0.187	0.000236
17.4	228	5.45E-02	5.51E-02		24.5	0.030238		316.5	0.3906		8.5	0.01049		0.0345	4.26E-05		0.003	2.03E-06		0.0745	9.19E-05		0.187	0.000231
17.5	234	5.33E-02	5.39E-02		24.5	0.029562		316.5	0.381895		8.5	0.010256		0.0345	4.16E-05		0.003	1.99E-06		0.0745	8.99E-05		0.187	0.000226
17.6	240	5.21E-02	5.27E-02	18	19.5	0.028902	204	207	0.373361	9	8	0.010027	0.032	0.029	4.07E-05	0.003	0.0025	1.94E-06	0.082	0.0705	8.79E-05	0.204	0.1835	0.000221
17.7	246	5.11E-02	5.16E-02		19.5	0.022521		207	0.239072		8	0.00693		0.029	3.35E-05		0.0025	1.26E-06		0.0705	8.14E-05		0.1835	0.000212
17.8	252	5.02E-02	5.06E-02		19.5	0.022104		207	0.234641		8	0.006801		0.029	3.29E-05		0.0025	1.24E-06		0.0705	7.99E-05		0.1835	0.000208
17.9	258	4.94E-02	4.98E-02		19.5	0.021733		207	0.230708		8	0.906687		0.029	3.23E-05		0.0025	1.22E-06		0.0705	7.86E-05		0.1835	0.000205
18	264	4.86E-02	4.90E-02		19.5	0.021393		207	0.227091		8	0.006582		0.029	3.18E-05		0.0025	1.2E-06		0.0705	7.73E-05		0.1835	0.000201
18.1	270	4.77E-02	4.82E-02		19.5	0.021028		207	0.223224		8	0.00647		0.029	3.13E-05		0.0025	1.18E-06		0.0705	7.6E-05		0.1835	0.000198
18.2	276	4.60E-02	4.68E-02		19.5	0.020447		207	0.217054		8	0.006291		0.029	3.04E-05		0.0025	1.14E-06		0.0705	7.39E-05		0.1835	0.000192

Conduit CSO 1005B

Time (hours)	Time (minutes)	Flow (ft^3/s)	Mean Flow	CBOD Conc.	CBOD Mean Conc.	CBOD Discharge lbs.	SS Conc. mg/l	SS Mean Conc.	SS Discharge lbs.	TKN Conc. mg/l	TKN Mean Conc.	TKN Discharge lbs.	Cu Conc. mg/l	Cu Mean Conc.	Cu Discharge lbs.	Cd Conc. mg/l	Cd Mean Conc.	Cd Discharge lbs.	Pb Conc. mg/l	Pb Mean Conc.	Pb Discharge lbs.	Zn Conc. mg/l	Zn Mean Conc.	Zn Discharge lbs.
18.3	282	4.33E-02	4.46E-02		19.5	0.019497		207	0.206963		6	0.005999		0.029	2.9E-05		0.0025	1.09E-06		0.0705	7.05E-05		0.1835	0.000183
18.4	288	4.01E-02	4.17E-02		19.5	0.018228		207	0.193495		6	0.005609		0.029	2.71E-05		0.0025	1.02E-06		0.0705	6.59E-05		0.1835	0.000172
18.5	294	3.68E-02	3.84E-02		19.5	0.016788		207	0.178215		6	0.005166		0.029	2.5E-05		0.0025	9.4E-07		0.0705	6.07E-05		0.1835	0.000158
18.6	300	3.30E-02	3.49E-02		19.5	0.015226		207	0.161627		6	0.004685		0.029	2.26E-05		0.0025	8.52E-07		0.0705	5.5E-05		0.1835	0.000143
18.7	306	2.90E-02	3.10E-02		19.5	0.013535		207	0.143678		6	0.004165		0.029	2.01E-05		0.0025	7.58E-07		0.0705	4.89E-05		0.1835	0.000127
18.8	312	2.49E-02	2.69E-02		19.5	0.011762		207	0.12486		6	0.003619		0.029	1.75E-05		0.0025	6.58E-07		0.0705	4.25E-05		0.1835	0.000111
18.9	318	2.06E-02	2.28E-02		19.5	0.009937		207	0.105483		6	0.003057		0.029	1.48E-05		0.0025	5.56E-07		0.0705	3.59E-05		0.1835	9.35E-05
19	324	1.65E-02	1.86E-02		19.5	0.008103		207	0.086016		6	0.002493		0.029	1.21E-05		0.0025	4.54E-07		0.0705	2.93E-05		0.1835	7.63E-05
19.1	330	1.24E-02	1.44E-02		19.5	0.006298		207	0.066859		6	0.001938		0.029	9.37E-06		0.0025	3.53E-07		0.0705	2.28E-05		0.1835	5.93E-05
19.2	336	8.63E-03	1.05E-02		19.5	0.004587		207	0.048696		6	0.001411		0.029	6.82E-06		0.0025	2.57E-07		0.0705	1.66E-05		0.1835	4.32E-05
19.3	342	5.85E-03	7.24E-03		19.5	0.003161		207	0.033554		6	0.000973		0.029	4.7E-06		0.0025	1.77E-07		0.0705	1.14E-05		0.1835	2.97E-05
19.4	348	3.49E-03	4.67E-03	21	21	0.002038	150	150	0.021632	3	3	0.000627	0.026	0.026	3.03E-06	0.002	0.002	1.14E-07	0.059	0.059	7.37E-06	0.163	0.163	1.92E-05
19.5	354	1.47E-03	2.48E-03		21	0.001165		150	0.008321		3	0.000166		0.026	1.44E-06		0.002	5.22E-08		0.059	3.27E-06		0.163	9.04E-06
19.6	360	1.55E-04	8.12E-04		21	0.000382		150	0.002726		3	5.45E-05		0.026	4.73E-07		0.002	1.71E-08		0.059	1.07E-06		0.163	2.96E-06
	366		7.77E-05		21	3.66E-05		150	0.000261		3	5.22E-06		0.026	4.53E-08		0.002	1.64E-09		0.059	1.03E-07		0.163	2.84E-07

Conduit CSO 1005C - S4CSO5C.XLS

Summary Statistics

Total Discharge Volume (cf)	Duration (hr)	CBOD (lbs)	SS (lbs)	TKN (lbs)	Cu (lbs)	Cd (lbs)	Pb (lbs)	Zn (lbs)
6.04E+03	7.20	12.6156	99.1306	3.2000	0.0134	0.0008	0.0290	0.0718

Conduit CSO 1005C

Time (hours)	Time (minutes)	Flow (ft^3/s)	Mean Flow	CBOD Conc.	CBOD Mean Conc.	CBOD Discharge lbs.	SS Conc. mg/l	SS Mean Conc.	SS Discharge lbs.	TKN Conc. mg/l	TKN Mean Conc.	TKN Discharge lbs.	Cu Conc. mg/l	Cu Mean Conc.	Cu Discharge lbs.	Cd Conc. mg/l	Cd Mean Conc.	Cd Discharge lbs.	Pb Conc. mg/l	Pb Mean Conc.	Pb Discharge lbs.	Zn Conc. mg/l	Zn Mean Conc.	Zn Discharge lbs.
13.4	0	6.60E-02		108	94.5		390	377.5		29	24.5		0.051	0.0525		0.003	0.003		0.135	0.112		0.227	0.238	
13.5	6	0.164084	1.15E-01		94.5	0.243429		377.5	0.972428		24.5	0.063111		0.0525	0.000135		0.003	1.64E-05		0.112	0.000289		0.238	0.000613
13.6	12	0.283152	2.14E-01		94.5	0.452052		377.5	1.805815		24.5	0.117199		0.0525	0.000251		0.003	3.04E-05		0.112	0.000536		0.238	0.001139
13.7	18	0.293993	2.79E-01	81	76.5	0.589506	365	334	2.354906	20	17	0.152835	0.054	0.054	0.000328	0.003	0.0035	3.96E-05	0.089	0.093	0.000699	0.249	0.2445	0.001485
13.8	24	0.310179	3.02E-01		76.5	0.5175		334	2.259411		17	0.115		0.064	0.000365		0.0035	4.06E-05		0.093	0.000629		0.2445	0.001654
13.9	30	0.318245	3.14E-01	72	76.5	0.538273	303	289	2.350109	14	12.5	0.119618	0.084	0.0485	0.00038	0.004	0.0035	4.22E-05	0.097	0.0905	0.000654	0.24	0.23	0.00172
14	36	0.321288	3.20E-01		76.5	0.647789		289	2.069425		12.5	0.089508		0.0485	0.000347		0.0035	4.29E-05		0.0905	0.000648		0.23	0.001647
14.1	42	0.321921	3.22E-01		78.5	0.550937		289	2.081318		12.5	0.090022		0.0485	0.000349		0.0035	4.32E-05		0.0905	0.000652		0.23	0.001656
14.2	48	0.321529	3.22E-01	45	41.5	0.551144	275	260	2.082099	11	9.5	0.090056	0.843	0.042	0.000349	0.003	0.003	4.32E-05	0.084	0.099	0.000652	0.22	0.214	0.001657
14.3	54	0.320736	3.21E-01		41.5	0.298438		260	1.869719		9.5	0.068317		0.042	0.000302		0.003	2E-05		0.099	0.000712		0.214	0.001539
14.4	60	0.319967	3.20E-01	38	40.5	0.29771	245	236.5	1.865172	8	8.5	0.068151	0.041	0.04	0.000301	0.003	0.003	2E-05	0.114	0.092	0.00071	0.208	0.194	0.001535
14.5	66	0.319314	3.20E-01		40.5	0.289891		236.5	1.692823		8.5	0.060841		0.84	0.000286		0.003	1.95E-05		0.092	0.000659		0.194	0.001389
14.6	72	0.31853	3.19E-01		40.5	0.289239		236.5	1.689015		8.5	0.060705		0.04	0.000286		0.003	1.94E-05		0.092	0.000657		0.194	0.001385
14.7	78	0.316414	3.17E-01		40.5	0.287924		238.5	1.681337		8.5	0.060429		0.04	0.000284		0.003	1.93E-05		0.092	0.000654		0.194	0.001379
14.8	84	0.312071	3.14E-01		40.5	0.284996		236.5	1.664233		8.5	0.059814		0.04	0.000281		0.003	1.91E-05		0.092	0.000647		0.194	0.001365
14.9	90	0.306022	3.09E-01	43	37	0.280283	228	298.5	1.636716	9	8.5	0.058825	0.039	0.038	0.000277	0.003	0.003	1.88E-05	0.07	0.0685	0.000637	0.18	0.175	0.001343
15	96	0.298987	3.03E-01		37	0.250641		298.5	2.022063		8.5	0.05758		0.038	0.000257		0.003	1.68E-05		0.0685	0.000484		0.175	0.001185
15.1	102	0.291395	2.95E-01		37	0.244581		298.5	1.973176		8.5	0.056188		0.038	0.000251		0.003	1.64E-05		0.0685	0.000453		0.175	0.001157
15.2	108	0.28469	2.88E-01		37	0.238658		298.5	1.925393		8.5	0.054827		0.038	0.000245		0.003	1.6E-05		0.0685	0.000442		0.175	0.001129
15.3	114	0.279657	2.82E-01		37	0.233796		298.5	1.886184		8.5	0.05371		0.038	0.00024		0.003	1.57E-05		0.0685	0.000433		0.175	0.001106
15.4	120	0.2761	2.78E-01	31	24.5	0.230237	369	316.5	1.857455	8	8.5	0.052892	0.037	0.0345	0.000236	0.003	0.003	1.55E-05	0.067	0.0745	0.000428	0.17	0.187	0.001089
15.5	128	0.273674	2.75E-01		24.5	0.150813		318.5	1.94826		8.5	0.052323		0.0345	0.000212		0.003	1.01E-05		0.0745	0.000459		0.187	0.001151
15.6	132	0.272047	2.73E-01		24.5	0.149701		318.5	1.933894		8.5	0.051937		0.0345	0.000211		0.003	1.01E-05		0.0745	0.000455		0.187	0.001143
15.7	138	0.2705	2.71E-01		24.5	0.14883		316.5	1.922644		8.5	0.051835		0.0345	0.00021		0.003	1E-05		0.0745	0.000453		0.187	0.001136
15.8	144	0.268648	2.70E-01		24.5	0.147898		316.5	1.910599		8.5	0.051311		0.0345	0.000208		0.003	9.94E-06		0.0745	0.00045		0.187	0.001129
15.9	150	0.26843	2.68E-01		24.5	0.146782		318.5	1.896179		8.5	0.050924		0.0345	0.000207		0.003	9.86E-06		0.0745	0.000446		0.187	0.00112
16	156	0.283933	2.65E-01		24.5	0.145488		316.5	1.879471		8.5	0.050476		0.0345	0.000205		0.003	9.77E-06		0.0745	0.000442		0.187	0.00111
18.1	162	0.261206	2.83E-01		24.5	0.144055		316.5	1.860956		8.5	0.049978		0.0345	0.000203		0.003	9.86E-06		0.0745	0.000438		0.187	0.0011
16.2	168	0.258811	2.60E-01		24.5	0.14265		318.5	1.842808		8.5	0.049491		0.0345	0.000201		0.003	9.58E-06		0.0745	0.000434		0.187	0.001089
18.3	174	0.256719	2.58E-01		24.5	0.141419		316.5	1.826908		8.5	0.049064		0.0345	0.000199		0.003	9.5E-06		0.0745	0.00043		0.187	0.001079
16.4	180	0.254982	2.56E-01		24.5	0.140369		316.5	1.813338		8.5	0.048699		0.0345	0.000198		0.003	9.43E-06		0.0745	0.000427		0.187	0.001071
16.5	186	0.253507	2.54E-01		24.5	0.139488		316.5	1.801953		8.5	0.048394		0.0345	0.000196		0.003	9.37E-06		0.0745	0.000424		0.187	0.001065
16.8	192	0.252272	2.53E-01		24.5	0.138744		316.5	1.792348		8.5	0.048136		0.0345	0.000195		0.003	9.32E-06		0.0745	0.000422		0.187	0.001059
16.7	198	0.251245	2.52E-01		24.5	0.138124		316.5	1.784333		8.5	0.04792		0.0345	0.000195		0.003	9.28E-06		0.0745	0.00042		0.187	0.001054
16.8	204	0.250608	2.51E-01		24.5	0.137667		316.5	1.778439		8.5	0.047762		0.0345	0.000194		0.003	9.25E-06		0.0745	0.000419		0.187	0.001051
16.9	210	0.250217	2.50E-01		24.5	0.137386		318.5	1.774796		8.5	0.047664		0.0345	0.000193		0.003	9.23E-06		0.0745	0.000418		0.187	0.001049
17	216	0.249976	2.50E-01		24.5	0.137212		316.5	1.772555		8.5	0.047604		0.0345	0.000193		0.003	9.22E-08		0.0745	0.000417		0.187	0.001047
17.1	222	0.249833	2.50E-01		24.5	0.137107		316.5	1.771192		8.5	0.047568		0.0345	0.000193		0.003	9.21E-06		0.0745	0.000417		0.187	0.001046
17.2	228	0.249826	2.50E-01		24.5	0.137066		318.5	1.770663		8.5	0.047553		0.0345	0.000193		0.003	9.21E-06		0.0745	0.000417		0.187	0.001046
17.3	234	0.249585	2.50E-01		24.5	0.136998		316.5	1.769784		8.5	0.04753		0.0345	0.000193		0.003	9.2E-06		0.0745	0.000417		0.187	0.001046
17.4	240	0.249344	2.49E-01	18	19.5	0.136865	284	207	1.768074	9	6	0.047484	0.032	0.029	0.000193	0.003	0.0025	9.19E-06	0.082	0.0705	0.000416	0.204	0.1835	0.001045
17.5	246	0.248807	2.49E-01		19.5	0.108764		207	1.154567		6	0.033466		0.029	0.000162		0.0025	8.09E-06		0.0705	0.000393		0.1835	0.001023
17.8	252	0.248322	2.49E-01		19.5	0.108541		207	1.152199		6	0.033397		0.029	0.000161		0.0025	6.08E-06		0.0705	0.000392		0.1835	0.001021
17.7	258	0.247843	2.48E-01		19.5	0.10833		207	1.149967		6	0.033332		0.029	0.000181		0.0025	6.06E-06		0.0705	0.000392		0.1835	0.001019
17.8	264	0.247542	2.48E-01		19.5	0.10816		207	1.148159		6	0.03328		0.029	0.000161		0.0025	6.06E-06		0.0705	0.000391		0.1835	0.001018
17.9	270	0.247451	2.47E-01		19.5	0.108074		207	1.14725		8	0.033254		0.029	0.000161		0.0025	8.05E-06		0.0705	0.000391		0.1835	0.001017
18	278	0.247388	2.47E-01		19.5	0.108041		207	1.148892		6	0.033243		0.029	0.000181		0.0025	8.05E-06		0.0705	0.000391		0.1835	0.001017

Conduit CSO 1005C

Time (hours)	Time (minutes)	Flow (ft^3/s)	Mean Flow	CBOD Conc.	CBOD Mean Conc.	CBOD Discharge lbs.	SS Conc. mg/l	SS Mean Conc.	SS Discharge lbs.	TKN Conc. mg/l	TKN Mean Conc.	TKN Discharge lbs.	Cu Conc. mg/l	Cu Mean Conc.	Cu Discharge lbs.	Cd Conc. mg/l	Cd Mean Conc.	Cd Discharge lbs.	Pb Conc. mg/l.	Pb Mean Conc.	Pb Discharge lbs.	Zn Conc. mg/l	Zn Mean Conc.	Zn Discharge lbs.
18.1	282	0.247302	2.47E-01		19.5	0.108008		207	1.146547		6	0.033233		0.029	0.000181		0.0025	6.05E-06		0.0705	0.00039		0.1835	0.001016
18.2	288	0.246508	2.47E-01		19.5	0.107816		207	1.144509		6	0.033174		0.029	0.00016		0.0025	6.04E-06		0.0705	0.00039		0.1835	0.001015
18.3	294	0.244431	2.45E-01		19.5	0.107189		207	1.137855		6	0.032981		0.029	0.000159		0.0025	6E-06		0.0705	0.000388		0.1835	0.001009
18.4	300	0.241179	2.43E-01		19.5	0.106026		207	1.125502		6	0.032623		0.029	0.000158		0.0025	5.94E-06		0.0705	0.000383		0.1835	0.000998
18.5	306	0.237045	2.39E-01		19.5	0.104413		207	1.108384		6	0.032127		0.029	0.000155		0.0025	5.85E-06		0.0705	0.000377		0.1835	0.000983
18.6	312	0.232383	2.35E-01		19.5	0.102488		207	1.087953		8	0.031535		0.029	0.000152		0.0025	5.74E-08		0.0705	0.000371		0.1835	0.000964
18.7	318	0.227784	2.30E-01		19.5	0.100466		207	1.066488		6	0.030913		0.029	0.000149		0.0025	5.62E-06		0.0705	0.000363		0.1835	0.000945
18.8	324	0.223416	2.26E-01		19.5	0.098513		207	1.04575		6	0.030312		0.029	0.000147		0.0025	5.52E-06		0.0705	0.000356		0.1835	0.000927
18.9	330	0.219121	2.21E-01		19.5	0.096621		207	1.025672		6	0.02973		0.029	0.000144		0.0025	5.41E-06		0.0705	0.000349		0.1835	0.000909
19	336	0.214708	2.17E-01		19.5	0.09472		207	1.005491		6	0.029145		0.029	0.000141		0.0025	5.3E-06		0.0705	0.000342		0.1835	0.000891
19.1	342	0.210537	2.13E-01		19.5	0.092848		207	0.985596		6	0.028568		0.029	0.000138		0.0025	5.2E-06		0.0705	0.000336		0.1835	0.000874
19.2	348	0.206645	2.09E-01	21	21	0.091086	150	150	0.966908	3	3	0.028026	0.028	0.026	0.000135	0.002	0.002	5.1E-06	0.059	0.059	0.000329	0.163	0.163	0.000857
19.3	354	0.203189	2.05E-01		21	0.096364		150	0.688316		3	0.013766		0.026	0.000119		0.002	4.32E-06		0.059	0.000271		0.163	0.000748
19.4	360	0.20006	2.02E-01		21	0.094816		150	0.677255		3	0.013545		0.026	0.000117		0.002	4.25E-06		0.059	0.000266		0.163	0.000736
19.5	366	0.196936	1.96E-01		21	0.093345		150	0.666753		3	0.013335		0.026	0.000116		0.002	4.18E-06		0.059	0.000262		0.163	0.000725
19.6	372	0.193681	1.95E-01		21	0.091846		150	0.856041		3	0.013121		0.026	0.000114		0.002	4.11E-06		0.059	0.000258		0.163	0.000713
19.7	378	0.171849	1.83E-01		21	0.085947		150	0.613909		3	0.012278		0.026	0.000106		0.002	3.85E-06		0.059	0.000241		0.163	0.000667
19.8	384	0.12315	1.47E-01		21	0.069363		150	0.49545		3	0.009909		0.026	8.59E-05		0.002	3.11E-06		0.059	0.000195		0.163	0.000538
19.9	390	0.101872	1.13E-01		21	0.052909		150	0.377923		3	0.007558		0.026	6.55E-05		0.002	2.37E-06		0.059	0.000149		0.163	0.000411
20	396	8.48E-02	9.33E-02		21	0.043885		150	0.313463		3	0.008269		0.026	5.43E-05		0.002	1.97E-06		0.059	0.000123		0.163	0.000341
20.1	402	5.43E-02	6.95E-02		21	0.032697		150	0.233549		3	0.004671		0.026	4.05E-05		0.002	1.46E-06		0.059	9.19E-05		0.163	0.000254
20.2	408	2.86E-02	4.15E-02		21	0.019497		150	0.139266		3	0.002785		0.028	2.41E-05		0.002	8.73E-07		0.059	5.48E-05		0.163	0.000151
20.3	414	1.71E-02	2.29E-02		21	0.010761		150	0.076864		3	0.001537		0.026	1.33E-05		0.002	4.82E-07		0.059	3.02E-05		0.163	8.35E-05
20.4	420	1.06E-02	1.39E-02		21	0.00653		150	0.046842		3	0.000933		0.026	6.08E-06		0.002	2.92E-07		0.059	1.83E-05		0.163	5.07E-05
20.5	426	5.38E-03	8.01E-03		21	0.003767		150	0.026907		3	0.000538		0.026	4.66E-06		0.002	1.69E-07		0.059	1.06E-05		0.163	2.92E-05
20.6	432	1.65E-03	3.52E-03		21	0.001654		150	0.011818		3	0.000236		0.026	2.05E-06		0.002	7.41E-08		0.059	4.65E-06		0.163	1.28E-05
	438		8.26E-04		21	0.000388		150	0.002774		3	5.55E-05		0.026	4.81E-07		0.002	1.74E-08		0.059	1.09E-06		0.163	3.01E-06

Conduit CSO 1005D - S4CSO5D.XLS

Summary Statistics

Total Discharge Volume (cf)	Duration (hr)	CBOD (lbs)	SS (lbs)	TKN (lbs)	Cu (lbs)	Cd (lbs)	Pb (lbs)	Zn (lbs)
4.39E+03	12.10	7.8417	68.8100	1.9839	0.0092	0.0005	0.0200	0.0502

Conduit CSO 1005D

Time (hours)	Time (minutes)	Flow (ft^3/s)	Mean Flow	CBOD Conc.	CBOD Mean Conc.	CBOD Discharge lbs.	SS Conc. mg/l	SS Mean Conc.	SS Discharge lbs.	TKN Conc. mg/l	TKN Mean Conc.	TKN Discharge lbs.	Cu Conc. mg/l	Cu Mean Conc.	Cu Discharge lbs.	Cd Conc. mg/l	Cd Mean Conc.	Cd Discharge lbs.	Pb Conc. mg/l	Pb Mean Conc.	Pb Discharge lbs.	Zn Conc. mg/l	Zn Mean Conc.	Zn Discharge lbs.
12.2	0	6.85E-04		108	94.5		390	377.5		29	24.5		0.051	0.0525		0.003	0.003		0.135	0.112		0.227	0.238	
12.3	6	5.56E-03	3.12E-03		94.5	0.006607		377.5	0.026393		24.5	0.001713		0.0525	3.67E-06		0.003	4.44E-07		0.112	7.83E-06		0.238	1.66E-05
12.4	12	2.15E-02	1.35E-02		94.5	0.028596		377.5	0.114233		24.5	0.007414		0.0525	1.59E-05		0.003	1.92E-06		0.112	3.39E-05		0.238	7.2E-05
12.5	18	4.74E-02	3.45E-02	81	76.5	0.072913	365	334	0.291267	20	17	0.018903	0.054	0.054	4.05E-05	0.003	0.0035	4.9E-06	0.089	0.093	8.64E-05	0.249	0.2445	0.000184
12.6	24	7.46E-02	6.10E-02		76.5	0.104517		334	0.456322		17	0.023226		0.054	7.38E-05		0.0035	8.19E-06		0.093	0.000127		0.2445	0.000334
12.7	30	9.78E-02	8.62E-02	72	76.5	0.147672	303	289	0.644739	14	12.5	0.032816	0.054	0.0485	0.000164	0.004	0.0035	1.16E-05	0.097	0.0905	0.00018	0.24	0.23	0.000472
12.8	36	0.114477	1.06E-01		76.5	0.181848		289	0.686982		12.5	0.029714		0.0485	0.000115		0.0035	1.43E-05		0.0905	0.000215		0.23	0.000547
12.9	42	0.126646	1.21E-01		76.5	0.206533		289	0.780235		12.5	0.033747		0.0485	0.000131		0.0035	1.82E-05		0.0905	0.000244		0.23	0.000621
13	48	0.137512	1.32E-01	45	41.5	0.228263	275	280	0.854771	11	9.5	0.036971	0.043	0.042	0.000143	0.003	0.003	1.77E-05	0.084	0.099	0.000268	0.22	0.214	0.00068
13.1	54	0.149361	1.43E-01		41.5	0.133299		260	0.835124		9.5	0.030514		0.042	0.000135		0.003	8.95E-06		0.099	0.000318		0.214	0.000687
13.2	60	0.167974	1.59E-01	38	40.5	0.147453	245	236.5	0.923804	8	8.5	0.033754	0.041	0.04	0.000149	0.003	0.003	9.91E-06	0.114	0.092	0.000352	0.208	0.194	0.00076
13.3	66	0.193366	1.81E-01		40.5	0.163855		236.5	0.956832		8.5	0.034389		0.04	0.000162		0.003	1.1E-05		0.092	0.000372		0.194	0.000785
13.4	72	0.219385	2.06E-01		40.5	0.187168		236.5	1.092969		8.5	0.039282		0.04	0.000185		0.003	1.26E-05		0.092	0.000425		0.194	0.000897
13.5	78	0.247247	2.33E-01		40.5	0.211601		236.5	1.235648		8.5	0.04441		0.04	0.000209		0.003	1.42E-05		0.092	0.000481		0.194	0.001014
13.6	84	0.272868	2.60E-01		40.5	0.235854		236.5	1.37727		8.5	0.0495		0.04	0.000233		0.003	1.58E-05		0.092	0.000536		0.194	0.00113
13.7	90	0.284358	2.79E-01	43	37	0.252682	228	298.5	1.47554	9	8.5	0.053032	0.039	0.038	0.00025	0.003	0.003	1.7E-05	0.07	0.0685	0.000574	0.18	0.175	0.00121
13.8	96	0.28501	2.85E-01		37	0.235876		298.5	1.902944		8.5	0.054188		0.038	0.000242		0.003	1.58E-05		0.0685	0.000437		0.175	0.001116
13.9	102	0.281633	2.83E-01		37	0.234747		298.5	1.893837		8.5	0.053928		0.038	0.000241		0.003	1.68E-05		0.0685	0.000435		0.175	0.00111
14	108	0.277352	2.79E-01		37	0.231574		298.5	1.868241		8.5	0.053199		0.038	0.000238		0.003	1.56E-05		0.0685	0.000429		0.175	0.001095
14.1	114	0.273342	2.75E-01		37	0.228139		298.5	1.840529		8.5	0.05241		0.038	0.000234		0.003	1.53E-05		0.0685	0.000422		0.175	0.001079
14.2	120	0.270982	2.72E-01	31	24.5	0.225501	369	316.5	1.819242	8	8.5	0.051804	0.037	0.0345	0.000232	0.003	0.003	1.51E-05	0.067	0.0745	0.000417	0.17	0.187	0.001067
14.3	126	0.269732	2.70E-01		24.5	0.148328		316.5	1.916154		8.5	0.051461		0.0345	0.000209		0.003	9.96E-06		0.0745	0.000451		0.187	0.001132
14.4	132	0.268906	2.69E-01		24.5	0.147758		316.5	1.908796		8.5	0.051283		0.0345	0.000208		0.003	9.93E-06		0.0745	0.000449		0.187	0.001128
14.5	138	0.268249	2.69E-01		24.5	0.147351		316.5	1.903539		8.5	0.051122		0.0345	0.000207		0.003	9.9E-06		0.0745	0.000448		0.187	0.001125
14.6	144	0.265821	2.67E-01		24.5	0.146505		316.5	1.892606		8.5	0.050828		0.0345	0.000206		0.003	9.84E-06		0.0745	0.000445		0.187	0.001118
14.7	150	0.256526	2.61E-01		24.5	0.143289		316.5	1.851064		8.5	0.049713		0.0345	0.000202		0.003	9.63E-06		0.0745	0.000436		0.187	0.001094
14.8	156	0.242537	2.50E-01		24.5	0.136902		316.5	1.76855		8.5	0.047497		0.0345	0.000193		0.003	9.2E-08		0.0745	0.000416		0.187	0.001045
14.9	162	0.226869	2.35E-01		24.5	0.128766		316.5	1.683452		8.5	0.044674		0.0345	0.000181		0.003	8.65E-06		0.0745	0.000392		0.187	0.000983
15	168	0.211055	2.19E-01		24.5	0.12013		316.5	1.551888		8.5	0.041678		0.0345	0.000189		0.003	8.07E-06		0.0745	0.000365		0.187	0.000917
15.1	174	0.196907	2.04E-01		24.5	0.111911		318.5	1.445711		8.5	0.038826		0.0345	0.000158		0.003	7.52E-06		0.0745	0.00034		0.187	0.000854
15.2	180	0.187833	1.92E-01		24.5	0.105541		318.5	1.36342		8.5	0.036618		0.0345	0.000149		0.003	7.09E-06		0.0745	0.000321		0.187	0.000806
15.3	186	0.18258	1.85E-01		24.5	0.101611		316.5	1.312651		8.5	0.035253		0.0345	0.000143		0.003	6.83E-06		0.0745	0.000309		0.187	0.000776
15.4	192	0.17937	1.81E-01		24.5	0.09929		316.5	1.282659		8.5	0.034447		0.0345	0.00014		0.003	6.67E-06		0.0745	0.000302		0.187	0.000768
15.5	198	0.176758	1.78E-01		24.5	0.097692		316.5	1.262025		8.5	0.033893		0.0345	0.000138		0.003	6.56E-06		0.0745	0.000297		0.187	0.000746
15.6	204	0.173965	1.75E-01		24.5	0.096209		318.5	1.24287		8.5	0.033379		0.0345	0.000135		0.003	6.46E-06		0.0745	0.000293		0.187	0.000734
15.7	210	0.169585	1.72E-01		24.5	0.094242		316.5	1.217453		8.5	0.032696		0.0345	0.000133		0.003	6.33E-06		0.0745	0.000287		0.187	0.000719
15.8	218	0.163966	1.67E-01		24.5	0.091499		316.5	1.18202		8.5	0.031745		0.0345	0.000129		0.003	6.15E-06		0.0745	0.000278		0.187	0.000698
15.9	222	0.157825	1.61E-01		24.5	0.088273		318.5	1.140345		8.5	0.030625		0.0345	0.000124		0.003	5.93E-06		0.0745	0.000268		0.187	0.000674
16	228	0.151575	1.55E-01		24.5	0.084874		316.5	1.096436		8.5	0.029446		0.0345	0.00012		0.003	5.7E-06		0.0745	0.000258		0.187	0.000648
16.1	234	0.14565	1.49E-01		24.5	0.081534		318.5	1.053289		8.5	0.028287		0.0345	0.000115		0.003	5.48E-06		0.0745	0.000248		0.187	0.000622
16.2	240	0.141321	1.43E-01	18	19.5	0.078721	264	207	1.016952	9	8	0.027312	0.032	0.029	0.000111	0.003	0.0025	5.29E-06	0.082	0.0705	0.000239	0.204	0.1835	0.000601
16.3	246	0.13812	1.40E-01		19.5	0.061012		207	0.647663		8	0.018773		0.029	9.07E-05		0.0025	3.42E-06		0.0705	0.000221		0.1835	0.000574
16.4	252	0.135435	1.37E-01		19.5	0.059726		207	0.634019		6	0.018377		0.029	8.88E-05		0.0025	3.34E-06		0.0705	0.000218		0.1835	0.000562
16.5	258	0.132945	1.34E-01		19.5	0.058597		207	0.622026		8	0.01803		0.029	8.71E-05		0.0025	3.28E-06		0.0705	0.000212		0.1835	0.000551
16.6	264	0.130626	1.32E-01		19.5	0.057547		207	0.81088		8	0.017707		0.029	8.56E-05		0.0025	3.22E-06		0.0705	0.000208		0.1835	0.000542
16.7	270	0.129151	1.30E-01		19.5	0.056718		207	0.602088		6	0.017452		0.029	8.44E-05		0.0025	3.18E-06		0.0705	0.000205		0.1835	0.000534
16.8	276	0.128241	1.29E-01		19.5	0.058198		207	0.598559		8	0.017292		0.029	8.38E-05		0.0025	3.15E-06		0.0705	0.000203		0.1835	0.000529

Conduit CSO 1005D

Time (hours)	Time (minutes)	Flow (ft^3/s)	Mean Flow	CBOD Conc.	CBOD Mean Conc.	CBOD Discharge lbs.	SS Conc. mg/l	SS Mean Conc.	SS Discharge lbs.	TKN Conc. mg/l	TKN Mean Conc.	TKN Discharge lbs.	Cu Conc. mg/l	Cu Mean Conc.	Cu Discharge lbs.	Cd Conc. mg/l	Cd Mean Conc.	Cd Discharge lbs.	Pb Conc. mg/l	Pb Mean Conc.	Pb Discharge lbs.	Zn Conc. mg/l	Zn Mean Conc.	Zn Discharge lbs.
16.9	282	0.127639	1.28E-01		19.5	0.055867		207	0.593054		8	0.01719		0.029	8.31E-05		0.0025	3.13E-06		0.0705	0.000202		0.1835	0.000526
17	288	0.127212	1.27E-01		19.5	0.055643		207	0.59067		6	0.017121		0.029	8.28E-05		0.0025	3.12E-06		0.0705	0.000201		0.1835	0.000524
17.1	294	0.126675	1.27E-01		19.5	0.055432		207	0.588436		6	0.017056		0.029	8.24E-05		0.0025	3.1E-06		0.0705	0.0002		0.1835	0.000522
17.2	300	0.125844	1.26E-01		19.5	0.055134		207	0.585266		6	0.016964		0.029	8.2E-05		0.0025	3.09E-06		0.0705	0.000199		0.1835	0.000519
17.3	306	0.124623	1.25E-01		19.5	0.054686		207	0.58051		6	0.016826		0.029	8.13E-05		0.0025	3.06E-06		0.0705	0.000198		0.1835	0.000515
17.4	312	0.123302	1.24E-01		19.5	0.054131		207	0.574617		6	0.015656		0.029	8.05E-05		0.0025	3.03E-06		0.0705	0.000196		0.1835	0.000509
17.5	318	0.121885	1.23E-01		19.5	0.053533		207	0.568271		6	0.016472		0.029	7.96E-05		0.0025	3E-06		0.0705	0.000194		0.1835	0.000504
17.6	324	0.120566	1.21E-01		19.5	0.052936		207	0.561931		6	0.016288		0.029	7.87E-05		0.0025	2.96E-06		0.0705	0.000191		0.1835	0.000498
17.7	330	0.11987	1.20E-01		19.5	0.052452		207	0.556798		6	0.016139		0.029	7.8E-05		0.0025	2.84E-06		0.0705	0.00019		0.1835	0.000494
17.8	336	0.119134	1.19E-01		19.5	0.052139		207	0.553479		6	0.016043		0.029	7.75E-05		0.0025	2.92E-06		0.0705	0.000189		0.1835	0.000491
17.9	342	0.118834	1.19E-01		19.5	0.051957		207	0.551542		6	0.015987		0.029	7.73E-05		0.0025	2.91E-06		0.0705	0.000188		0.1835	0.000489
18	348	0.1166	1.19E-01	21	21	0.05184	150	150	0.550303	3	3	0.015951	0.028	0.026	7.71E-05	0.002	0.002	2.9E-06	0.059	0.059	0.000187	0.163	0.163	0.000488
18.1	354	0.117674	1.18E-01		21	0.055555		150	0.396822		3	0.007936		0.026	6.88E-05		0.002	2.49E-06		0.059	0.000156		0.163	0.000431
18.2	350	0.113975	1.16E-01		21	0.054466		150	0.389056		3	0.007781		0.026	8.74E-05		0.002	2.44E-06		0.059	0.000153		0.163	0.000423
16.3	366	0.10792	1.11E-01		21	0.052174		150	0.372674		3	0.007453		0.028	6.46E-05		0.002	2.34E-06		0.059	0.000147		0.163	0.000405
18.4	372	0.100007	1.04E-01		21	0.04889		150	0.349213		3	0.006984		0.026	6.05E-05		0.002	2.19E-06		0.059	0.000137		0.163	0.000379
18.5	378	9.20E-02	9.50E-02		21	0.045151		150	0.322509		3	0.00645		0.026	5.59E-05		0.002	2.02E-06		0.059	0.000127		0.163	0.00035
18.6	384	8.43E-02	8.82E-02		21	0.041469		150	0.296209		3	0.005924		0.026	5.13E-05		0.002	1.86E-06		0.059	0.000117		0.163	0.000322
18.7	390	7.82E-02	8.13E-02		21	0.038217		150	0.272976		3	0.00546		0.026	4.73E-05		0.002	1.71E-06		0.059	0.000107		0.163	0.000297
18.8	396	7.32E-02	7.57E-02		21	0.035593		150	0.254237		3	0.005085		0.028	4.41E-05		0.002	1.59E-06		0.059	1E-04		0.163	0.000276
18.9	402	6.88E-02	7.10E-02		21	0.033385		150	0.238466		3	0.004769		0.028	4.13E-05		0.002	1.5E-06		0.059	9.38E-05		0.163	0.000259
19	408	8.47E-02	6.67E-02		21	0.031383		150	0.224162		3	0.004483		0.026	3.89E-05		0.002	1.41E-06		0.059	8.82E-05		0.163	0.000244
19.1	414	6.11E-02	8.29E-02		21	0.029563		150	0.211163		3	0.004223		0.026	3.66E-05		0.002	1.32E-06		0.059	8.31E-05		0.163	0.000229
19.2	420	5.91E-02	6.01E-02		21	0.028251		150	0.201793		3	0.004036		0.026	3.5E-05		0.002	1.27E-06		0.059	7.94E-05		0.163	0.000219
19.3	426	5.86E-02	5.89E-02		21	0.027684		150	0.19774		3	0.003955		0.026	3.43E-05		0.002	1.24E-06		0.059	7.78E-05		0.163	0.000215
19.4	432	5.90E-02	5.88E-02		21	0.027672		150	0.197657		3	0.003953		0.028	3.43E-05		0.002	1.24E-06		0.059	7.77E-05		0.163	0.000215
19.5	438	5.99E-02	5.95E-02		21	0.027979		150	0.199849		3	0.003997		0.026	3.46E-05		0.002	1.25E-06		0.059	7.86E-05		0.163	0.000217
19.6	444	6.06E-02	6.03E-02		21	0.028341		150	0.202434		3	0.004049		0.026	3.51E-05		0.002	1.27E-06		0.059	7.96E-05		0.163	0.00022
19.7	450	5.93E-02	6.00E-02		21	0.028197		150	0.201406		3	0.004028		0.026	3.49E-05		0.002	1.26E-06		0.059	7.92E-05		0.163	0.000219
19.8	456	5.62E-02	5.78E-02		21	0.027166		150	0.194043		3	0.063881		0.028	3.36E-05		0.002	1.22E-06		0.059	7.63E-05		0.163	0.000211
19.9	462	5.20E-02	5.41E-02		21	0.025452		150	0.181802		3	0.003636		0.026	3.15E-05		0.002	1.14E-06		0.059	7.15E-05		0.163	0.000198
20	468	4.75E-02	4.98E-02		21	0.02341		150	0.187212		3	0.003344		0.028	2.9E-05		0.002	1.05E-06		0.059	6.58E-05		0.163	0.000182
20.1	474	4.26E-02	4.50E-02		21	0.021181		150	0.151295		3	0.003026		0.026	2.62E-05		0.002	9.49E-07		0.059	5.95E-05		0.163	0.000164
20.2	480	3.87E-02	4.06E-02		21	0.019107		150	0.136475		3	0.00273		0.026	2.37E-05		0.002	8.56E-07		0.059	5.37E-05		0.163	0.000148
20.3	486	3.61E-02	3.74E-02		21	0.017591		150	0.125649		3	0.002513		0.026	2.18E-05		0.002	7.88E-07		0.059	4.84E-05		0.163	0.000137
20.4	492	3.43E-02	3.52E-02		21	0.016551		150	0.118222		3	0.002364		0.028	2.05E-05		0.002	7.41E-07		0.059	4.65E-05		0.163	0.000128
20.5	498	3.27E-02	3.35E-02		21	0.015751		150	0.112508		3	0.00225		0.026	1.95E-05		0.002	7.05E-07		0.059	4.43E-05		0.163	0.000122
20.6	504	3.14E-02	3.21E-02		21	0.015089		150	0.107777		3	0.002156		0.026	1.87E-05		0.002	6.76E-07		0.059	4.24E-05		0.163	0.000117
20.7	510	3.08E-02	3.11E-02		21	0.01463		150	0.104502		3	0.00209		0.026	1.81E-05		0.002	6.55E-07		0.059	4.11E-05		0.163	0.000114
20.8	516	3.08E-02	3.07E-02		21	0.014432		150	0.103082		3	0.002062		0.026	1.79E-05		0.002	6.46E-07		0.059	4.05E-05		0.163	0.000112
20.9	522	3.07E-02	3.06E-02		21	0.014412		150	0.102945		3	0.002059		0.028	1.78E-05		0.002	8.45E-07		0.059	4.05E-05		0.163	0.000112
21	528	3.11E-02	3.09E-02		21	0.014518		150	0.1037		3	0.002074		0.026	1.8E-05		0.002	6.5E-07		0.059	4.08E-05		0.163	0.000113
21.1	534	3.15E-02	3.13E-02		21	0.014702		150	0.105013		3	0.0021		0.026	1.82E-05		0.002	6.58E-07		0.059	4.13E-05		0.163	0.000114
21.2	540	3.15E-02	3.15E-02		21	0.014807		150	0.105764		3	0.002115		0.028	1.63E-05		0.002	6.63E-07		0.059	4.16E-05		0.183	0.000115
21.3	546	3.12E-02	3.13E-02		21	0.014741		150	0.105293		3	0.002106		0.026	1.83E-05		0.002	6.6E-07		0.059	4.14E-05		0.163	0.000114
21.4	552	3.07E-02	3.09E-02		21	0.014543		150	0.103881		3	0.002078		0.026	1.8E-05		0.002	6.51E-07		0.059	4.09E-05		0.163	0.000113
21.5	558	3.00E-02	3.03E-02		21	0.014253		150	0.10181		3	0.002036		0.026	1.76E-05		0.002	6.38E-07		0.059	4E-05		0.163	0.000111
21.6	564	2.92E-02	2.96E-02		21	0.01391		150	0.099361		3	0.001987		0.026	1.72E-05		0.002	6.23E-07		0.059	3.91E-05		0.163	0.000108
21.7	570	2.83E-02	2.88E-02		21	0.013532		150	0.096658		3	0.001933		0.026	1.68E-05		0.002	6.06E-07		0.059	3.8E-05		0.163	0.000105
21.8	576	2.74E-02	2.79E-02		21	0.013097		150	0.093551		3	0.001871		0.026	1.62E-05		0.002	5.87E-07		0.059	3.68E-05		0.163	0.000102
21.9	582	2.63E-02	2.68E-02		21	0.012619		150	0.090133		3	0.001803		0.028	1.56E-05		0.002	5.65E-07		0.059	3.55E-05		0.183	9.79E-05
22	588	2.52E-02	2.58E-02		21	0.012118		150	0.086546		3	0.001731		0.026	1.5E-05		0.002	5.43E-07		0.059	3.4E-05		0.163	9.4E-05
22.1	584	2.41E-02	2.47E-02		21	0.011607		150	0.08291		3	0.001658		0.028	1.44E-05		0.002	5.2E-07		0.059	3.28E-05		0.183	9.01E-05
22.2	600	2.31E-02	2.36E-02		21	0.011099		150	0.079276		3	0.001586		0.028	1.37E-05		0.002	4.97E-07		0.059	3.12E-05		0.183	8.81E-05
22.3	606	2.19E-02	2.25E-02		21	0.010581		150	0.075582		3	0.001512		0.028	1.31E-05		0.002	4.74E-07		0.059	2.97E-05		0.163	8.21E-05
22.4	612	2.08E-02	2.14E-02		21	0.010061		150	0.071865		3	0.001437		0.026	1.25E-05		0.002	4.51E-07		0.059	2.83E-05		0.183	7.81E-05
22.5	618	1.97E-02	2.03E-02		21	0.009542		150	0.068155		3	0.001363		0.028	1.16E-05		0.002	4.27E-07		0.059	2.88E-05		0.163	7.41E-05

Conduit CSO 1005D

Time (hours)	Time (minutes)	Flow (ft^3/s)	Mean Flow	CBOD Conc.	CBOD Mean Conc.	CBOD Discharge lbs.	SS Conc. mg/l	SS Mean Conc.	SS Discharge lbs.	TKN Conc. mg/l	TKN Mean Conc.	TKN Discharge lbs.	Cu Conc. mg/l	Cu Mean Conc.	Cu Discharge lbs.	Cd Conc. mg/l	Cd Mean Conc.	Cd Discharge lbs.	Pb Conc. mg/l	Pb Mean Conc.	Pb Discharge lbs.	Zn Conc. mg/l	Zn Mean Conc.	Zn Discharge lbs.
22.6	624	1.86E-02	1.92E-02		21	0.009023		150	0.064449		3	0.001289		0.026	1.12E-05		0.002	4.04E-07		0.059	2.53E-05		0.163	7E-05
22.7	630	1.74E-02	1.80E-02		21	0.008467		150	0.060482		3	0.00121		0.026	1.05E-05		0.002	3.79E-07		0.059	2.38E-05		0.163	6.57E-05
22.8	636	1.60E-02	1.67E-02		21	0.007843		150	0.056024		3	0.00112		0.026	9.71E-06		0.002	3.51E-07		0.059	2.2E-05		0.163	6.09E-05
22.9	642	1.45E-02	1.52E-02		21	0.007169		150	0.051208		3	0.001024		0.028	8.88E-06		0.002	3.21E-07		0.059	2.01E-05		0.163	5.56E-05
23	648	1.30E-02	1.38E-02		21	0.006475		150	0.046248		3	0.000925		0.026	8.02E-06		0.002	2.9E-07		0.059	1.82E-05		0.163	5.03E-05
23.1	654	1.16E-02	1.23E-02		21	0.005789		150	0.041347		3	0.000827		0.026	7.17E-06		0.002	2.59E-07		0.059	1.63E-05		0.163	4.49E-05
23.2	660	1.02E-02	1.09E-02		21	0.005132		150	0.036655		3	0.000733		0.026	6.35E-06		0.002	2.3E-07		0.059	1.44E-05		0.163	3.98E-05
23.3	666	8.29E-03	9.26E-03		21	0.004354		150	0.031104		3	0.000622		0.028	5.39E-06		0.002	1.95E-07		0.059	1.22E-05		0.163	3.38E-05
23.4	672	6.83E-03	7.56E-03		21	0.003554		150	0.025382		3	0.000508		0.026	4.4E-06		0.002	1.59E-07		0.059	9.98E-06		0.163	2.76E-05
23.5	678	5.54E-03	6.18E-03		21	0.002908		150	0.020772		3	0.000415		0.026	3.6E-06		0.002	1.3E-07		0.059	8.17E-06		0.163	2.26E-05
23.6	684	4.37E-03	4.96E-03		21	0.002331		150	0.016647		3	0.000333		0.026	2.89E-06		0.002	1.04E-07		0.059	6.55E-06		0.163	1.81E-05
23.7	690	3.35E-03	3.86E-03		21	0.001816		150	0.012968		3	0.000259		0.026	2.25E-06		0.002	8.13E-08		0.059	5.1E-06		0.163	1.41E-05
23.8	696	2.47E-03	2.91E-03		21	0.00137		150	0.009785		3	0.000196		0.028	1.7E-06		0.002	6.14E-08		0.059	3.85E-06		0.163	1.06E-06
23.9	702	1.72E-03	2.10E-03		21	0.000987		150	0.007048		3	0.000141		0.026	1.22E-06		0.002	4.42E-08		0.059	2.77E-06		0.163	7.66E-06
24	708	1.11E-03	1.41E-03		21	0.000665		150	0.004749		3	9.5E-05		0.026	8.23E-07		0.002	2.98E-08		0.059	1.87E-06		0.163	5.16E-06
24.09972	714	6.09E-04	8.57E-04		21	0.000403		150	0.002879		3	5.76E-05		0.026	4.99E-07		0.002	1.81E-08		0.059	1.13E-06		0.163	3.13E-06
24.19972	720	2.58E-04	4.33E-04		21	0.000204		150	0.001455		3	2.91E-05		0.026	2.52E-07		0.002	9.12E-09		0.059	5.72E-07		0.163	1.58E-06
24.29972	726	2.38E-05	1.41E-04		21	6.62E-05		150	0.000473		3	9.45E-06		0.026	8.19E-08		0.002	2.96E-09		0.059	1.86E-07		0.163	5.14E-07
	732		1.19E-05		21	5.59E-06		150	3.99E-05		3	7.98E-07		0.026	6.91E-09		0.002	2.5E-10		0.059	1.57E-08		0.163	4.34E-08

Conduit CSO 1006 - S4CSO6.XLS

Summary Statistics

Total Discharge Volume (cf)	Duration (hr)	CBOD (lbs)	SS (lbs)	TKN (lbs)	Cu (lbs)	Cd (lbs)	Pb (lbs)	Zn (lbs)
3.11E+05	11.60	570.18	4817.64	141.87	0.65	0.04	1.42	3.56

Conduit CSO 1006

Time (hours)	Time (minutes)	Flow (ft^3/s)	Mean Flow	CBOD Conc.	CBOD Mean Conc.	CBOD Discharge lbs.	SS Conc. mg/l	SS Mean Conc.	SS Discharge lbs.	TKN Conc. mg/l	TKN Mean Conc.	TKN Discharge lbs.	Cu Conc. mg/l	Cu Mean Conc.	Cu Discharge lbs.	Cd Conc. mg/l	Cd Mean Conc.	Cd Discharge lbs.	Pb Conc. mg/l	Pb Mean Conc.	Pb Discharge lbs.	Zn Conc. mg/l	Zn Mean Conc.	Zn Discharge lbs.
12.3	0	0.705074		108	94.5		390	377.5		29	24.5		0.051	0.0525		0.003	0.003		0.135	0.112		0.227	0.238	
12.4	6	3.870605	2.29E+00		94.5	4.841455		377.5	19.3402		24.5	1.255192		0.0525	0.00269		0.003	0.000325		0.112	0.005738		0.238	0.012193
12.5	12	4.958531	4.41E+00		94.5	9.341973		377.5	37.31846		24.5	2.421993		0.0525	0.00519		0.003	0.000628		0.112	0.011072		0.238	0.023528
12.8	18	6.140353	5.55E+00	81	76.5	11.74356	365	334	46.9121	20	17	3.044826	0.054	0.054	0.006524	0.003	0.0035	0.000789	0.089	0.093	0.013918	0.249	0.2445	0.029576
12.7	24	7.311224	6.73E+00		76.5	11.52188		334	50.30466		17	2.560417		0.054	0.008133		0.0035	0.000903		0.093	0.014007		0.2445	0.036825
12.8	30	8.302563	7.81E+00	72	76.5	13.37391	303	289	58.39065	14	12.5	2.971979	0.054	0.0485	0.00944	0.004	0.0035	0.001048	0.097	0.0905	0.016258	0.24	0.23	0.042744
12.9	36	9.103542	8.70E+00		76.5	14.90911		289	56.32329		12.5	2.436129		0.0485	0.009452		0.0035	0.001169		0.0905	0.017638		0.23	0.044825
13	42	9.777443	9.44E+00		76.5	16.17241		289	81.09576		12.5	2.64255		0.0485	0.010253		0.0035	0.001268		0.0905	0.019132		0.23	0.048823
13.1	48	10.34845	1.01E+01	45	41.5	17.23701	275	260	65.11761	11	9.5	2.816505	0.043	0.042	0.010928	0.003	0.003	0.001351	0.084	0.099	0.020391	0.22	0.214	0.051824
13.2	54	11.01174	1.07E+01		41.5	9.924328		260	62.17652		9.5	2.271834		0.842	0.010044		0.003	0.000667		0.099	0.023675		0.214	0.051176
13.3	60	11.95534	1.15E+01	38	40.5	10.67192	245	236.5	66.86021	8	8.5	2.442969	0.041	0.04	0.0108	0.003	0.003	0.000717	0.114	0.092	0.025458	0.208	0.194	0.055031
13.4	66	13.16736	1.26E+01		40.5	11.39226		236.5	66.52518		8.5	2.390968		0.04	0.011252		0.003	0.000765		0.092	0.025879		0.194	0.05457
13.5	72	14.52524	1.38E+01		40.5	12.55762		238.5	73.3303		8.5	2.63555		0.04	0.012403		0.003	0.000844		0.092	0.028526		0.194	0.060153
13.6	78	15.94761	1.52E+01		40.5	13.81837		236.5	80.69243		8.5	2.900151		0.04	0.013648		0.003	0.000928		0.092	0.03139		0.194	0.066192
13.7	84	17.0756	1.85E+01		40.5	14.97486		236.5	87.44581		8.5	3.142873		0.04	0.01479		0.003	0.001006		0.092	0.034017		0.194	0.071731
13.8	90	17.643	1.74E+01	43	37	15.74366	228	298.5	91.93522	9	8.5	3.304228	0.039	0.038	0.015549	0.003	0.003	0.001058	0.07	0.0685	0.035763	0.18	0.175	0.076414
13.9	96	17.83679	1.77E+01		37	14.69844		298.5	118.5807		8.5	3.376669		0.038	0.015096		0.003	0.000987		0.0685	0.027212		0.175	0.06952
14	102	17.81305	1.78E+01		37	14.76889		298.5	119.149		8.5	3.392853		0.038	0.015168		0.003	0.000992		0.0685	0.027342		0.175	0.069853
14.1	108	17.63779	1.77E+01		37	14.68645		298.5	118.4839		8.5	3.373914		0.038	0.015083		0.003	0.000987		0.0685	0.02719		0.175	0.069463
14.2	114	17.43704	1.75E+01		37	14.53068		298.5	117.2272		8.5	3.338129		0.038	0.014923		0.003	0.000976		0.0685	0.026901		0.175	0.068726
14.3	120	17.29237	1.74E+01	31	24.5	14.38758	369	316.5	116.0728	8	8.5	3.305255	0.037	0.0345	0.014776	0.003	0.003	0.000967	0.067	0.0745	0.026636	0.17	0.187	0.068049
14.4	126	17.18889	1.72E+01		24.5	9.458838		316.5	122.1927		8.5	3.281638		0.0345	0.01332		0.003	0.000635		0.0745	0.028763		0.187	0.072198
14.5	132	17.10866	1.71E+01		24.5	9.408443		316.5	121.5417		8.5	3.264154		0.0345	0.013249		0.003	0.000632		0.0745	0.028609		0.187	0.071811
14.6	138	17.02973	1.71E+01		24.5	9.364783		318.5	120.9777		8.5	3.249006		0.0345	0.013187		0.003	0.000629		0.0745	0.028477		0.187	0.071478
14.7	144	16.70028	1.69E+01		24.5	9.277445		316.5	119.8494		8.5	3.218705		0.0345	0.013064		0.003	0.000623		0.0745	0.028211		0.187	0.070812
14.8	150	16.28774	1.65E+01		24.5	9.073904		318.5	117.22		8.5	3.148089		0.0345	0.012778		0.003	0.00061		0.0745	0.027592		0.187	0.069258
14.9	156	15.61366	1.60E+01		24.5	8.751136		318.5	113.0504		8.5	3.036108		0.0345	0.012323		0.003	0.000588		0.0745	0.028611		0.187	0.066794
15	162	14.8335	1.52E+01		24.5	8.352211		316.5	107.8969		8.5	2.897706		0.0345	0.011761		0.003	0.000561		0.0745	0.025398		0.187	0.06375
15.1	168	13.99334	1.44E+01		24.5	7.907728		316.5	102.1549		8.5	2.743497		0.0345	0.011135		0.003	0.000531		0.0745	0.024046		0.187	0.060357
15.2	174	13.25336	1.36E+01		24.5	7.474266		318.5	96.55532		8.5	2.593113		0.0345	0.010525		0.003	0.000502		0.0745	0.022728		0.187	0.057048
15.3	180	12.73252	1.30E+01		24.5	7.128401		316.5	92.0873		8.5	2.473119		0.0345	0.010038		0.003	0.000479		0.0745	0.021676		0.187	0.054409
15.4	186	12.3756	1.26E+01		24.5	6.887615		318.5	88.97674		8.5	2.389581		0.0345	0.009699		0.003	0.000463		0.0745	0.020944		0.187	0.052571
15.5	192	12.11884	1.22E+01		24.5	6.719271		316.5	86.80202		8.5	2.331176		0.0345	0.009462		0.003	0.000451		0.0745	0.020432		0.187	0.051286
15.6	198	11.92685	1.20E+01		24.5	6.596171		316.5	85.21176		8.5	2.288458		0.0345	0.009288		0.003	0.000443		0.0745	0.020058		0.187	0.050346
15.7	204	11.73176	1.18E+01		24.5	6.489988		316.5	83.84005		8.5	2.251628		0.0345	0.009139		0.003	0.000436		0.0745	0.019735		0.187	0.049536
15.8	210	11.47523	1.16E+01		24.5	8.3661		316.5	82.23962		8.5	2.208647		0.0345	0.008965		0.003	0.000428		0.0745	0.019358		0.187	0.04859
15.9	216	11.16082	1.13E+01		24.5	6.209481		316.5	80.21636		8.5	2.15431		0.0345	0.008744		0.003	0.000417		0.0745	0.018882		0.187	0.047395
16	222	10.82381	1.10E+01		24.5	6.030785		318.5	77.90789		8.5	2.092313		0.0345	0.008492		0.003	0.000405		0.0745	0.018339		0.187	0.046031
16.1	228	10.47022	1.06E+01		24.5	5.841341		316.5	75.46058		8.5	2.026588		0.0345	0.008226		0.003	0.000392		0.0745	0.017762		0.187	0.044585
16.2	234	10.14021	1.03E+01		24.5	5.653817		316.5	73.03808		8.5	1.961528		0.0345	0.007961		0.003	0.00038		0.0745	0.017192		0.187	0.043154
16.3	240	9.869646	1.00E+01	18	19.5	5.489068	264	207	70.9098	9	6	1.904371	0.032	0.029	0.00773	0.003	0.0025	0.000389	0.082	0.0705	0.018891	0.204	0.1835	0.041898
16.4	246	9.648329	9.76E+00		19.5	4.261455		207	45.23699		6	1.311217		0.029	0.006338		0.0025	0.000239		0.0705	0.015407		0.1835	0.040101
16.5	252	9.457596	9.55E+00		19.5	4.171491		207	44.28198		6	1.283538		0.029	0.006204		0.0025	0.000234		0.0705	0.015082		0.1835	0.039255
16.6	258	9.286929	9.37E+00		19.5	4.092584		207	43.44438		6	1.259257		0.029	0.006088		0.0025	0.000229		0.0705	0.014798		0.1835	0.038512
16.7	264	9.142991	9.21E+00		19.5	4.023895		207	42.71519		6	1.238122		0.029	0.005984		0.0025	0.000225		0.0705	0.014548		0.1835	0.037866
16.8	270	9.038104	9.09E+00		19.5	3.969131		207	42.13385		6	1.221271		0.029	0.005003		0.0025	0.000222		0.0705	0.01435		0.1835	0.037351
18.9	278	8.956245	9.00E+00		19.5	3.928358		207	41.70103		6	1.208726		0.029	0.005842		0.0025	0.00022		0.0705	0.014203		0.1835	0.036967

Conduit CSO 1006

Time (hours)	Time (minutes)	Flow (ft^3/s)	Mean Flow	CBOD Conc.	CBOD Mean Conc.	CBOD Discharge lbs.	SS Conc. mg/l	SS Mean Conc.	SS Discharge lbs.	TKN Conc. mg/l	TKN Mean Conc.	TKN Discharge lbs.	Cu Conc. mg/l	Cu Mean Conc.	Cu Discharge lbs.	Cd Conc. mg/l	Cd Mean Conc.	Cd Discharge lbs.	Pb Conc. mg/l	Pb Mean Conc.	Pb Discharge lbs.	Zn Conc. mg/l	Zn Mean Conc.	Zn Discharge lbs.
17	282	8.894718	8.93E+00		19.5	3.897489		207	41.37334		6	1.199227		0.029	0.005796		0.0025	0.000218		0.0705	0.014091		0.1835	0.036676
17.1	288	8.841304	8.87E+00		19.5	3.872393		207	41.10694		6	1.191506		0.029	0.005759		0.0025	0.000217		0.0705	0.014		0.1835	0.03644
17.2	294	8.785971	8.81E+00		19.5	3.84865		207	40.8549		6	1.1842		0.029	0.005724		0.0025	0.000215		0.0705	0.013914		0.1835	0.036217
17.3	300	8.715234	8.75E+00		19.5	3.821124		207	40.5627		8	1.175731		0.029	0.005883		0.0025	0.000214		0.0705	0.013815		0.1835	0.035958
17.4	306	8.629514	8.67E+00		19.5	3.786964		207	40.20008		6	1.16522		0.029	0.005632		0.0025	0.000212		0.0705	0.013691		0.1835	0.035636
17.5	312	8.538118	8.58E+00		19.5	3.748294		207	39.78958		6	1.153321		0.029	0.005574		0.0025	0.00021		0.0705	0.013552		0.1835	0.035272
17.6	318	8.44498	8.49E+00		19.5	3.707999		207	39.36183		6	1.140923		0.029	0.005514		0.0025	0.000208		0.0705	0.013406		0.1835	0.034893
17.7	324	8.363278	8.40E+00		19.5	3.669825		207	38.95661		6	1.129177		0.029	0.005458		0.0025	0.000205		0.0705	0.013268		0.1835	0.034534
17.8	330	8.305735	8.33E+00		19.5	3.639428		207	38.63392		6	1.119824		0.029	0.005412		0.0025	0.000204		0.0705	0.013158		0.1835	0.034248
17.9	336	8.269848	8.29E+00		19.5	3.610029		207	38.41738		6	1.113547		0.029	0.005382		0.0025	0.000203		0.0705	0.013084		0.1835	0.034056
18	342	8.245545	8.26E+00		19.5	3.605887		207	38.27788		8	1.109504		0.029	0.005363		0.0025	0.000202		0.0705	0.013037		0.1835	0.033932
18.1	348	8.22516	8.24E+00	21	21	3.59613	150	150	38.1743	3	3	1.100502	0.028	0.028	0.005348	0.002	0.002	0.000201	0.059	0.059	0.013001	0.163	0.163	0.033841
18.2	354	8.135888	8.18E+00		21	3.846972		150	27.47837		3	0.549567		0.026	0.004763		0.002	0.000172		0.059	0.010808		0.163	0.02986
18.3	360	7.907058	8.02E+00		21	3.772178		150	28.94412		3	0.538882		0.028	0.00487		0.002	0.000169		0.059	0.010598		0.163	0.029279
18.4	366	7.560688	7.73E+00		21	3.63693		150	25.97807		3	0.519561		0.026	0.004503		0.002	0.000163		0.059	0.010218		0.163	0.02823
18.5	372	7.142095	7.35E+00		21	3.457064		150	24.69331		3	0.493866		0.026	0.00426		0.002	0.000155		0.059	0.009713		0.163	0.026833
18.6	378	6.677166	6.91E+00		21	3.249322		150	23.20944		3	0.464189		0.028	0.004023		0.002	0.000146		0.059	0.009129		0.163	0.025221
18.7	384	8.228591	8.45E+00		21	3.034529		150	21.67521		3	0.433504		0.026	0.003757		0.002	0.000136		0.059	0.008526		0.163	0.023554
18.8	390	5.837367	6.03E+00		21	2.837068		150	20.26477		3	0.405295		0.026	0.003513		0.002	0.000127		0.059	0.007971		0.163	0.022021
18.9	396	5.503139	5.87E+00		21	2.668492		150	19.04637		3	0.380927		0.026	0.003301		0.002	0.000119		0.059	0.007492		0.163	0.020697
19	402	5.203432	5.35E+00		21	2.517435		150	17.98168		3	0.359634		0.028	0.003117		0.002	0.000113		0.059	0.007073		0.163	0.01954
19.1	408	4.93011	5.07E+00		21	2.382699		150	17.01928		3	0.340386		0.026	0.00295		0.002	0.000107		0.059	0.006694		0.163	0.018494
19.2	414	4.713253	4.82E+00		21	2.207443		150	16.19602		3	0.32392		0.026	0.002887		0.002	0.000102		0.059	0.00637		0.163	0.0176
19.3	420	4.592529	4.85E+00		21	2.188068		150	15.82905		3	0.312581		0.026	0.002709		0.002	9.8E-05		0.059	0.006147		0.163	0.016984
19.4	426	4.565725	4.58E+00		21	2.153379		150	15.38128		3	0.307626		0.026	0.002666		0.002	9.64E-05		0.059	0.00605		0.163	0.016714
19.5	432	4.612001	4.59E+00		21	2.158146		150	15.41533		3	0.308307		0.026	0.002672		0.002	9.67E-05		0.059	0.006063		0.163	0.016751
19.6	438	4.702249	4.66E+00		21	2.100247		150	15.64462		3	0.312892		0.026	0.002712		0.002	9.81E-05		0.059	0.006154		0.163	0.017
19.7	444	4.750173	4.73E+00		21	2.224898		150	15.89213		3	0.317843		0.026	0.002755		0.002	9.96E-05		0.059	0.006251		0.163	0.017269
19.8	450	4.897293	4.73E+00		21	2.223733		150	15.88381		3	0.317878		0.028	0.002753		0.002	9.86E-05		0.059	0.006248		0.163	0.01726
19.9	456	4.505795	4.60E+00		21	2.163921		150	15.45858		3	0.309132		0.026	0.002679		0.002	9.69E-05		0.059	0.00608		0.163	0.016796
20	462	4.223756	4.36E+00		21	2.052579		150	14.66128		3	0.293226		0.026	0.002541		0.002	9.19E-05		0.059	0.005767		0.163	0.015932
20.1	468	3.891578	4.06E+00		21	1.908158		150	13.6297		3	0.272594		0.028	0.002362		0.002	8.55E-05		0.059	0.005361		0.163	0.014811
20.2	474	3.511599	3.70E+00		21	1.740708		150	12.43363		3	0.248673		0.028	0.002155		0.002	7.8E-05		0.059	0.004891		0.163	0.013511
20.3	480	3.233009	3.37E+00		21	1.585859		150	11.32756		3	0.228551		0.026	0.001963		0.002	7.1E-05		0.059	0.004456		0.163	0.012309
20.4	486	3.028791	3.13E+00		21	1.472336		150	10.51669		3	0.210334		0.026	0.001823		0.002	6.59E-05		0.059	0.004137		0.163	0.011428
20.5	492	2.800726	2.95E+00		21	1.389504		150	9.92503		3	0.198501		0.026	0.00172		0.002	6.22E-05		0.059	0.003004		0.163	0.010785
20.6	498	2.774271	2.83E+00		21	1.329659		150	9.497564		3	0.189951		0.026	0.001648		0.002	5.96E-05		0.059	0.003736		0.163	0.010321
20.7	504	2.703616	2.74E+00		21	1.288015		150	9.200108		3	0.184002		0.026	0.001595		0.002	5.77E-05		0.059	0.003619		0.163	0.009997
20.8	510	2.672886	2.69E+00		21	1.264176		150	9.029832		3	0.180597		0.026	0.001565		0.002	5.66E-05		0.059	0.003552		0.163	0.009812
20.9	516	2.874415	2.67E+00		21	1.25731		150	8.980789		3	0.179616		0.026	0.001557		0.002	5.63E-05		0.059	0.003532		0.163	0.009759
21	522	2.708314	2.69E+00		21	1.266641		150	9.84029		3	0.180806		0.026	0.001567		0.002	5.87E-05		0.059	0.003556		0.163	0.009824
21.1	528	2.762567	2.74E+00		21	1.286368		150	9.188341		3	0.183787		0.026	0.001593		0.002	5.76E-05		0.059	0.003614		0.163	0.009985
21.2	534	2.814873	2.79E+00		21	1.311423		150	9.367307		3	0.187346		0.026	0.001624		0.002	5.87E-05		0.059	0.003684		0.163	0.010179
21.3	540	2.835493	2.83E+00		21	1.32857		150	9.489786		3	0.189796		0.026	0.001645		0.002	5.95E-05		0.059	0.003733		0.163	0.010312
21.4	646	2.8174	2.83E+00		21	1.329164		150	9.49403		3	0.189881		0.028	0.001846		0.002	5.95E-05		0.059	0.003734		0.163	0.010317
21.5	552	2.769131	2.79E+00		21	1.313561		150	9.382575		3	0.187652		0.026	0.001828		0.002	5.88E-05		0.059	0.00369		0.163	0.010196
21.6	558	2.702775	2.74E+00		21	1.286609		150	9.190063		3	0.183801		0.026	0.001593		0.002	5.76E-05		0.059	0.003615		0.163	0.009987
21.7	564	2.627081	2.66E+00		21	1.253209		150	8.95149		3	0.17003		0.026	0.001552		0.002	5.61E-05		0.059	0.003521		0.163	0.009727
21.8	570	2.549916	2.59E+00		21	1.217267		150	8.694763		3	0.173895		0.026	0.001507		0.002	5.45E-05		0.059	0.00342		0.163	0.009448
21.9	576	2.47457	2.51E+00		21	1.181407		150	8.438621		3	0.168772		0.026	0.001463		0.002	5.29E-05		0.059	0.003319		0.163	0.00917
22	582	2.399636	2.44E+00		21	1.146072		150	8.186226		3	0.163725		0.026	0.001419		0.002	5.13E-05		0.059	0.00322		0.163	0.008896
22.1	588	2.325478	2.36E+00		21	1.111015		150	7.935823		3	0.158716		0.026	0.001376		0.002	4.88E-05		0.059	0.003121		0.163	0.008624
22.2	594	2.253004	2.29E+00		21	1.076538		150	7.689554		3	0.153791		0.026	0.001333		0.002	4.82E-05		0.059	0.003025		0.163	0.008356
22.3	600	2.182129	2.22E+00		21	1.042832		150	7.448803		3	0.148976		0.026	0.001291		0.002	4.67E-05		0.059	0.00293		0.163	0.008094
22.4	606	2.113937	2.15E+00		21	1.010134		150	7.21524		3	0.144305		0.026	0.001251		0.002	4.52E-05		0.059	0.002838		0.163	0.007841
22.5	612	2.047076	2.08E+00		21	0.978379		150	6.968419		3	0.139768		0.026	0.001211		0.002	4.38E-05		0.059	0.002749		0.163	0.007594
22.6	618	1.977494	2.01E+00		21	0.948297		150	8.759263		3	0.135185		0.028	0.001172		0.002	4.24E-05		0.059	0.002859		0.163	0.007345

Conduit CSO 1006

Time (hours)	Time (minutes)	Flow (ft^3/s)	Mean Flow	CBOD Conc.	CBOD Mean Conc.	CBOD Discharge lbs.	SS Conc. mg/l	SS Mean Conc.	SS Discharge lbs.	TKN Conc. mg/l	TKN Mean Conc.	TKN Discharge lbs.	Cu Conc. mg/l	Cu Mean Conc.	Cu Discharge lbs.	Cd Conc. mg/l	Cd Mean Conc.	Cd Discharge lbs.	Pb Conc. mg/l	Pb Mean Conc.	Pb Discharge lbs.	Zn Conc. mg/l	Zn Mean Conc.	Zn Discharge lbs.
22.7	624	1.898161	1.94E+00		21	0.911282		150	6.50916		3	0.130183		0.026	0.001128		0.002	4.06E-05		0.059	0.00256		0.163	0.007073
22.8	630	1.802097	1.85E+00		21	0.870041		150	6.214581		3	0.124292		0.026	0.001077		0.002	3.9E-05		0.059	0.002444		0.163	0.006753
22.9	636	1.666491	1.74E+00		21	0.820271		150	5.859081		3	0.117182		0.026	0.001016		0.002	3.67E-05		0.059	0.002305		0.163	0.006367
23	642	1.555239	1.62E+00		21	0.762228		150	5.444483		3	0.10889		0.026	0.000944		0.002	3.41E-05		0.059	0.002141		0.163	0.005916
23.1	648	1.411427	1.48E+00		21	0.697552		150	4.982514		3	0.09965		0.026	0.000864		0.002	3.12E-05		0.059	0.00196		0.163	0.005414
23.2	654	1.259764	1.34E+00		21	0.628077		150	4.486264		3	0.089725		0.026	0.000778		0.002	2.81E-05		0.059	0.001765		0.163	0.004875
23.3	660	1.095749	1.18E+00		21	0.553852		150	3.956083		3	0.079122		0.026	0.000686		0.002	2.48E-05		0.059	0.001556		0.163	0.004299
23.4	666	0.91964	1.01E+00		21	0.473878		150	3.384845		3	0.067697		0.026	0.000587		0.002	2.12E-05		0.059	0.001331		0.163	0.003678
23.5	672	0.732706	8.26E-01		21	0.388516		150	2.775115		3	0.055502		0.026	0.000481		0.002	1.74E-05		0.059	0.001092		0.163	0.003016
23.6	678	0.540629	6.37E-01		21	0.299399		150	2.138566		3	0.042771		0.026	0.000371		0.002	1.34E-05		0.059	0.000841		0.163	0.002324
23.7	684	0.350628	4.46E-01		21	0.209561		150	1.496866		3	0.029937		0.026	0.000259		0.002	9.39E-06		0.059	0.000589		0.163	0.001627
23.8	690	0.175477	2.63E-01		21	0.123703		150	0.883594		3	0.017672		0.026	0.000153		0.002	5.54E-06		0.059	0.000348		0.163	0.00096
23.9	696	3.68E-02	1.06E-01		21	0.049916		150	0.35654		3	0.007131		0.026	6.18E-05		0.002	2.24E-06		0.059	0.00014		0.163	0.000387
	702		1.84E-02		21	0.008656		150	0.061826		3	0.001237		0.026	1.07E-05		0.002	3.88E-07		0.059	2.43E-05		0.163	6.72E-05

Conduit CSO 1007 - S4CSO7.XLS

Summary Statistics

Total Discharge Volume (cf)	Duration (hr)	CBOD (lbs)	SS (lbs)	TKN (lbs)	Cu (lbs)	Cd (lbs)	Pb (lbs)	Zn (lbs)
9.07E+04	13.10	152.532	1385.508	39.048	0.184	0.009	0.404	1.027

Conduit CSO 1007

Time (hours)	Time (minutes)	Flow (ft^3/s)	Mean Flow	CBOD Conc.	CBOD Mean Conc.	CBOD Discharge lbs.	SS Conc. mg/l	SS Mean Conc.	SS Discharge lbs.	TKN Conc. mg/l	TKN Mean Conc.	TKN Discharge lbs.	Cu Conc. mg/l	Cu Mean Conc.	Cu Discharge lbs.	Cd Conc. mg/l	Cd Mean Conc.	Cd Discharge lbs.	Pb Conc. mg/l	Pb Mean Conc.	Pb Discharge lbs.	Zn Conc. mg/l	Zn Mean Conc.	Zn Discharge lbs.
11.4	0	0.540735		108	94.5		390	377.5		29	24.5		0.051	0.0525		0.003	0.003		0.135	0.112		0.227	0.238	
11.5	6	0.795406	6.68E-01		94.5	1.41375		377.5	5.647522		24.5	0.366528		0.0525	0.000785		0.003	9.5E-05		0.112	0.001676		0.238	0.003561
11.6	12	0.963876	8.80E-01		94.5	1.861469		377.5	7.436027		24.5	0.482503		0.0525	0.001034		0.003	0.000125		0.112	0.002200		0.238	0.004688
11.7	18	1.111409	1.04E+00	81	76.5	2.195827	365	334	8.771689	20	17	0.569288	0.054	0.054	0.00122	0.003	0.0035	0.000148	0.089	0.093	0.002602	0.249	0.2445	0.00553
11.8	24	1.256265	1.18E+00		76.5	2.028019		334	8.854356		17	0.450671		0.054	0.001432		0.0035	0.000159		0.093	0.002465		0.2445	0.006482
11.9	30	1.399753	1.33E+00	72	76.5	2.274998	303	289	9.932671	14	12.5	0.505555	0.054	0.9485	0.001600	0.004	0.0035	0.000178	0.097	0.0905	0.002766	0.24	0.23	0.007271
12	36	1.543431	1.47E+00		76.5	2.520969		289	9.523659		12.5	0.411923		0.0485	0.001598		0.0035	0.000198		0.0905	0.002982		0.23	0.007579
12.1	42	1.763746	1.65E+00		76.5	2.832745		289	10.70148		12.5	0.462867		0.0485	0.001796		0.0035	0.000222		0.0905	0.003351		0.23	0.008517
12.2	48	2.018204	1.89E+00	45	41.5	3.239409	275	260	12.23777	11	9.5	0.529315	0.043	0.042	0.002054	0.003	0.003	0.000254	0.084	0.099	0.003832	0.22	0.214	0.009739
12.3	64	2.280473	2.15E+00		41.5	1.99743		200	12.51402		9.5	0.457243		0.042	0.002021		0.003	0.000134		0.099	0.004765		0.214	0.0103
12.4	60	2.549098	2.41E+00	38	40.5	2.244116	245	236.5	14.05952	8	8.5	0.513713	0.041	0.04	0.002271	0.003	0.003	0.000151	0.114	0.092	0.005353	0.208	0.194	0.011572
12.5	66	2.822374	2.69E+00		40.5	2.435774		236.5	14.22372		8.5	0.511212		0.04	0.002406		0.003	0.000164		0.092	0.005533		0.194	0.011668
12.6	72	2.92552	2.87E+00		40.5	2.606468		238.5	15.22048		8.5	0.547036		0.04	0.002574		0.003	0.000175		0.092	0.005921		0.194	0.012485
12.7	78	2.961528	2.94E+00		40.5	2.669569		238.5	15.58897		8.5	0.55028		0.04	0.002637		0.003	0.000179		0.092	0.006064		0.194	0.012788
12.8	84	2.979903	2.97E+00		40.5	2.69423		236.5	15.73297		8.5	0.565458		0.04	0.002661		0.003	0.000181		0.092	0.00612		0.194	0.012906
12.9	90	2.986682	2.98E+00	43	37	2.705636	228	298.5	15.79958	9	8.5	0.56785	0.039	0.038	0.002672	0.003	0.003	0.000182	0.07	0.0685	0.006146	0.18	0.175	0.01296
13	96	2.989839	2.99E+00		37	2.475932		298.5	19.97475		8.5	0.588795		0.038	0.002543		0.003	0.000166		0.0685	0.004584		0.175	0.01171
13.1	102	3.239779	3.11E+00		37	2.580784		298.5	20.82065		8.5	0.592883		0.038	0.002851		0.003	0.000173		0.0685	0.004778		0.175	0.012206
13.2	108	3.587445	3.41E+00		37	2.828359		298.5	22.81797		8.5	0.649758		0.038	0.002905		0.003	0.00019		0.0685	0.005236		0.175	0.013377
13.3	114	3.964088	3.78E+00		37	3.128423		298.5	25.23876		8.5	0.718692		0.038	0.003213		0.003	0.00021		0.0685	0.005792		0.175	0.014797
13.4	120	4.351226	4.16E+00	31	24.5	3.444839	389	316.5	27.79147	8	8.5	0.791382	0.037	0.0345	0.003538	0.003	0.003	0.000231	0.067	0.0745	0.006378	0.17	0.187	0.016293
13.5	128	4.682155	4.52E+00		24.5	2.478021		316.5	32.01199		8.5	0.859722		0.0345	0.003489		0.003	0.000166		0.0745	0.007535		0.187	0.018914
13.8	132	5.599552	5.14E+00		24.5	2.82046		316.5	36.43573		8.5	0.978527		0.0345	0.003972		0.003	0.000189		0.0745	0.008578		0.187	0.021528
13.7	138	5.515946	5.56E+00		24.5	3.049184		316.5	39.39048		8.5	1.05788		0.0345	0.004294		0.003	0.000205		0.0745	0.009272		0.187	0.023273
13.8	144	5.46503	5.49E+00		24.5	3.012282		316.5	38.91376		8.5	1.045077		0.0345	0.004242		0.003	0.000202		0.0745	0.00918		0.187	0.022992
13.9	150	5.395734	5.43E+00		24.5	2.979306		318.5	38.48778		8.5	1.033637		0.0345	0.004195		0.003	0.0002		0.0745	0.00906		0.187	0.02274
14	158	5.276679	5.34E+00		24.5	2.927637		316.5	37.8203		8.5	1.015711		0.0345	0.004123		0.003	0.000197		0.0745	0.008902		0.187	0.022346
14.1	162	5.231516	5.25E+00		24.5	2.882589		316.5	37.23835		8.5	1.000082		0.0345	0.004059		0.003	0.000194		0.0745	0.000765		0.187	0.022002
14.2	168	5.215827	5.22E+00		24.5	2.865897		316.5	37.02271		8.5	0.994291		0.0345	0.004036		0.003	0.000193		0.0745	0.008715		0.187	0.021874
14.3	174	5.207429	5.21E+00		24.5	2.859289		316.5	38.93735		8.5	0.991998		0.0345	0.004026		0.003	0.000192		0.0745	0.008695		0.187	0.021824
14.4	180	5.204806	5.21E+00		24.5	2.850266		316.5	38.89829		8.5	0.990949		0.0345	0.004022		0.003	0.000192		0.0745	0.008685		0.187	0.021001
14.5	186	5.203688	5.20E+00		24.5	2.85524		316.5	36.88503		8.5	0.990593		0.0345	0.004021		0.003	0.000192		0.0745	0.008682		0.187	0.021793
14.6	192	4.986994	5.10E+00		24.5	2.79549		316.5	38.11318		8.5	0.969864		0.0345	0.003937		0.003	0.000188		0.0745	0.008501		0.187	0.021337
14.7	198	4.672607	4.83E+00		24.5	2.649805		316.5	34.23115		8.5	0.91932		0.0345	0.003731		0.003	0.000178		0.0745	0.008058		0.187	0.020225
14.8	204	4.324259	4.50E+00		24.5	2.468004		316.5	31.88259		8.5	0.856246		0.0345	0.003475		0.003	0.000166		0.0745	0.007505		0.187	0.018837
14.9	210	3.929746	4.13E+00		24.5	2.264224		316.5	29.25008		8.5	0.785547		0.0345	0.003188		0.003	0.000152		0.0745	0.006885		0.187	0.017282
15	216	3.390209	3.66E+00		24.5	2.007997		316.5	25.94004		8.5	0.896652		0.0345	0.002828		0.003	0.000135		0.0745	0.006106		0.187	0.015326
15.1	222	3.225928	3.31E+00		24.5	1.814927		316.5	23.44589		8.5	0.829669		0.0345	0.002556		0.003	0.000122		0.0745	0.005519		0.187	0.013853
15.2	228	3.165977	3.20E+00		24.5	1.753416		316.5	22.65127		8.5	0.608328		0.0345	0.002469		0.003	0.000118		0.0745	0.005332		0.187	0.013383
15.3	234	3.130545	3.15E+00		24.5	1.727251		316.5	22.31328		8.5	0.59925		0.0345	0.002432		0.003	0.000116		0.0745	0.005252		0.187	0.013184
15.4	240	3.102854	3.12E+00	18	19.5	1.709935	264	207	22.08957	9	8	0.593243	0.032	0.029	0.002408	0.003	0.0025	0.000115	0.082	0.0705	0.0052	0.204	0.1835	0.013051
15.5	246	3.079926	3.09E+00		19.5	1.349917		207	14.32989		6	0.415359		0.029	0.002006		0.0025	7.56E-05		0.0705	0.00488		0.1835	0.012703
15.6	252	2.991455	3.04E+00		19.5	1.325594		207	14.0717		6	0.407875		0.029	0.001971		0.0025	7.42E-05		0.0705	0.004793		0.1835	0.012474
15.7	258	2.875561	2.93E+00		19.5	1.280974		207	13.59804		6	0.394146		0.029	0.001905		0.0025	7.17E-05		0.0705	0.004631		0.1835	0.012054
15.8	264	2.755484	2.82E+00		19.5	1.229454		207	13.05112		6	0.378293		0.029	0.001828		0.0025	8.88E-05		0.0705	0.004445		0.1835	0.011569
15.9	270	2.638654	2.70E+00		19.5	1.177729		207	12.50204		8	0.362378		0.029	0.001751		0.0025	6.59E-05		0.0705	0.004258		0.1835	0.011083
16	276	2.511554	2.58E+00		19.5	1.12447		207	11.93668		8	0.345991		0.029	0.001872		0.0025	6.3E-05		0.0705	0.004065		0.1835	0.010582

Conduit CSO 1007

Time (hours)	Time (minutes)	Flow (ft^3/s)	Mean Flow	CBOD Conc.	CBOD Mean Conc.	CBOD Discharge lbs.	SS Conc. mg/l	SS Mean Conc.	SS Discharge lbs.	TKN Conc. mg/l	TKN Mean Conc.	TKN Discharge lbs.	Cu Conc. mg/l	Cu Mean Conc.	Cu Discharge lbs.	Cd Conc. mg/l	Cd Mean Conc.	Cd Discharge lbs.	Pb Conc. mg/l	Pb Mean Conc.	Pb Discharge lbs.	Zn Conc. mg/l	Zn Mean Conc.	Zn Discharge lbs.
16.1	282	2.429296	2.47E+00		19.5	1.07876		207	11.45145		6	0.331926		0.029	0.001604		0.0025	6.04E-05		0.0705	0.0039		0.1835	0.010151
16.2	288	2.370451	2.40E+00		19.5	1.047952		207	11.12442		6	0.322447		0.029	0.001558		0.0025	5.87E-05		0.0705	0.003789		0.1835	0.009862
16.3	294	2.327538	2.35E+00		19.5	1.025735		207	10.88857		6	0.315611		0.029	0.001525		0.0025	5.74E-05		0.0705	0.003708		0.1835	0.009652
16.4	300	2.281862	2.30E+00		19.5	1.606393		207	10.68325		8	0.309659		0.029	0.001497		0.0025	5.63E-05		0.0705	0.003638		0.1835	0.00947
16.5	306	2.262811	2.27E+00		19.5	0.992261		207	10.53323		8	0.305311		0.029	0.001476		0.0025	5.56E-05		0.0705	0.003587		0.1835	0.009337
16.6	312	2.271943	2.27E+00		19.5	0.990095		207	10.51024		6	0.304645		0.029	0.001472		0.0025	5.54E-05		0.0705	0.00358		0.1835	0.009317
16.7	318	2.288663	2.28E+00		19.5	0.99574		207	10.57016		6	0.306381		0.029	0.001481		0.0025	5.57E-05		0.0705	0.0036		0.1835	0.00937
16.8	324	2.303376	2.30E+00		19.5	1.002602		207	10.64301		6	0.308493		0.029	0.001491		0.0025	5.61E-05		0.0705	0.003625		0.1835	0.009435
16.9	330	2.313499	2.31E+00		19.5	1.008025		207	10.70057		6	0.310162		0.029	0.001499		0.0025	5.64E-05		0.0705	0.003644		0.1835	0.009486
17	336	2.319055	2.32E+00		19.5	1.011448		207	10.73691		6	0.311215		0.029	0.001504		0.0025	5.66E-05		0.0705	0.003657		0.1835	0.009518
17.1	342	2.303067	2.31E+00		19.5	1.009171		207	10.71273		8	0.310514		0.029	0.001501		0.0025	5.65E-05		0.0705	0.003649		0.1835	0.009497
17.2	348	2.278057	2.29E+00	21	21	1.000219	150	150	10.61771	3	3	0.30776	0.026	0.026	0.001488	0.002	0.002	5.6E-05	0.059	0.059	0.003616	0.163	0.163	0.009412
17.3	354	2.24931	2.26E+00		21	1.064519		150	7.60371		3	0.152074		0.026	0.001318		0.002	4.77E-05		0.059	0.002991		0.163	0.008263
17.4	360	2.217346	2.23E+00		21	1.058244		150	7.601746		3	0.150035		0.026	0.0013		0.002	4.7E-05		0.059	0.002951		0.163	0.008152
17.5	366	2.184798	2.20E+00		21	1.035078		150	7.393398		3	0.147868		0.028	0.001282		0.002	4.64E-05		0.059	0.002908		0.163	0.008034
17.6	372	2.169537	2.18E+00		21	1.023834		150	7.313103		3	0.146262		0.026	0.001288		0.002	4.59E-05		0.059	0.002876		0.163	0.007947
17.7	378	2.163547	2.17E+00		21	1.018838		150	7.277412		3	0.145548		0.026	0.001261		0.002	4.56E-05		0.059	0.002862		0.163	0.007908
17.8	384	2.158978	2.16E+00		21	1.016355		150	7.259678		3	0.145194		0.026	0.001258		0.002	4.55E-05		0.059	0.002855		0.163	0.007889
17.9	390	2.155386	2.16E+00		21	1.014436		150	7.245972		3	0.144919		0.026	0.001256		0.002	4.54E-05		0.059	0.00285		0.163	0.007874
18	396	2.152783	2.15E+00		21	1.012979		150	7.235567		3	0.144711		0.026	0.001254		0.002	4.54E-05		0.059	0.002846		0.163	0.007863
18.1	402	2.055272	2.10E+00		21	0.98944		150	7.067426		3	0.141349		0.026	0.001225		0.002	4.43E-05		0.059	0.00278		0.163	0.00768
18.2	408	1.921339	1.99E+00		21	0.93502		150	6.678716		3	0.133574		0.026	0.001158		0.002	4.19E-05		0.059	0.002627		0.163	0.007258
18.3	414	1.7795	1.85E+00		21	0.870178		150	6.215557		3	0.124311		0.026	0.001077		0.002	3.9E-05		0.059	0.002445		0.163	0.006754
18.4	420	1.632624	1.71E+00		21	0.802292		150	5.73066		3	0.114613		0.028	0.000993		0.002	3.59E-05		0.059	0.002254		0.163	0.006227
18.5	426	1.483348	1.56E+00		21	0.732658		150	5.233273		3	0.104665		0.026	0.000807		0.002	3.28E-05		0.059	0.002058		0.163	0.005687
18.6	432	1.395592	1.44E+00		21	0.676925		158	4.835178		3	0.096704		0.026	0.000838		0.002	3.03E-05		0.059	0.001002		0.163	0.005254
18.7	438	1.331155	1.36E+00		21	0.64114		150	4.57957		3	0.091591		0.026	0.000794		0.002	2.87E-05		0.059	0.001801		0.163	0.004976
18.8	444	1.272043	1.30E+00		21	0.61209		150	4.372069		3	0.087441		0.026	0.000758		0.002	2.74E-05		0.059	0.00172		0.163	0.004751
18.9	450	1.216763	1.24E+00		21	0.585193		150	4.179948		3	0.083599		0.028	0.900725		0.002	2.62E-05		0.059	0.001644		0.163	0.004542
19	456	1.163975	1.19E+00		21	0.559783		150	3.998448		3	0.079969		0.026	0.000693		0.002	2.51E-05		0.059	0.001573		0.163	0.004345
19.1	462	1.170662	1.17E+00		21	0.548943		150	3.921021		3	0.07842		0.026	0.00068		0.002	2.46E-05		0.059	0.001542		0.163	0.004261
19.2	468	1.206424	1.19E+00		21	0.558924		150	3.992314		3	0.079846		0.026	0.000692		0.002	2.5E-05		0.059	0.00157		0.163	0.004338
19.3	474	1.24756	1.23E+00		21	0.577005		150	4.121465		3	0.082429		0.026	0.000714		0.002	2.68E-05		0.059	0.001621		0.163	0.004479
19.4	480	1.29283	1.27E+00		21	0.597322		150	4.266583		3	0.085332		0.026	0.00074		0.002	2.68E-05		0.059	0.001678		0.163	0.004636
19.5	486	1.34109	1.32E+00		21	0.619313		150	4.423667		3	0.088473		0.026	0.000787		0.002	2.77E-05		0.059	0.00174		0.163	0.004807
19.6	492	1.288906	1.31E+00		21	0.618391		150	4.417077		3	0.088342		0.026	0.000766		0.002	2.77E-05		0.059	0.001737		0.163	0.0048
19.7	498	1.188879	1.24E+00		21	0.582601		150	4.161438		3	0.083229		0.026	0.000721		0.002	2.61E-05		0.059	0.001637		0.163	0.004522
19.8	504	1.079595	1.13E+00		21	0.533386		150	3.809901		3	0.076198		0.026	0.00066		0.002	2.39E-05		0.059	0.001499		0.163	0.00414
19.9	510	0.964314	1.02E+00		21	0.400584		150	3.432744		3	0.068855		0.026	0.000595		0.002	2.15E-05		0.059	0.00135		0.163	0.00373
20	516	0.845396	9.05E-01		21	0.425517		150	3.039407		3	0.060788		0.026	0.000527		0.002	1.91E-05		0.059	0.001196		0.163	0.003303
20.1	522	0.792473	8.19E-01		21	0.385112		150	2.7508		3	0.055016		0.028	0.000477		0.002	1.72E-05		0.059	0.001082		0.163	0.002989
20.2	528	0.774476	7.83E-01		21	0.368438		150	2.631689		3	0.052634		0.026	0.000456		0.002	1.65E-05		0.059	0.001035		0.163	0.00288
20.3	534	0.761781	7.68E-01		21	0.36122		150	2.580142		3	0.051603		0.026	0.000447		0.002	1.62E-05		0.059	0.001015		0.163	0.002504
20.4	540	0.754066	7.58E-01		21	0.356421		158	2.545863		3	0.050917		0.026	0.000441		0.002	1.6E-05		0.059	0.001001		0.163	0.002767
20.5	546	0.749252	7.52E-01		21	0.353475		150	2.524821		3	0.050496		0.028	0.000438		0.002	1.58E-05		0.059	0.000993		0.163	0.002744
20.6	552	0.760379	7.55E-01		21	0.354959		150	2.535425		3	0.050708		0.026	0.000439		0.002	1.59E-05		0.059	0.000997		0.163	0.002755
20.7	558	0.780737	7.71E-01		21	0.362363		150	2.588304		3	0.051766		0.026	0.000449		0.002	1.62E-05		0.059	0.001018		0.163	0.002813
20.8	564	0.802966	7.92E-01		21	0.372376		150	2.659828		3	0.053197		0.026	0.000461		0.002	1.67E-05		0.059	0.001046		0.163	0.00289
20.9	570	0.826502	8.15E-01		21	0.383151		150	2.736791		3	0.054736		0.026	0.000474		0.002	1.72E-05		0.059	0.001076		0.163	0.002974
21	576	0.851284	8.39E-01		21	0.394512		150	2.817942		3	0.056359		0.028	0.000488		0.002	1.77E-05		0.059	0.001108		0.163	0.003062
21.1	582	0.84873	8.50E-01		21	0.399724		150	2.855172		3	0.057103		0.028	0.000495		0.002	1.79E-05		0.059	0.001123		0.163	0.003103
21.2	588	0.831653	8.40E-01		21	0.395106		150	2.822201		3	0.056444		0.026	0.000489		0.002	1.77E-05		0.059	0.00111		0.163	0.003067
21.3	594	0.812001	8.22E-01		21	0.386472		150	2.760515		3	0.05521		0.026	0.000478		0.002	1.73E-05		0.059	0.601086		0.163	0.003
21.4	600	0.780245	8.01E-01		21	0.376738		150	2.89097		3	0.053819		0.026	0.000466		0.002	1.69E-05		0.059	0.001058		0.183	0.002924
21.5	606	0.767154	7.79E-01		21	0.366191		150	2.815851		3	0.052313		0.028	0.000453		0.002	1.84E-05		0.059	0.001029		0.163	0.002842
21.6	812	0.74293	7.55E-01		21	0.355066		150	2.536186		3	0.050724		0.026	0.00044		0.002	1.59E-05		0.059	0.000998		0.163	0.002756
21.7	618	0.718319	7.31E-01		21	0.343583		150	2.454166		3	0.049083		0.028	0.000425		0.002	1.54E-05		0.059	0.000965		0.183	0.002887

Conduit CSO 1007

Time (hours)	Time (minutes)	Flow (ft^3/s)	Mean Flow	CBOD Conc.	CBOD Mean Conc.	CBOO Discharge lbs.	SS Conc. mg/l	SS Mean Conc.	SS Discharge lbs.	TKN Conc. mg/l	TKN Mean Conc.	TKN Discharge lbs.	Cu Conc. mg/l	Cu Mean Conc.	Cu Discharge lbs.	Cd Conc. mg/l	Cd Mean Conc.	Cd Discharge lbs.	Pb Conc. mg/l	Pb Mean Conc.	Pb Discharge lbs.	Zn Conc. mg/l	Zn Mean Conc.	Zn Discharge lbs.
21.8	624	0.69328	7.06E-01		21	0.331909		150	2.37078		3	0.047416		0.026	0.000411		0.002	1.49E-05		0.059	0.000933		0.163	0.002576
21.9	630	0.66817	6.81E-01		21	0.320118		150	2.286554		3	0.045731		0.026	0.000396		0.002	1.43E-05		0.059	0.000899		0.163	0.002485
22	636	0.84308	6.56E-01		21	0.308314		150	2.202243		3	0.044045		0.026	0.000382		0.002	1.38E-05		0.059	0.000866		0.163	0.002393
22.1	642	0.618027	6.31E-01		21	0.296524		150	2.118028		3	0.042361		0.026	0.000367		0.002	1.33E-05		0.059	0.000833		0.163	0.002302
22.2	648	0.593365	6.06E-01		21	0.284834		150	2.034531		3	0.040691		0.026	0.000353		0.002	1.28E-05		0.059	0.0008		0.163	0.002211
22.3	654	0.569167	5.81E-01		21	0.273346		150	1.952472		3	0.039049		0.026	0.000338		0.002	1.22E-05		0.059	0.000768		0.163	0.002122
22.4	660	0.545451	5.57E-01		21	0.26208		150	1.672		3	0.03744		0.026	0.000324		0.002	1.17E-05		0.059	0.000736		0.163	0.002034
22.5	666	0.52215	5.34E-01		21	0.251025		150	1.793034		3	0.035861		0.026	0.000311		0.002	1.12E-05		0.059	0.000705		0.163	0.001948
22.6	672	0.493912	5.08E-01		21	0.238906		150	1.706474		3	0.034129		0.026	0.000296		0.002	1.07E-05		0.059	0.000671		0.163	0.001854
22.7	678	0.462831	4.78E-01		21	0.224959		150	1.606849		3	0.032137		0.026	0.000279		0.002	1.01E-05		0.059	0.000632		0.163	0.001746
22.8	684	0.431403	4.47E-01		21	0.210261		150	1.501868		3	0.030037		0.026	0.00026		0.002	9.42E-06		0.059	0.000591		0.163	0.001632
22.9	690	0.399703	4.16E-01		21	0.195418		150	1.395842		3	0.027917		0.026	0.000242		0.002	8.75E-06		0.059	0.000549		0.163	0.001517
23	696	0.367791	3.84E-01		21	0.180461		150	1.289006		3	0.02578		0.026	0.000223		0.002	8.08E-06		0.059	0.000507		0.163	0.001401
23.1	702	0.336689	3.52E-01		21	0.165644		150	1.183174		3	0.023663		0.026	0.000205		0.002	7.42E-06		0.059	0.000465		0.163	0.001286
23.2	708	0.308615	3.23E-01		21	0.15173		150	1.083788		3	0.021676		0.026	0.000188		0.002	6.8E-06		0.059	0.000426		0.163	0.001178
23.3	714	0.277294	2.93E-01		21	0.137765		150	0.984034		3	0.019681		0.026	0.000171		0.002	6.17E-06		0.059	0.000387		0.163	0.001069
23.4	720	0.245688	2.61E-01		21	0.122969		150	0.878347		3	0.017567		0.026	0.000152		0.002	5.51E-06		0.059	0.000345		0.163	0.000954
23.5	726	0.213876	2.30E-01		21	0.108057		150	0.771837		3	0.015437		0.026	0.000134		0.002	4.84E-06		0.059	0.000304		0.163	0.000839
23.6	732	0.182167	1.98E-01		21	0.093122		150	0.665155		3	0.013303		0.026	0.000115		0.002	4.17E-06		0.059	0.000262		0.163	0.000723
23.7	738	0.150644	1.66E-01		21	0.078254		150	0.558956		3	0.011179		0.026	9.69E-05		0.002	3.5E-06		0.059	0.00022		0.163	0.000607
23.8	744	0.11983	1.35E-01		21	0.063597		150	0.454261		3	0.009085		0.028	7.87E-05		0.002	2.85E-06		0.059	0.000179		0.163	0.000494
23.9	750	9.01E-02	1.05E-01		21	0.04935		150	0.352503		3	0.00705		0.026	6.11E-05		0.002	2.21E-06		0.059	0.000139		0.163	0.000383
24	756	6.14E-02	7.57E-02		21	0.035608		150	0.25434		3	0.005087		0.026	4.41E-05		0.002	1.59E-06		0.059	0.0001		0.163	0.000276
24.09972	762	3.50E-02	4.82E-02		21	0.022662		150	0.161875		3	0.003237		0.026	2.81E-05		0.002	1.01E-06		0.059	8.37E-05		0.163	0.000176
24.19972	768	1.25E-02	2.37E-02		21	0.011166		150	0.079757		3	0.001595		0.026	1.38E-05		0.002	5E-07		0.059	3.14E-05		0.163	8.67E-05
24.29972	774	1.66E-03	7.07E-03		21	0.003327		150	0.023764		3	0.000475		0.026	4.12E-06		0.002	1.49E-07		0.059	9.35E-06		0.163	2.58E-05
24.39972	780	3.60E-04	1.01E-03		21	0.000475		150	0.003395		3	6.79E-05		0.026	5.88E-07		0.002	2.13E-08		0.059	1.34E-06		0.163	3.69E-06
24.49972	786	1.26E-04	2.43E-04		21	0.000114		150	0.000816		3	1.63E-05		0.026	1.41E-07		0.002	5.11E-09		0.059	3.21E-07		0.163	8.86E-07
	792		6.29E-05		21	2.96E-05		150	0.000211		3	4.22E-06		0.026	3.66E-08		0.002	1.32E-09		0.059	8.31E-08		0.163	2.29E-07

Conduit CSO 1009 - S4CSO9.XLS

Summary Statistics

Total Discharge Volume (cf)	Duration (hr)	CBOD (lbs)	SS (lbs)	TKN (lbs)	Cu (lbs)	Cd (lbs)	Pb (lbs)	Zn (lbs)
2.93E+04	8.70	52.340	499.113	14.471	0.063	0.003	0.137	0.340

Conduit CSO 1009

Time (hours)	Time (minutes)	Flow (ft^3/s)	Mean Flow	CBOD Conc.	CBOD Mean Conc.	CBOD Discharge lbs.	SS Conc. mg/l	SS Mean Conc.	SS Discharge lbs.	TKN Conc. mg/l	TKN Mean Conc.	TKN Discharge lbs.	Cu Conc. mg/l	Cu Mean Conc.	Cu Discharge lbs.	Cd Conc. mg/l	Cd Mean Conc.	Cd Discharge lbs.	Pb Conc. mg/l	Pb Mean Conc.	Pb Discharge lbs.	Zn Conc. mg/l	Zn Mean Conc.	Zn Discharge lbs.
12.6	0	5.45E-03		108	94.5		300	377.5		29	24.5		0.051	0.0525		0.003	0.003		0.135	0.112		0.227	0.238	
12.7	6	4.07E-02	2.31E-02		94.5	0.048829		377.5	0.195059		24.5	0.012659		0.0525	2.71E-05		0.003	3.28E-06		0.112	5.79E-05		0.238	0.000123
12.8	12	0.109114	7.49E-02		94.5	0.158517		377.5	0.633228		24.5	0.041097		0.0525	8.81E-05		0.003	1.06E-05		0.112	0.000188		0.238	0.000399
12.9	18	0.176839	1.43E-01	81	76.5	0.302663	365	334	1.20865	20	17	0.078442	0.054	0.054	0.000168	0.003	0.0035	2.03E-05	0.089	0.093	0.000359	0.249	0.2445	0.000762
13	24	0.257079	2.17E-01		76.5	0.37167		334	1.622718		17	0.082593		0.054	0.000262		0.0035	2.91E-05		0.093	0.000452		0.2445	0.001188
13.1	30	0.366698	3.12E-01	72	76.5	0.534293	303	289	2.332732	14	12.5	0.118732	0.054	0.8485	0.000377	0.004	0.0035	4.19E-05	0.097	0.0905	0.00065	0.24	0.23	0.001708
13.2	36	0.503099	4.35E-01		76.5	0.74502		289	2.814521		12.5	0.121735		0.0485	0.000472		0.0035	5.84E-05		0.0905	0.000881		0.23	0.00224
13.3	42	0.684698	5.94E-01		76.5	1.017401		289	3.843516		12.5	0.166242		0.0485	0.000645		0.0035	7.97E-05		0.0905	0.001204		0.23	0.003059
13.4	48	0.906631	7.96E-01	45	41.5	1.363044	275	280	5.149278	11	9.5	0.22272	0.043	0.042	0.000864	0.003	0.003	0.000107	0.084	0.099	0.001612	0.22	0.214	0.004098
13.5	54	1.190563	1.05E+00		41.5	0.974485		260	6.105208		9.5	0.223075		0.042	0.000986		0.003	6.55E-05		0.099	0.002325		0.214	0.005025
13.6	60	1.412573	1.30E+00	38	40.5	1.209577	245	236.5	7.578073	8	8.5	0.278891	0.041	0.84	0.001224	0.003	0.003	8.13E-05	0.114	0.092	0.002885	0.208	0.194	0.006237
13.7	66	1.579711	1.50E+00		40.5	1.356896		236.5	7.9236		8.5	0.284781		0.04	0.00134		0.003	9.12E-05		0.092	0.003082		0.194	0.0065
13.8	72	1.694878	1.64E+00		40.5	1.48491		238.5	8.671141		8.5	0.311848		0.84	0.001467		0.003	9.98E-05		0.092	0.003373		0.194	0.007113
13.9	78	1.770718	1.73E+00		40.5	1.571525		236.5	9.17693		8.5	0.329826		0.04	0.001552		0.003	0.000106		0.092	0.00357		0.194	0.007528
14	84	1.824426	1.80E+00		40.5	1.630271		230.5	9.51998		8.5	0.342156		0.04	0.00161		0.003	0.00011		0.092	0.003703		0.194	0.007809
14.1	90	1.866518	1.85E+00	43	37	1.673713	228	298.5	9.773859	9	8.5	0.351273	0.039	0.038	0.001653	0.003	0.003	0.000112	0.07	0.0685	0.003802	0.18	0.175	0.008017
14.2	96	1.899828	1.88E+00		37	1.560309		298.5	12.5879		8.5	0.356449		0.038	0.001802		0.003	0.000105		0.0685	0.002889		0.175	0.00738
14.3	102	1.924695	1.91E+00		37	1.58441		298.5	12.78234		8.5	0.363986		0.038	0.001627		0.003	0.000106		0.0685	0.002933		0.175	0.007494
14.4	108	1.944073	1.93E+00		37	1.60274		298.5	12.93021		8.5	0.368197		0.038	0.001848		0.003	0.000108		0.0685	0.002967		0.175	0.007581
14.5	114	1.963077	1.95E+00		37	1.61864		296.5	13.05849		8.5	0.37185		0.038	0.001862		0.003	0.000109		0.0685	0.002997		0.175	0.007656
14.6	120	1.969523	1.98E+00	31	24.5	1.637469	369	316.5	13.21039	8	8.5	0.376175	0.037	0.0345	0.001682	0.003	0.003	0.00011	0.067	0.0745	0.003032	0.17	0.187	0.007745
14.7	128	1.985169	1.99E+00		24.5	1.09033		316.5	14.08529		8.5	0.378278		0.0345	0.001535		0.003	7.32E-05		0.0745	0.003315		0.187	0.008322
14.8	132	1.928068	1.96E+00		24.5	1.073472		316.5	13.86751		8.5	0.372429		0.0345	0.001512		0.003	7.21E-05		0.0745	0.003264		0.187	0.008193
14.9	138	1.863753	1.90E+00		24.5	1.040166		318.5	13.43724		8.5	0.360874		0.0345	0.001465		0.003	8.99E-05		0.0745	0.003163		0.187	0.007939
15	144	1.80933	1.84E+00		24.5	1.007594		316.5	13.01648		8.5	0.349573		0.0345	0.001419		0.003	6.77E-05		0.0745	0.003064		0.187	0.007691
15.1	150	1.770547	1.79E+00		24.5	0.982028		316.5	12.68617		8.5	0.340703		0.0345	0.001383		0.003	6.6E-05		0.0745	0.002986		0.187	0.007495
15.2	156	1.782864	1.78E+00		24.5	0.974765		318.5	12.59238		8.5	0.338184		0.0345	0.001373		0.003	6.55E-05		0.0745	0.002964		0.187	0.00744
15.3	162	1.78681	1.78E+00		24.5	0.979227		316.5	12.65001		8.5	0.339732		0.0345	0.001379		0.003	6.58E-05		0.0745	0.002978		0.187	0.007474
15.4	168	1.784435	1.79E+00		24.5	0.979658		316.5	12.65558		8.5	0.339881		0.0345	0.00138		0.003	8.58E-05		0.0745	0.002979		0.187	0.007477
15.5	174	1.749608	1.77E+00		24.5	0.969452		316.5	12.52374		8.5	0.336341		0.0345	0.001365		0.003	6.51E-05		0.0745	0.002948		0.187	0.007399
15.6	180	1.782745	1.77E+00		24.5	0.968989		318.5	12.51775		8.5	0.33618		0.0345	0.001364		0.003	6.51E-05		0.0745	0.002947		0.187	0.007398
15.7	186	1.958207	1.87E+00		24.5	1.026211		318.5	13.25697		8.5	0.356033		0.0345	0.001445		0.003	6.89E-05		0.0745	0.003121		0.187	0.007833
15.8	192	2.057688	2.01E+00		24.5	1.101833		316.5	14.2313		8.5	0.382199		0.0345	0.001551		0.003	7.4E-05		0.0745	0.00335		0.187	0.008408
15.9	198	2.212044	2.13E+00		24.5	1.171265		318.5	15.13084		8.5	0.406357		0.0345	0.001649		0.003	7.87E-05		0.0745	0.003562		0.187	0.00894
18	204	2.71023	2.46E+00		24.5	1.358269		316.5	17.44328		8.5	0.468481		0.0345	0.001901		0.003	9.07E-05		0.0745	0.004106		0.187	0.010306
16.1	210	2.661762	2.69E+00		24.5	1.473635		316.5	19.03896		8.5	0.511261		0.0345	0.002075		0.003	9.9E-05		0.0745	0.004481		0.187	0.011248
16.2	216	1.526327	2.09E+00		24.5	1.148869		316.5	14.84151		8.5	0.398587		0.0345	0.001618		0.003	7.72E-05		0.0745	0.003494		0.187	0.008769
16.3	222	1.820305	1.67E+00		24.5	0.918042		316.5	11.85961		8.5	0.318504		0.0345	0.001293		0.003	6.17E-05		0.0745	0.002792		0.187	0.007007
16.4	228	1.692724	1.76E+00		24.5	0.963688		316.5	12.44927		8.5	0.334341		0.0345	0.001357		0.003	6.47E-05		0.0745	0.00293		0.187	0.007355
16.5	234	1.456137	1.57E+00		24.5	0.86379		318.5	11.15876		8.5	0.299682		0.0345	0.001216		0.003	5.8E-05		0.0745	0.002627		0.187	0.006593
16.6	240	1.279525	1.37E+00	18	19.5	0.750442	264	207	9.694485	9	8	0.280357	0.032	0.029	0.001057	0.003	0.0025	5.04E-05	0.082	0.0705	0.002282	0.204	0.1835	0.005728
16.7	246	1.138997	1.21E+00		19.5	0.527611		207	5.000795		6	0.162342		0.029	0.000785		0.0025	2.95E-05		0.0705	0.001908		0.1835	0.004965
16.8	252	1.059006	1.10E+00		19.5	0.479464		207	5.089696		8	0.147527		0.029	0.000713		0.0025	2.86E-05		0.0705	0.001733		0.1835	0.004512
16.9	258	1.0165	1.04E+00		19.5	0.453155		207	4.810419		8	0.139432		0.029	0.000674		0.0025	2.54E-05		0.0705	0.001638		0.1835	0.004264
17	264	0.982814	1.00E+00		19.5	0.43652		207	4.633829		8	0.134314		0.029	0.000649		0.0025	2.44E-05		0.0705	0.001578		0.1835	0.004108
17.1	270	0.955407	9.69E-01		19.5	0.423181		207	4.492232		6	0.13021		0.029	0.000629		0.0025	2.37E-05		0.0705	0.00153		0.1835	0.003982
17.2	276	0.930533	9.43E-01		19.5	0.411767		207	4.37106		8	0.126897		0.029	0.000612		0.0025	2.31E-05		0.0705	0.001489		0.1835	0.003875

Conduit CSO 1009

Time (hours)	Time (minutes)	Flow (ft^3/s)	Mean Flow	CBOD Conc.	CBOD Mean Conc.	CBOD Discharge lbs.	SS Conc. mg/l	SS Mean Conc.	SS Discharge lbs.	TKN Conc. mg/l	TKN Mean Conc.	TKN Discharge lbs.	Cu Conc. mg/l	Cu Mean Conc.	Cu Discharge lbs.	Cd Conc. mg/l	Cd Mean Conc.	Cd Discharge lbs.	Pb Conc. mg/l	Pb Mean Conc.	Pb Discharge lbs.	Zn Conc. mg/l	Zn Mean Conc.	Zn Discharge lbs.
17.3	282	0.906043	9.18E-01		19.5	0.400989		207	4.256649		6	0.123381		0.029	0.000596		0.0025	2.24E-05		0.0705	0.00145		0.1835	0.003773
17.4	288	0.881642	8.94E-01		19.5	0.390314		207	4.143332		6	0.120097		0.029	0.00058		0.0025	2.19E-05		0.0705	0.001411		0.1835	0.003673
17.5	294	0.857563	8.70E-01		19.5	0.379729		207	4.030972		6	0.11684		0.029	0.000565		0.0025	2.13E-05		0.0705	0.001373		0.1835	0.003573
17.6	300	0.838561	8.47E-01		19.5	0.369886		207	3.926486		6	0.113811		0.029	0.00055		0.0025	2.07E-05		0.0705	0.001337		0.1835	0.003481
17.7	306	0.817382	8.27E-01		19.5	0.361113		207	3.833359		6	0.111112		0.029	0.000537		0.0025	2.02E-05		0.0705	0.001306		0.1835	0.003388
17.8	312	0.800545	8.09E-01		19.5	0.35325		207	3.749885		6	0.108692		0.029	0.000525		0.0025	1.98E-05		0.0705	0.001277		0.1835	0.003324
17.9	318	0.788119	7.94E-01		19.5	0.346861		207	3.682062		6	0.106726		0.029	0.000516		0.0025	1.94E-05		0.0705	0.001254		0.1835	0.003264
18	324	0.777935	7.83E-01		19.5	0.341924		207	3.629657		6	0.105207		0.029	0.000509		0.0025	1.91E-05		0.0705	0.001236		0.1835	0.003218
18.1	330	0.766156	7.72E-01		19.5	0.337129		207	3.578752		6	0.103732		0.029	0.000501		0.0025	1.89E-05		0.0705	0.001219		0.1835	0.003172
18.2	336	0.743223	7.55E-01		19.5	0.32955		207	3.498301		6	0.1014		0.029	0.00049		0.0025	1.84E-05		0.0705	0.001191		0.1835	0.003101
18.3	342	0.704872	7.24E-01		19.5	0.31617		207	3.356263		6	0.097283		0.029	0.00047		0.0025	1.77E-05		0.0705	0.001143		0.1835	0.002975
18.4	348	0.646817	6.76E-01	21	21	0.295121	150	150	3.132823	3	3	0.090806	0.026	0.028	0.000439	0.002	0.002	1.65E-05	0.059	0.059	0.001067	0.163	0.163	0.002777
18.5	354	0.57957	6.13E-01		21	0.28836		150	2.059716		3	0.041194		0.026	0.000357		0.002	1.29E-05		0.059	0.00081		0.163	0.002238
18.6	360	0.512033	5.46E-01		21	0.256668		150	1.833346		3	0.036667		0.026	0.000318		0.002	1.15E-05		0.059	0.000721		0.163	0.001992
18.7	366	0.44817	4.80E-01		21	0.225772		150	1.612659		3	0.032253		0.026	0.00028		0.002	1.01E-05		0.059	0.000634		0.163	0.001752
18.8	372	0.390363	4.19E-01		21	0.197164		150	1.408316		3	0.028166		0.026	0.000244		0.002	8.83E-06		0.059	0.000554		0.163	0.00153
18.9	378	0.338745	3.65E-01		21	0.171435		150	1.224537		3	0.024491		0.026	0.000212		0.002	7.68E-06		0.059	0.000482		0.163	0.001331
19	384	0.289053	3.14E-01		21	0.147614		150	1.054386		3	0.021088		0.026	0.000183		0.002	6.61E-06		0.059	0.000415		0.163	0.001146
19.1	390	0.246096	2.68E-01		21	0.12583		150	0.898782		3	0.017976		0.026	0.000156		0.002	5.64E-06		0.059	0.000354		0.163	0.000977
19.2	396	0.210465	2.28E-01		21	0.107351		150	0.766793		3	0.015336		0.026	0.000133		0.002	4.81E-06		0.059	0.000302		0.163	0.000833
19.3	402	0.184811	1.98E-01		21	0.092941		150	0.663865		3	0.013277		0.026	0.000115		0.002	4.16E-06		0.059	0.000261		0.163	0.000721
19.4	408	0.167648	1.76E-01		21	0.082874		150	0.591954		3	0.011839		0.026	0.000103		0.002	3.71E-06		0.059	0.000233		0.163	0.000643
19.5	414	0.150846	1.59E-01		21	0.074887		150	0.534909		3	0.010698		0.026	9.27E-05		0.002	3.35E-06		0.059	0.00021		0.163	0.000581
19.6	420	0.137151	1.44E-01		21	0.067717		150	0.48369		3	0.009674		0.026	8.38E-05		0.002	3.03E-06		0.059	0.00019		0.163	0.000526
19.7	426	0.12426	1.31E-01		21	0.061466		150	0.43904		3	0.008781		0.026	7.61E-05		0.002	2.75E-06		0.059	0.000173		0.163	0.000477
19.8	432	0.108283	1.16E-01		21	0.054678		150	0.390556		3	0.007811		0.026	6.77E-05		0.002	2.45E-06		0.059	0.000154		0.163	0.000424
19.9	438	8.92E-02	9.88E-02		21	0.046443		150	0.331736		3	0.006635		0.026	5.75E-05		0.002	2.08E-06		0.059	0.00013		0.163	0.00036
20	444	6.62E-02	7.77E-02		21	0.036555		150	0.261104		3	0.005222		0.026	4.53E-05		0.002	1.64E-06		0.059	0.000103		0.163	0.000284
20.1	450	4.70E-02	5.66E-02		21	0.026623		150	0.190166		3	0.003803		0.026	3.3E-05		0.002	1.19E-06		0.059	7.48E-05		0.163	0.000207
20.2	456	2.54E-02	3.62E-02		21	0.017016		150	0.121545		3	0.002431		0.026	2.11E-05		0.002	7.62E-07		0.059	4.78E-05		0.163	0.000132
20.3	462	1.19E-02	1.86E-02		21	0.008768		150	0.062629		3	0.001253		0.026	1.09E-05		0.002	3.93E-07		0.059	2.46E-05		0.163	6.81E-05
20.4	468	5.27E-03	8.59E-03		21	0.004041		150	0.028867		3	0.000577		0.026	5E-06		0.002	1.81E-07		0.059	1.14E-05		0.163	3.14E-05
20.5	474	2.57E-03	3.92E-03		21	0.001842		150	0.013157		3	0.000263		0.026	2.28E-06		0.002	8.25E-08		0.059	5.18E-06		0.163	1.43E-05
20.6	480	1.91E-03	2.24E-03		21	0.001052		150	0.007512		3	0.00015		0.026	1.3E-06		0.002	4.71E-08		0.059	2.95E-06		0.163	8.16E-06
20.7	486	2.25E-03	2.08E-03		21	0.000977		150	0.006979		3	0.00014		0.026	1.21E-06		0.002	4.38E-08		0.059	2.75E-06		0.163	7.58E-06
20.8	492	3.04E-03	2.64E-03		21	0.001243		150	0.008882		3	0.000178		0.026	1.54E-06		0.002	5.57E-08		0.059	3.49E-06		0.163	9.65E-06
20.9	498	3.65E-03	3.35E-03		21	0.001574		150	0.01124		3	0.000225		0.026	1.95E-06		0.002	7.05E-08		0.059	4.42E-06		0.163	1.22E-05
21	504	3.64E-03	3.65E-03		21	0.001714		150	0.012246		3	0.000245		0.026	2.12E-06		0.002	7.68E-08		0.059	4.82E-06		0.163	1.33E-05
21.1	510	2.97E-03	3.30E-03		21	0.001553		150	0.01109		3	0.000222		0.026	1.92E-06		0.002	6.95E-08		0.059	4.36E-06		0.163	1.21E-05
21.2	516	1.91E-03	2.44E-03		21	0.001146		150	0.008183		3	0.000164		0.026	1.42E-06		0.002	5.13E-08		0.059	3.22E-06		0.163	8.89E-06
21.3	522	7.92E-04	1.35E-03		21	0.000634		150	0.004532		3	9.06E-05		0.026	7.86E-07		0.002	2.84E-08		0.059	1.78E-06		0.163	4.92E-06
	528		3.96E-04		21	0.000186		150	0.00133		3	2.66E-05		0.026	2.31E-07		0.002	8.34E-09		0.059	5.23E-07		0.163	1.45E-06

Conduit CSO 1033 - S4CSO33.XLS

Summary Statistics

Total Discharge Volume (cf)	Duration (hr)	CBOD (lbs)	SS (lbs)	TKN (lbs)	Cu (lbs)	Cd (lbs)	Pb (lbs)	Zn (lbs)
1.17E+04	11.40	21.835	197.990	5.772	0.025	0.001	0.054	0.135

Conduit CSO 1033

Time (hours)	Time (minutes)	Flow (ft^3/s)	Mean Flow	CBOD Conc.	CBOD Mean Conc.	CBOD Discharge lbs.	SS Conc. mg/l	SS Mean Conc.	SS Discharge lbs.	TKN Conc. mg/l	TKN Mean Conc.	TKN Discharge lbs.	Cu Conc. mg/l	Cu Mean Conc.	Cu Discharge lbs.	Cd Conc. mg/l	Cd Mean Conc.	Cd Discharge lbs.	Pb Conc. mg/l	Pb Mean Conc.	Pb Discharge lbs.	Zn Conc. mg/l	Zn Mean Conc.	Zn Discharge lbs.
12	0	1.70E-03		108	94.5		390	377.5		29	24.5		0.051	0.0525		0.003	0.003		0.135	0.112		0.227	0.238	
12.1	6	1.42E-02	7.96E-03		94.5	0.016847		377.5	0.067298		24.5	0.004368		0.0525	9.36E-06		0.003	1.13E-06		0.112	2E-05		0.238	4.24E-05
12.2	12	4.02E-02	2.72E-02		94.5	0.057616		377.5	0.23016		24.5	0.014938		0.0525	3.2E-05		0.003	3.87E-06		0.112	6.83E-05		0.238	0.000145
12.3	18	9.32E-02	6.67E-02	81	76.5	0.141149	365	334	0.56385	20	17	0.036594	0.054	0.054	7.84E-05	0.003	0.0035	9.48E-06	0.089	0.093	0.000167	0.249	0.2445	0.000355
12.4	24	0.176408	1.35E-01		76.5	0.230905		334	1.008136		17	0.051312		0.064	0.000163		0.0035	1.81E-05		0.093	0.000281		0.2445	0.000738
12.5	30	0.254048	2.15E-01	72	76.5	0.368705	303	289	1.809771	14	12.5	0.081934	0.064	0.0485	0.00026	0.004	0.0035	2.89E-05	0.097	0.0905	0.000448	0.24	0.23	0.001178
12.6	36	0.340497	2.97E-01		76.5	0.509255		289	1.923851		12.5	0.083212		0.0485	0.000323		0.0035	3.99E-05		0.0905	0.000602		0.23	0.001531
12.7	42	0.409065	3.75E-01		76.5	0.642034		289	2.425461		12.5	0.104007		0.0485	0.000407		0.0035	5.03E-05		0.0005	0.00076		0.23	0.00193
12.8	48	0.440649	4.25E-01	45	41.5	0.727818	275	260	2.749535	11	9.5	0.118925	0.043	0.042	0.000461	0.003	0.003	5.7E-05	0.084	0.099	0.000861	0.22	0.214	0.002188
12.9	54	0.456409	4.49E-01		41.5	0.416828		260	2.611454		9.5	0.095419		0.042	0.000422		0.003	2.8E-05		0.099	0.000994		0.214	0.002149
13	60	0.469161	4.63E-01	38	40.5	0.430077	245	238.5	2.694458	8	8.5	0.098451	0.041	0.04	0.000435	0.003	0.003	2.89E-05	0.114	0.092	0.001026	0.208	0.194	0.002218
13.1	66	0.486809	4.78E-01		40.5	0.433499		236.5	2.53142		8.5	0.090981		0.04	0.000428		0.003	2.91E-05		0.092	0.000985		0.194	0.002077
13.2	72	0.549213	5.18E-01		40.5	0.4698		236.5	2.743398		8.5	0.0986		0.04	0.000464		0.003	3.16E-05		0.092	0.001067		0.194	0.00225
13.3	78	0.655248	8.02E-01		40.5	0.646181		236.5	3.189428		8.5	0.114631		0.04	0.000539		0.003	3.67E-05		0.092	0.001241		0.194	0.002616
13.4	84	0.781545	7.18E-01		40.5	0.651535		236.5	3.804644		8.5	0.136742		0.04	0.000643		0.003	4.38E-05		0.092	0.00148		0.194	0.003121
13.5	90	0.923669	8.53E-01	43	37	0.773255	228	298.5	4.515425	9	8.5	0.162288	0.039	0.038	0.000764	0.003	0.003	5.19E-05	0.07	0.0685	0.001757	0.18	0.175	0.003704
13.6	96	1.065725	9.95E-01		37	0.824159		298.5	8.04896		8.5	0.189334		0.038	0.000846		0.003	5.54E-05		0.0685	0.001526		0.175	0.003898
13.7	102	1.120388	1.09E+00		37	0.905655		298.5	7.306435		8.5	0.208058		0.038	0.00093		0.003	6.08E-05		0.0685	0.001677		0.175	0.004284
13.8	108	1.104073	1.11E+00		37	0.921542		298.5	7.434602		8.5	0.211706		0.038	0.000946		0.003	6.19E-05		0.0685	0.001706		0.175	0.004359
13.9	114	1.064935	1.00E+00		37	0.898569		298.5	7.249267		8.5	0.206428		0.038	0.000923		0.003	6.04E-05		0.0685	0.001664		0.175	0.00425
14	120	1.021087	1.04E+00	31	24.5	0.86419	369	316.5	6.971911	8	8.5	0.19853	0.037	0.0345	0.000888	0.803	0.003	5.81E-05	0.067	0.0745	0.0016	0.17	0.187	0.004087
14.1	128	0.979387	1.00E+00		24.5	0.548787		316.5	7.089168		8.5	0.190388		0.0345	0.000773		0.003	3.69E-05		0.0745	0.001669		0.187	0.004189
14.2	132	0.956979	9.68E-01		24.5	0.531181		318.5	6.661986		8.5	0.104287		0.0345	0.000748		0.003	3.57E-05		0.0745	0.001615		0.187	0.004054
14.3	138	0.950479	9.54E-01		24.5	0.52325		318.5	6.759541		8.5	0.181536		0.0345	0.000737		0.003	3.52E-05		0.0745	0.001591		0.187	0.003994
14.4	144	0.949985	9.50E-01		24.5	0.521332		318.5	8.734758		8.5	0.18087		0.0345	0.000734		0.003	3.5E-05		0.0745	0.001585		0.187	0.003979
14.5	150	0.950706	9.50E-01		24.5	0.521394		316.5	6.735561		8.5	0.180892		0.0345	0.000734		0.003	3.5E-05		0.0745	0.001585		0.187	0.00398
14.6	156	0.945994	9.48E-01		24.5	0.520299		316.5	8.721415		8.5	0.180512		0.0345	0.000733		0.003	3.5E-05		0.0745	0.001582		0.187	0.003971
14.7	162	0.901981	9.24E-01		24.5	0.506933		318.5	6.548749		8.5	0.175875		0.0345	0.000714		0.003	3.41E-05		0.0745	0.001541		0.187	0.003869
14.8	168	0.829919	8.66E-01		24.5	0.475092		316.5	8.13741		8.5	0.164828		0.0345	0.000669		0.003	3.19E-05		0.0745	0.001445		0.187	0.003626
14.9	174	0.740441	7.89E-01		24.5	0.432973		316.5	5.593301		8.5	0.150215		0.0345	0.00061		0.003	2.91E-05		0.0745	0.001317		0.187	0.003305
15	160	0.666848	7.08E-01		24.5	0.38824		316.5	5.015421		8.5	0.134895		0.0345	0.000547		0.003	2.61E-05		0.0745	0.001181		0.187	0.002963
15.1	186	0.588708	6.28E-01		24.5	0.344422		318.5	4.449367		8.5	0.110493		0.0345	0.000485		0.003	2.31E-05		0.0745	0.001047		0.187	0.002629
15.2	192	0.534943	5.62E-01		24.5	0.308238		316.5	3.961928		8.5	0.10694		0.0345	0.000434		0.003	2.07E-05		0.0745	0.000937		0.187	0.002353
15.3	198	0.509668	5.22E-01		24.5	0.286556		318.5	3.701832		8.5	0.099417		0.0345	0.000404		0.003	1.93E-05		0.0745	0.000871		0.187	0.002187
15.4	204	0.494197	5.02E-01		24.5	0.275379		316.5	3.557441		8.5	0.095539		0.0345	0.000388		0.003	1.85E-05		0.0745	0.000837		0.187	0.002102
15.5	210	0.481231	4.88E-01		24.5	0.267578		318.5	3.456669		8.5	0.092833		0.0345	0.000377		0.003	1.8E-05		0.0745	0.000814		0.187	0.002042
15.6	218	0.467506	4.74E-01		24.5	0.260278		316.5	3.362366		8.5	0.0903		0.0345	0.000367		0.003	1.75E-05		0.0745	0.000791		0.187	0.001987
15.7	222	0.444144	4.56E-01		24.5	0.250104		318.5	3.230939		8.5	0.086771		0.0345	0.000352		0.003	1.68E-05		0.0745	0.000761		0.187	0.001909
15.8	228	0.411938	4.28E-01		24.5	0.234839		316.5	3.033737		8.5	0.081475		0.0345	0.000331		0.003	1.58E-05		0.0745	0.000714		0.187	0.001792
15.9	234	0.378766	3.94E-01		24.5	0.216356		318.5	2.704965		8.5	0.075062		0.0345	0.000305		0.003	1.45E-05		0.0745	0.000658		0.187	0.001651
16	240	0.343638	3.60E-01	18	19.5	0.19782	264	207	2.552927	9	8	0.068562	0.032	0.029	0.000278	0.003	0.0025	1.33E-05	0.082	0.0705	0.000601	0.204	0.1835	0.001508
16.1	246	0.313286	3.28E-01		19.5	0.143429		207	1.522559		6	0.044132		0.029	0.000213		0.0025	8.03E-06		0.0705	0.000519		0.1835	0.00135
16.2	252	0.291752	3.03E-01		19.5	0.132101		207	1.4023		8	0.040648		0.029	0.000196		0.0025	7.4E-06		0.0705	0.000478		0.1835	0.001243
18.3	258	0.279468	2.86E-01		19.5	0.124717		207	1.323921		6	0.038375		0.029	0.000185		0.0025	8.98E-06		0.0705	0.000451		0.1835	0.001174
18.4	264	0.271524	2.75E-01		19.5	0.120301		207	1.27704		6	0.037016		0.029	0.000179		0.0025	6.73E-06		0.0705	0.000435		0.1835	0.001132
16.5	270	0.264866	2.68E-01		19.5	0.117113		207	1.243197		8	0.036035		0.029	0.000174		0.0025	8.56E-06		0.0705	0.000423		0.1835	0.001102
16.8	278	0.258739	2.82E-01		19.5	0.114321		207	1.213565		8	0.035176		0.029	0.00017		0.0025	8.4E-06		0.0705	0.000413		0.1835	0.001076

Conduit CSO 1033

Time (hours)	Time (minutes)	Flow (ft^3/s)	Mean Flow	CBOD Conc.	CBOD Mean Conc.	CBOD Discharge lbs.	SS Conc. mg/l	SS Mean Conc.	SS Discharge lbs.	TKN Conc. mg/l	TKN Mean Conc.	TKN Discharge lbs.	Cu Conc. mg/l	Cu Mean Conc.	Cu Discharge lbs.	Cd Conc. mg/l	Cd Mean Conc.	Cd Discharge lbs.	Pb Conc. mg/l	Pb Mean Conc.	Pb Discharge lbs.	Zn Conc. mg/l	Zn Mean Conc.	Zn Discharge lbs.
22.4	624	3.64E-03	3.49E-03		21	0.00184		150	0.011717		3	0.000234		0.026	2.03E-06		0.002	7.35E-08		0.059	4.61E-06		0.163	1.27E-05
22.5	630	4.33E-03	3.99E-03		21	0.001875		150	0.013394		3	0.000268		0.026	2.32E-06		0.002	8.4E-08		0.059	5.27E-06		0.163	1.46E-05
22.6	636	5.16E-03	4.75E-03		21	0.002234		150	0.015954		3	0.000319		0.026	2.77E-06		0.002	1E-07		0.059	6.28E-06		0.163	1.73E-05
22.7	642	5.90E-03	5.53E-03		21	0.002601		150	0.01858		3	0.000372		0.026	3.22E-06		0.002	1.16E-07		0.059	7.31E-06		0.163	2.02E-05
22.8	648	6.38E-03	6.14E-03		21	0.002887		150	0.020624		3	0.000412		0.026	3.57E-06		0.002	1.29E-07		0.059	8.11E-06		0.163	2.24E-05
22.9	654	6.70E-03	6.54E-03		21	0.003077		150	0.021977		3	0.00044		0.026	3.81E-06		0.002	1.38E-07		0.059	8.64E-06		0.163	2.39E-05
23	660	6.92E-03	6.81E-03		21	0.003204		150	0.022889		3	0.000458		0.026	3.97E-06		0.002	1.44E-07		0.059	9E-06		0.163	2.49E-05
23.1	666	6.95E-03	6.94E-03		21	0.003263		150	0.023309		3	0.000466		0.026	4.04E-06		0.002	1.46E-07		0.059	9.17E-06		0.163	2.53E-05
23.2	672	5.57E-03	6.26E-03		21	0.002944		150	0.021031		3	0.000421		0.026	3.65E-06		0.002	1.32E-07		0.059	8.27E-06		0.163	2.29E-05
23.3	678	2.85E-03	4.21E-03		21	0.001979		150	0.014136		3	0.000283		0.026	2.45E-06		0.002	8.86E-08		0.059	5.56E-06		0.163	1.54E-05
23.4	684	3.06E-04	1.58E-03		21	0.000742		150	0.005298		3	0.000106		0.026	9.18E-07		0.002	3.32E-08		0.059	2.08E-06		0.163	5.76E-06
	690		1.53E-04		21	7.2E-05		150	0.000514		3	1.03E-05		0.026	8.92E-08		0.002	3.23E-09		0.059	2.02E-07		0.163	5.59E-07

Conduit CSO 1033

Time (hours)	Time (minutes)	Flow (ft^3/s)	Mean Flow	CBOD Conc.	CBOD Mean Conc.	CBOD Discharge lbs.	SS Conc. mg/l	SS Mean Conc.	SS Discharge lbs.	TKN Conc. mg/l	TKN Mean Conc.	TKN Discharge lbs.	Cu Conc. mg/l	Cu Mean Conc.	Cu Discharge lbs.	Cd Conc. mg/l	Cd Mean Conc.	Cd Discharge lbs.	Pb Conc. mg/l	Pb Mean Conc.	Pb Discharge lbs.	Zn Conc. mg/l	Zn Mean Conc.	Zn Discharge lbs.
16.7	282	0.255252	2.57E-01		19.5	0.112222		207	1.191263		6	0.03453		0.029	0.000167		0.0025	6.28E-06		0.0705	0.000406		0.1835	0.001056
16.8	288	0.254588	2.55E-01		19.5	0.111316		207	1.18166		6	0.034251		0.029	0.000166		0.0025	6.23E-06		0.0705	0.000402		0.1835	0.001048
16.9	294	0.255344	2.55E-01		19.5	0.111336		207	1.181874		6	0.034257		0.029	0.000166		0.0025	6.23E-06		0.0705	0.000403		0.1835	0.001048
17	300	0.256509	2.56E-01		19.5	0.111756		207	1.186328		6	0.034388		0.029	0.000166		0.0025	6.26E-06		0.0705	0.000404		0.1835	0.001052
17.1	306	0.257405	2.57E-01		19.5	0.112205		207	1.191103		6	0.034525		0.029	0.000167		0.0025	6.28E-06		0.0705	0.000406		0.1835	0.001056
17.2	312	0.255915	2.57E-01		19.5	0.112076		207	1.189726		8	0.034485		0.029	0.000167		0.0025	8.27E-06		0.0705	0.000405		0.1835	0.001055
17.3	318	0.251909	2.54E-01		19.5	0.110876		207	1.176987		6	0.034116		0.029	0.000165		0.0025	6.21E-06		0.0705	0.000401		0.1835	0.001043
17.4	324	0.246773	2.49E-01		19.5	0.10888		207	1.155799		6	0.033501		0.029	0.000162		0.0025	6.1E-06		0.0705	0.000394		0.1835	0.001025
17.5	330	0.241358	2.44E-01		19.5	0.106576		207	1.131346		6	0.032793		0.029	0.000158		0.0025	5.97E-06		0.0705	0.000385		0.1835	0.001003
17.6	336	0.236162	2.39E-01		19.5	0.104259		207	1.106752		6	0.03206		0.029	0.000155		0.0025	5.84E-06		0.0705	0.000377		0.1835	0.000981
17.7	342	0.232787	2.34E-01		19.5	0.102388		207	1.086887		6	0.031504		0.029	0.000152		0.0025	5.73E-06		0.0705	0.00037		0.1835	0.000963
17.8	348	0.231541	2.32E-01	21	21	0.101379	150	150	1.076178	3	3	0.031194	0.026	0.026	0.000151	0.002	0.002	5.68E-06	0.059	0.059	0.000367	0.163	0.163	0.000954
17.9	354	0.231089	2.31E-01		21	0.108778		150	0.776987		3	0.01554		0.026	0.000135		0.002	4.67E-06		0.059	0.000306		0.163	0.000844
18	360	0.230915	2.31E-01		21	0.108631		150	0.775935		3	0.015519		0.026	0.000134		0.002	4.87E-06		0.059	0.000305		0.163	0.000843
18.1	366	0.229692	2.30E-01		21	0.108302		150	0.773587		3	0.015472		0.026	0.000134		0.002	4.85E-06		0.059	0.000304		0.163	0.000841
16.2	372	0.217407	2.24E-01		21	0.105126		150	0.750901		3	0.015018		0.026	0.00013		0.002	4.71E-06		0.059	0.000295		0.163	0.000816
18.3	376	0.193667	2.06E-01		21	0.096656		150	0.690396		3	0.013808		0.026	0.00012		0.002	4.33E-06		0.059	0.000272		0.163	0.00075
18.4	384	0.165735	1.00E-01		21	0.084506		150	0.603615		3	0.012072		0.026	0.000105		0.002	3.78E-06		0.059	0.000237		0.163	0.000656
18.5	390	0.133029	1.49E-01		21	0.070248		150	0.501774		3	0.010035		0.026	6.7E-05		0.002	3.15E-06		0.059	0.000197		0.163	0.000545
18.6	396	0.10133	1.17E-01		21	0.055105		150	0.393606		3	0.007672		0.026	6.82E-05		0.002	2.47E-06		0.059	0.000155		0.163	0.000428
18.7	402	7.86E-02	9.00E-02		21	0.042317		150	0.302267		3	0.006045		0.026	5.24E-05		0.002	1.9E-06		0.059	0.000119		0.163	0.000328
18.8	408	6.46E-02	7.16E-02		21	0.033681		150	0.24058		3	0.004612		0.026	4.17E-05		0.002	1.51E-06		0.059	9.46E-05		0.163	0.000261
18.9	414	5.59E-02	6.03E-02		21	0.028337		150	0.20241		3	0.004048		0.026	3.51E-05		0.002	1.27E-06		0.059	7.96E-05		0.163	0.00022
19	420	4.82E-02	5.21E-02		21	0.024479		150	0.174653		3	0.003497		0.026	3.03E-05		0.002	1.1E-06		0.059	6.88E-05		0.163	0.00019
19.1	426	4.15E-02	4.48E-02		21	0.021084		150	0.150598		3	0.003012		0.026	2.61E-05		0.002	9.44E-07		0.059	5.92E-05		0.163	0.000184
19.2	432	3.80E-02	3.97E-02		21	0.018689		150	0.13349		3	0.00267		0.026	2.31E-05		0.002	8.37E-07		0.059	5.25E-05		0.163	0.000145
19.3	438	3.84E-02	3.82E-02		21	0.017969		150	0.128349		3	0.002567		0.028	2.22E-05		0.002	8.05E-07		0.059	5.05E-05		0.163	0.000139
19.4	444	4.13E-02	3.99E-02		21	0.018752		150	0.133842		3	0.002679		0.026	2.32E-05		0.002	8.4E-07		0.059	5.27E-05		0.163	0.000146
19.5	450	4.54E-02	4.34E-02		21	0.020397		150	0.145693		3	0.002914		0.026	2.53E-05		0.002	9.14E-07		0.059	5.73E-05		0.163	0.000158
19.6	456	4.94E-02	4.74E-02		21	0.0223		150	0.159288		3	0.003186		0.028	2.76E-05		0.002	9.99E-07		0.059	6.27E-05		0.163	0.000173
19.7	462	4.89E-02	4.91E-02		21	0.02311		150	0.165074		3	0.003301		0.026	2.86E-05		0.002	1.04E-06		0.059	6.49E-05		0.163	0.000179
19.8	468	4.23E-02	4.56E-02		21	0.021429		150	0.153061		3	0.003061		0.028	2.65E-05		0.002	9.6E-07		0.059	6.02E-05		0.163	0.000166
19.9	474	3.30E-02	3.77E-02		21	0.017711		150	0.126508		3	0.00253		0.028	2.19E-05		0.002	7.93E-07		0.059	4.98E-05		0.163	0.000137
20	480	2.40E-02	2.85E-02		21	0.013403		150	0.095734		3	0.001915		0.026	1.66E-05		0.002	6E-07		0.059	3.77E-05		0.163	0.000104
20.1	486	1.64E-02	2.02E-02		21	0.00949		150	0.067786		3	0.001356		0.026	1.17E-05		0.002	4.25E-07		0.059	2.67E-05		0.163	7.37E-05
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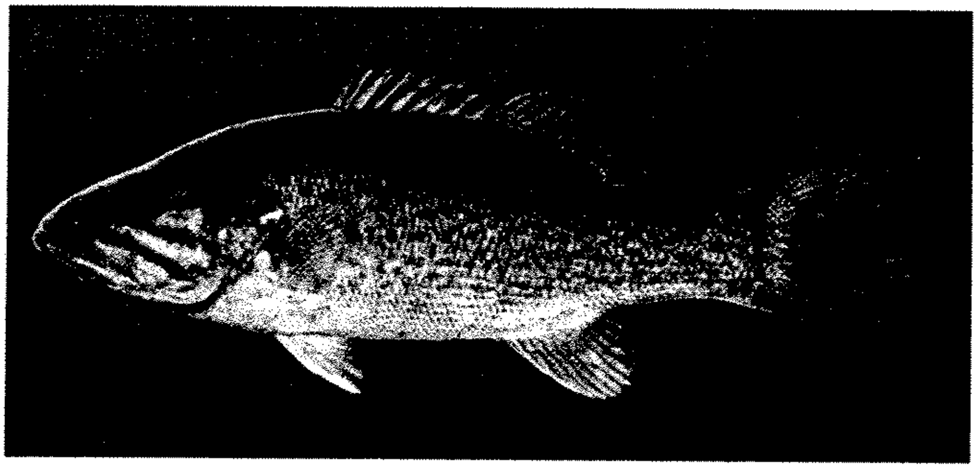
20.3	498	1.13E-02	1.18E-02		21	0.005527		150	0.039478		3	0.00079		0.026	6.84E-06		0.002	2.48E-07		0.059	1.55E-05		0.163	4.29E-05
20.4	504	1.24E-02	1.18E-02		21	0.005581		150	0.039725		3	0.000784		0.026	6.89E-06		0.002	2.49E-07		0.059	1.56E-05		0.163	4.32E-05
20.5	510	1.45E-02	1.34E-02		21	0.006311		150	0.04508		3	0.000002		0.028	7.81E-06		0.002	2.83E-07		0.059	1.77E-05		0.163	4.9E-05
20.6	516	1.71E-02	1.58E-02		21	0.007413		150	0.052946		3	0.001059		0.026	9.16E-06		0.002	3.32E-07		0.059	2.08E-05		0.163	5.75E-05
20.7	522	2.05E-02	1.88E-02		21	0.008829		150	0.063064		3	0.001261		0.026	1.09E-05		0.002	3.95E-07		0.059	2.48E-05		0.163	6.85E-05
20.6	528	2.53E-02	2.29E-02		21	0.010774		150	0.076959		3	0.001539		0.026	1.33E-05		0.002	4.83E-07		0.059	3.03E-05		0.163	8.36E-05
20.9	534	3.15E-02	2.84E-02		21	0.013354		150	0.095382		3	0.001908		0.026	1.65E-05		0.002	5.98E-07		0.059	3.75E-05		0.163	0.000104
21	540	3.86E-02	3.51E-02		21	0.016484		150	0.117743		3	0.002355		0.026	2.04E-05		0.002	7.38E-07		0.059	4.63E-05		0.163	0.000128
21.1	546	4.61E-02	4.23E-02		21	0.019914		150	0.142244		3	0.002845		0.026	2.47E-05		0.002	8.92E-07		0.059	5.59E-05		0.163	0.000155
21.2	552	4.93E-02	4.77E-02		21	0.02242		150	0.160146		3	0.003203		0.026	2.78E-05		0.002	1E-06		0.059	6.3E-05		0.163	0.000174
21.3	558	4.67E-02	4.80E-02		21	0.022571		150	0.161221		3	0.003224		0.026	2.79E-05		0.002	1.01E-06		0.059	6.34E-05		0.163	0.000175
21.4	564	4.10E-02	4.36E-02		21	0.020608		150	0.147198		3	0.002944		0.028	2.55E-05		0.002	9.23E-07		0.059	5.79E-05		0.163	0.00016
21.5	570	3.45E-02	3.77E-02		21	0.017749		150	0.12678		3	0.002536		0.026	2.2E-05		0.002	7.95E-07		0.059	4.99E-05		0.163	0.000138
21.6	578	2.65E-02	3.15E-02		21	0.014811		150	0.105795		3	0.002116		0.026	1.63E-05		0.002	6.63E-07		0.059	4.16E-05		0.163	0.000115
21.7	562	2.26E-02	2.56E-02		21	0.012058		150	0.086126		3	0.001723		0.026	1.49E-05		0.002	5.4E-07		0.058	3.39E-05		0.163	9.36E-05
21.8	588	1.76E-02	2.02E-02		21	0.009516		150	0.067972		3	0.001359		0.026	1.16E-05		0.002	4.26E-07		0.059	2.67E-05		0.163	7.39E-05
21.9	594	1.30E-02	1.53E-02		21	0.007199		150	0.051421		3	0.001026		0.028	8.91E-06		0.002	3.22E-07		0.059	2.02E-05		0.163	5.59E-05
22	600	6.90E-03	1.09E-02		21	0.005143		150	0.036734		3	0.000735		0.026	6.37E-06		0.002	2.3E-07		0.059	1.44E-05		0.163	3.99E-05
22.1	606	5.82E-03	7.26E-03		21	0.003415		150	0.024391		3	0.000488		0.026	4.23E-06		0.002	1.53E-07		0.059	9.59E-06		0.163	2.65E-05
22.2	612	3.61E-03	4.71E-03		21	0.002217		150	0.015837		3	0.000317		0.028	2.75E-06		0.002	9.93E-08		0.059	6.23E-06		0.163	1.72E-05
22.3	618	3.34E-03	3.57E-03		21	0.00188		150	0.011999		3	0.00024		0.026	2.08E-06		0.002	7.52E-08		0.059	4.72E-06		0.163	1.3E-05

APPENDIX C

FINAL

AQUATIC SURVEY OF THE LICKING RIVER

NEWARK , OHIO
MARCH, 1998



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EXECUTIVE SUMMARY

During the 1997 field season, EnviroScience, Inc. performed an aquatic survey at eight sites on tributaries to the Licking River and the Licking River mainstem in the vicinity of Newark, Ohio. The survey was conducted to determine whether the City's Combined Sewer Overflows (CSOs) are impacting the streams in the study area. This report describes the methods used, and the results of the survey.

Qualitative habitat analysis, pulsed DC electrofishing, and benthic macroinvertebrate sampling was performed at seven sampling sites. Electrofishing was performed twice during the sampling season; July 7-8, and September 2-4, 1997. Additional electrofishing was conducted at RM 1.0 of the South Fork during the second electrofishing event. Benthic macroinvertebrate sampling began on July 7-8, 1997 when Modified Hester-Dendy Artificial Substrate samplers (Hester-Dendy samplers) were deployed. The samplers remained in the water for six weeks and were retrieved on August 26, 1997. The week prior to sampler retrieval, flooding washed out the samplers in the South Fork and Mainstem. A fiber bag was found wrapped around the downstream North Fork samplers (RM 0.1) at the time of retrieval. For these reasons, samplers were reset at the South Fork, mainstem, and downstream North Fork sites. Supplemental qualitative macroinvertebrate sampling of the natural substrates was performed at the time of sampler collection. Qualitative habitat analysis was performed during the second electrofishing event August 2-4, 1997.

Collected data were evaluated using indices developed by the Ohio Environmental Protection Agency (Ohio EPA). The indices include the Qualitative Habitat Evaluation Index (QHEI), the Index of Biotic Integrity (IBI), the Modified Index of Well Being (MIwb), and the Invertebrate Community Index (ICI).

Values for the biological indices at each sampling site were compared to Warmwater Habitat (WWH) benchmark values set by the Ohio EPA. The benchmarks are believed to be representative of undisturbed streams similar to the Licking River in the Erie/Ontario Lake Plain

Ecoregion.

To be in FULL attainment of WWH, all calculated indices must fall in or above the "marginally good" range. In the Licking River survey six sites achieved FULL WWH attainment status. The downstream site on the North Fork (NF-0.1) achieved PARTIAL attainment status due to "fair" macroinvertebrate community performance. Site SF-1.0 on the South Fork could not be considered for FULL attainment WWH since macroinvertebrates were not collected at the site and no indices were calculated.

Two sites, one on Racoon Creek (RC-5.7) and one on the North Fork (NF-0.1), had slightly impaired biological communities. The Racoon Creek reference site (RC-5.7) had the highest percentage of tolerant fish observed during the entire study. The relatively low ICI value of 30 ("marginally good") at this site indicated upstream pollution sources, unrelated to CSOs, exist. On the North Fork, the mean IBI scores dropped slightly and the ICI scores dropped considerably between the upstream and downstream sites (NF-2.6 and NF-0.1). The lower IBI and ICI scores at NF-0.1 may be related to poor habitat, since the QHEI value was 63, the lowest recorded during the survey.

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1.0 INTRODUCTION

EnviroScience, Inc. completed an aquatic survey of eight sites in the Licking River study area between July 7 and October 7, 1997. Two sites were located on the South Fork of the Licking River, two were on the North Fork, two were on Racoon Creek, and one was on the Licking River Mainstem (Figure 1.1).

The Licking River study area is located within the Erie/Ontario Lake Plain ecoregion. The two main branches of the river are the North Fork which has a drainage area of 241 square miles and the South Fork which has a drainage area of 287 square miles. Racoon Creek enters the South Fork at river mile (RM) 1.0 and has a drainage area of 102 square miles. The North and South Forks meet within the city of Newark to form the Licking River mainstem.

The Licking River watershed has been extensively used for agriculture. This has produced increased sedimentation and erosion within the basin. In addition to non-point pollution, point source discharges may affect the receiving streams in this watershed. Possible point source influences within the study area include the Heath WWTP at RM 2.2 of the South Fork and Newark CSOs on the lower reaches of Racoon Creek, South Fork, and the North Fork (Ohio EPA, 1995).

2.0 METHODS

This section of the report describes the methodology used during the aquatic survey of the Licking River Study area. These descriptions include methods used for qualitative habitat analysis, fish collection and identification, fish population data, macroinvertebrate collection and processing, water chemistry collection and analysis, and chain of custody.

Methods used in this study to assess the biotic communities included the Qualitative Habitat Evaluation Index (QHEI), pulsed DC electrofishing, Modified-Hester Dendy Multiple Plate Artificial Substrate Samplers, qualitative "kick" macroinvertebrate sampling, and in-field chemistry for a limited set of parameters. All methods were in compliance with EnviroScience, Inc. standard operating procedures (SOPs), and adhere to those stated in the *Manual of Ohio*

EPA Surveillance Methods and Quality Assurance Practices (Ohio EPA, 1991) and *Biological Criteria for the Protection of Aquatic Life*, Volumes I-V (Ohio EPA, updated January 1, 1989).

2.1 Qualitative Habitat Evaluation Index (QHEI)

To evaluate stream habitat quality, a Qualitative Habitat Evaluation Index (QHEI) score was calculated at each site. The QHEI, as developed by the Ohio EPA, is a physical habitat index which provides a quantified evaluation of the lotic macrohabitat characteristics important to fish communities (Ohio EPA, 1989b). The index is calculated by assigning scores for each of the following six metrics:

- Quality of Substrate, maximum 20 points
- Type of Instream Cover, maximum 20 points
- Channel Morphology, maximum 20 points
- Riparian Zone and Bank Erosion, maximum 10 points
- Pool/Glide and Riffle/Run Quality, maximum 20 points
- Gradient, maximum 10 points

The sum of the scores from these metrics yield a total score that numerically rates the habitat of a particular stream reach. The QHEI is based on a scale of 100 possible points. This maximum score was determined by the Ohio EPA to represent undisturbed habitats similar in structure to the Licking River study sites (Ohio EPA, 1989b). Sites having QHEI scores >60 are expected to sustain fish and macroinvertebrate populations indicative of WWH. QHEI scoring sheets are presented in Appendix A.

2.2 Fish Populations

2.2.1 Electrofishing

A Smith-Root® 2.5 GPP Portable DC Pulsed Electrofisher was used to sample fish populations at each site on July 7-8 and October 2-4, 1997. The available peak current from the unit is 1,000 volts and 5,000 watts. The output of the unit is adjusted according to the conductivity of the water being sampled. The current flowing through the water is directly related to the

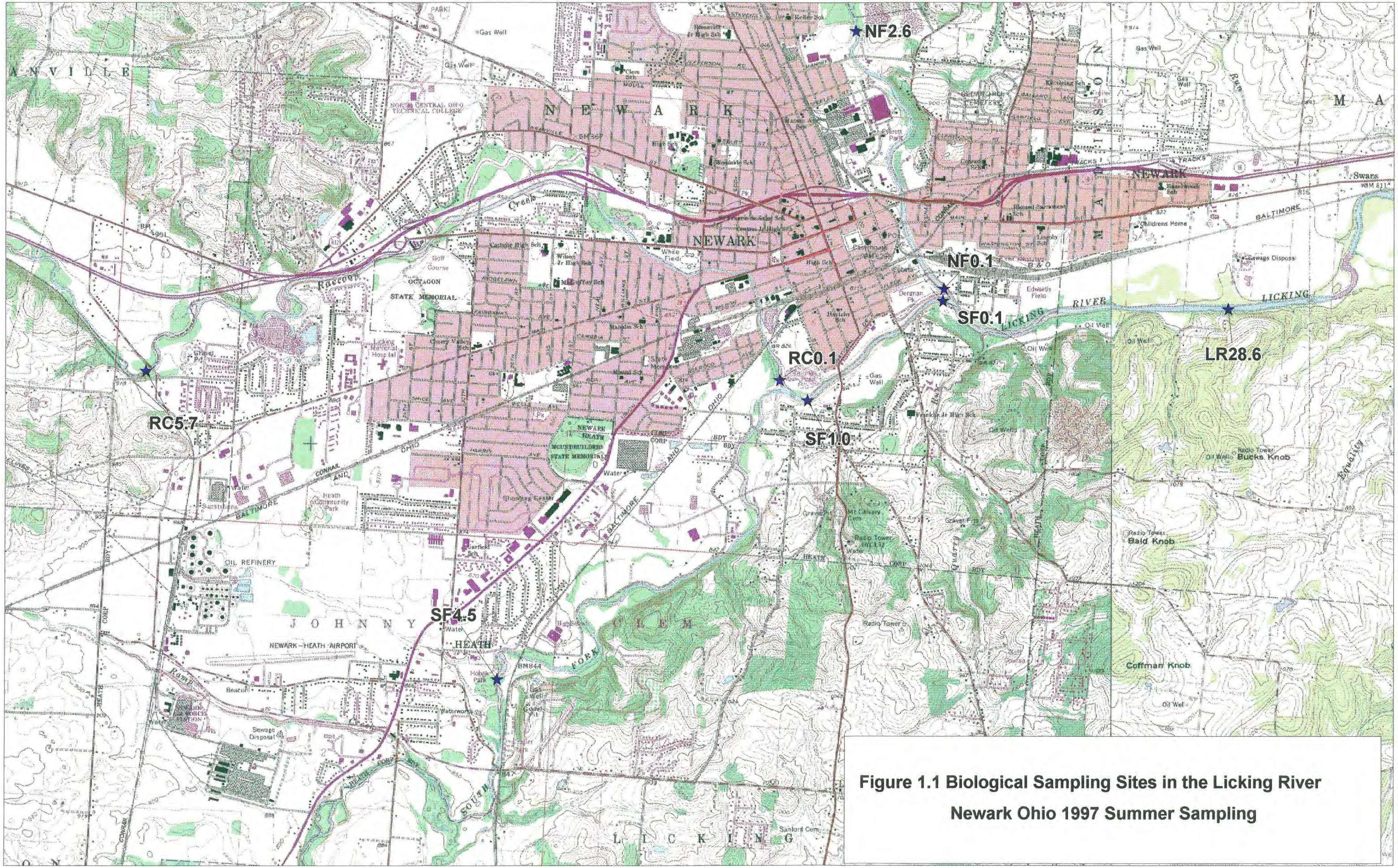


Figure 1.1 Biological Sampling Sites in the Licking River Newark Ohio 1997 Summer Sampling

voltage applied: the higher the voltage the greater the current. Based on an average conductivity of 626 µmhos in the Licking River Study area, the voltage of the electrofishing unit was adjusted to approximately 30-40% of the total available power. This power output was adequate to representatively sample the smaller individuals, while minimizing adverse effects on larger individuals.

Sampling sites were approximately 200 meters in length, and included all representative habitats within each sampling site. Riffle and pool depth determined the type of electrofishing apparatus used. At sites having numerous riffles and areas <10 centimeters in depth, the long-line configuration was used. Deeper sites required that a tote barge or sport-yak configuration be used. Electrofishing started at the downstream end of each sampling site and proceeded upstream. The electrofishing crew consisted of two netters, an individual controlling the anode ring, and one person identifying, weighing, and recording specimens from a livewell at the streamside field station.

2.2.2 Identification/Enumeration

Immediately after collection, stunned fish were taken to shore where they were identified, weighed to the nearest 1/10 (0.10) of a gram, measured, and examined for external anomalies. Total lengths were recorded to the nearest 0.10 centimeter. Mass and length measurements were taken for fifty (50) randomly selected individuals of each species. Length, mass and anomaly data were recorded on EnviroScience Fish Data Sheets (Appendix D). Except for those retained for laboratory confirmation, all collected fish were released upon total recovery from the initial shock.

Fish collected during the course of this study were identified in the field by experienced aquatic biologists. Representative samples having uncertain identity were preserved in borax-buffered 10% formalin and returned to the EnviroScience lab for further examination.

2.2.3 Fish Data Analysis

The biological community assessment methods used to evaluate fish populations in this study were the Index of Biotic Integrity (IBI) and the Modified Index of Well Being (MIwb). The IBI is a multi-metric index patterned after an original described by Karr (1981) and Fausch et al. (1984). The metric scoring range is from one to five, where one, three, or five are the only metric scores possible. The higher metric score is considered more favorable and the sum of the metrics becomes the IBI score, where the maximum possible is 60. The twelve IBI metrics are listed below:

- Total Number of Indigenous Fish Species
- Number of Darter Species (Wading Sites)
- Number of Sunfish Species (Wading Sites)
- Number of Sucker Species (Wading Sites)
- Number of Intolerant Species (Wading Sites)
- Percent Abundance of Tolerant Species
- Percent Omnivores
- Proportion as Insectivores
- Percent Top Carnivores (Wading Sites)
- Percent Simple Lithophilic Spawners
- Relative Number of Individuals
- Percent DELT Anomalies

The Modified Index of Well Being incorporates four measures of fish communities that have traditionally been used separately: numbers of individuals, biomass, and the Shannon Diversity Index based on numbers and weights (OEPA, 1987). All relative numbers and relative weights are adjusted so as to represent a .3 kilometer sampling pass. The maximum sore for the MIwb is 10.0.

The sites were evaluated against WWH criteria by compiling and interpreting the values of the IBI indices and the MIwb. The values from these indexes calculated each site were classified to represent, “very good”, “good”, “marginally good”, “fair” “poor”, or “very poor” fish community condition (Table 2.1).

Table 2.1 Water Quality Criteria Ranges for the Erie/Ontario Lake Plain Ecoregion

Index	**Community Condition**						
	Exceptional	Very Good	Good	Marginally Good	Fair	Poor	Very Poor
IBI	50-60	46-49	38-45	34-37	28-33	18-27	12-17
MIwb	≥9.4	8.9-9.3	7.9-8.8	7.4-7.8	5.9-7.3	4.5-5.8	0.0-4.4
ICI	46-60	40-44	34-38	30-32	14-28	2-12	<2

* To be considered in attainment of WWH criteria, the scores for the fish and macroinvertebrate indices must fall in or above the "marginally good" range.

2.3 Macroinvertebrates

The primary sampling apparatus used for the collection of benthic macroinvertebrates is the Modified Hester-Dendy Multiple-Plate Artificial Substrate sampler. Each sampler is constructed of 1/8 inch tempered hardboard cut into eight three-inch square plates, separated by twelve round nylon spacers. The plates and spacers are placed on a 1/4 inch eyebolt with three single spaces, three double spaces, and one triple space between the plates. The total surface area of the sampler, excluding the eyebolt, is 145.6 square inches. A set of samplers consists of five multiple-plate samplers (approximately five square feet), at all sampling locations. Two sets of Hester-Dendy samplers were installed at each site to provide a backup set in case one set was lost. However, only one set from each site was processed. Hester-Dendy samplers were initially deployed at study sites on July 7-8, 1997. The samplers were allowed to colonize for six weeks before collection.

2.3.1 Procedure for Sampling with a Hester-Dendy Sampler

Hester-Dendy samplers were positioned in the euphotic zone (one to two feet below the water surface) and in adequate flow to obtain maximum abundance and diversity of macroinvertebrates. Samplers were positioned as to be located midway in the water column at low flow. Samplers were placed on 8 inch cement blocks and anchored to the bottom of the stream to avoid loss during floods. Care was taken not to allow the samplers to touch the stream bottom which would permit siltation, and increase the chance of sampling error.

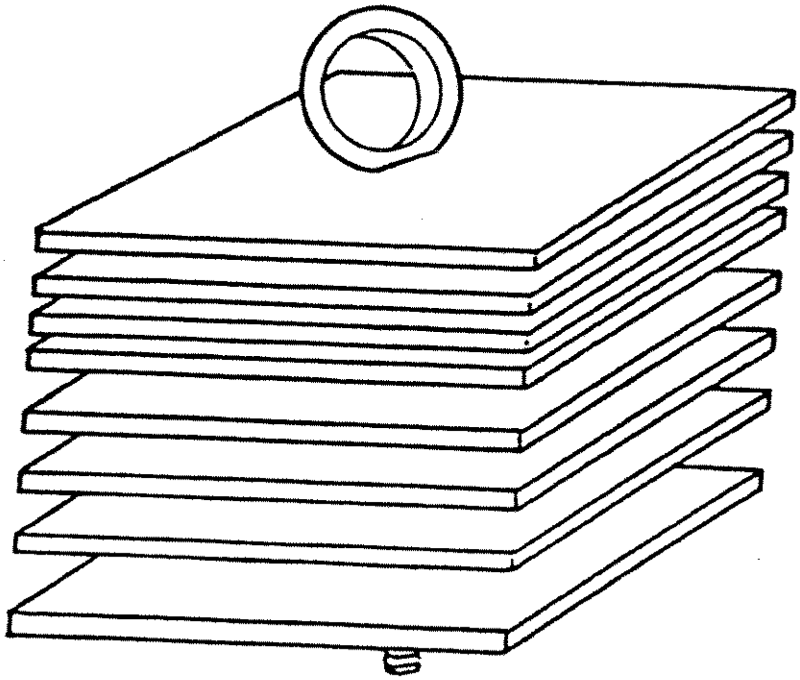
At the end of the six week colonization period (August 26, 1997), the samplers were retrieved from their respective sites. Flood conditions in the week prior to sampler removal washed out the samplers in the South Fork and Mainstem, and a fiber bag was found wrapped around the downstream North Fork samplers (RM 0.1). The lost or disturbed samplers were reset on August 26, and subsequently retrieved on October 7, 1998.

Loss of macroinvertebrates was minimized when retrieving multi-plate samplers by approaching from downstream and by placing a sieve under the samplers before lifting them from the stream. The samplers were then quickly removed from the block and placed in polyethylene containers containing 10% formalin. Organisms which fell from the samplers were picked from the sieve and placed in the containers with the samplers. Each container was labeled with the location, habitat, date, and time of collection.

2.3.2 Supplemental Qualitative Sampling

When samplers were removed from the stream, qualitative "kick" samples were collected at each site from the available natural substrates. For each kick sample, at least thirty (30) minutes was spent disturbing the substrate immediately upstream of a D-frame net fitted with U.S. Standard Number Thirty (#30) mesh. This qualitative sampling continued until no new taxa were evident in gross examination. The qualitative samples were collected to obtain data to supplement the quantitative data collected by the Hester-Dendy samplers.

Figure 2.1 One Modified Hester-Dendy Multiple Plate Artificial Substrate Sampler.



2.3.3 Labeling and Record Keeping

All samples were labeled in the field at the time of collection. Sample labels were made of water-resistant paper and were placed inside the sample container. A lead based soft pencil or water resistant ink was used to protect against bleeding or discoloration from the sample preservative. The outside of each container and lid were also labeled with the same information. All labels included sample identification information corresponding to that entered on the EnviroScience, Inc. Chain of Custody forms (Appendix G). The Chain of Custody forms included the date, name of client, sampling method, weather, and other physical or environmental conditions.

Upon arrival at the laboratory, each sample was assigned a unique sequential identification (ID) number. This number identifies the sample in a permanent ledger where the information from the chain of custody form is recorded. The chain of custody form was copied, and one copy retained for permanent record. The chain of custody, sample ID number, and the ledger document the transfer of the sample from the field to the laboratory. The sample ID number was placed prominently on and in the sample container before storing. This ID number was also placed on all specimen vials, and microscope slides, connected with the sample.

2.3.4 Sample Processing

The Hester-Dendy samplers were placed into a tray of laboratory water and dismantled. The individual tiles were scrubbed with a soft brush and carefully rinsed into the tray. The tiles were also visually inspected, and clinging organisms were removed.

The water in the tray was then washed through a No. 30 sieve which was placed on top of a No. 40 sieve. The organisms were then picked from the screens with forceps and placed into sample vessels containing 90% ethanol. The remaining debris in the sieves was inspected under a dissecting microscope for the presence of additional small organisms.

As noted, samplers were initially fixed in 10-15% formalin in the field to help preserve and sustain body parts important in identification. After fixing and sorting, they were placed in small screw cap vials and preserved in 90% ethanol. Because some amount of rinse water is carried over with the organisms, 90% ethanol was used to insure that the final solution would be strong enough to preserve the specimens. Containers used for holding preserved organisms were sized so that they were not over one-half full of the washed sample before the preservative was added.

After each sample was sorted, notations were made in the sample log book. These included, the date and the initials of the sorter. Samples were checked by a second biologist or supervisor to confirm that organisms were not overlooked.

2.3.5 Macroinvertebrate Identification

Identifications were carried to the lowest taxonomic level required by EnviroScience's standard operating procedures (SOP's) and the Ohio EPA. When necessary, identified specimens were compared to EnviroScience's permanent reference collection which has been verified by an outside authority in benthic macroinvertebrate identification.

Subsampling techniques were used when the number of individuals from a specific group (Order) was expected to exceed a standard recommended by the Ohio EPA. A minimum of 70 mayfly, 70 caddisfly, and 100 chironomid larvae must be collected before subsampling techniques are initiated. Subsampling was completed by random extraction of organisms from the sample until adequate numbers were counted. Remaining organisms were extrapolated and recorded to obtain a relative number for the sample.

Members of the Dipteran family Chironomidae (midges) were cleared in 10% potassium hydroxide and mounted in water on microscope slides for identification.

As organisms were identified, the individuals in each taxonomic group were counted. These numbers and taxa were recorded on Aquatic Invertebrate Bench Sheets (Appendix E), on labels inserted in the bottles, and on the slides.

2.3.6 Macroinvertebrate Data Analysis

The principle measure of overall macroinvertebrate community condition used by EnviroScience, Inc. is the ICI, a measurement derived by the Ohio EPA. The ICI is ~~a~~ modification of the Index of Biotic Integrity (IBI) for fish developed by Karr (Ohio EPA, 1987). The ICI consists of ten structural community metrics, each with four scoring categories. The ICI metrics are as follows:

- Total Number of Taxa
- Number of Mayfly Taxa
- Number of Caddisfly Taxa
- Number of Dipteran Taxa
- Percent Mayflies
- Percent Caddisflies
- Percent Tanytarsini Midges
- Percent Other Diptera and Non-Insects
- Percent Tolerant Organisms
- Qualitative Ephemeroptera, Plecoptera, and Trichoptera Taxa

The metric scoring range is from zero to six, where zero, two, four, or six are the only metric scores possible. Like the IBI, a higher score for each metric is considered favorable and the total score is 60. After the metrics are summed, the sample is evaluated against a database of comparable reference sites within the Erie/Ontario Lake Plain Ecoregion (Table 2.1).

2.4 In-field Chemistry and Site Characterization

At the time of electrofishing, in-field chemistry was performed for a limited set of parameters including dissolved oxygen, pH, velocity, conductivity, water temperature, and air temperature. At this time, pertinent details regarding each sample site were also recorded on EnviroScience's Fish Data Sheets (Appendix D).

In-field testing was performed in accordance with *Standard Methods For The Examination of Water and Wastewater* (Standard Methods, 1992.) and EnviroScience, Inc.'s SOPs, which are available upon request. All field meters were calibrated at the start of the workday and the results recorded in a bound notebook. In-field test methods are briefly described in the following paragraphs.

Dissolved oxygen was measured using a YSI® Model 51B meter. The meter was calibrated by compensating for temperature, checking the membrane, and air calibrating the meter to 1,000 feet above sea level. Once calibrated, the probe was submerged below the water surface. The probe was gently waved through the water in order to ensure a constant flow of water over the membrane. Once the meter stabilized, the reading was noted and recorded on an in-field chemistry data sheet.

The pH was measured using a Corning® PS 30 meter. The pH meter was manually temperature compensated and calibrated using standard buffer solutions having a pH of 7 and 10, respectively. Once calibrated and logged, the pH probe was lowered into the water to be tested. The probe was gently waved through the water to ensure a constant flow of water over the electrode. Once the reading stabilized, the value was recorded.

Conductivity was measured using a Cole Parmer® model 19815 conductivity meter. The meter was calibrated by submerging the meter's electrode in a 1413 µmhos standard solution for a minimum of 20 minutes. The meter was then manually calibrated for temperature and conductivity and the reading recorded in the calibration log. Once calibrated, the probe was lowered into the water to be tested. The probe was gently waved through the water in order to ensure a constant flow of water over the electrode. Once the reading stabilized, the value was recorded.

Air and water temperatures were taken using a Multi-Thermometer®. The thermometer is calibrated in the laboratory monthly against a National Institute of Standards and Technical calibration instrument (I.D. No. 88024). Calibrations are recorded in EnviroScience's~~s~~ laboratory calibration log book. Water temperature was taken by exposing the thermometer to the ambient water for approximately 3 minutes, or until the reading stabilized. The temperature was then recorded on the data sheets. Temperature data was obtained in conformance with *Ohio EPA Water Quality Criteria Development Guidelines for Toxic Chemicals* (Ohio EPA, 1986).

3.0 RESULTS

Hand scored QHEI sheets are included in Appendix A. Spreadsheets summarizing the results from fish sampling performed on July 7 and 8, and September 2 - 4, 1997 are included in Appendix B. IBI scoring sheets are presented in Appendix C. Complete fish data results can be found on the Fish Data Sheets included as Appendix D. Complete macroinvertebrate data for quantitative and qualitative samples can be found on the Aquatic Invertebrate Bench Sheets in Appendix E. The hand scored ICI sheets are located in Appendix F.

3.1 South Fork of the Licking River

Tables 3.1 to 3.4 show Qualitative Habitat Evaluation Index (QHEI), Index of Biotic Integrity (IBI), Modified Index of well being (MIwb), Invertebrate Community Index (ICI), and In-field chemistry results collected at the South Fork sampling sites.

Table 3.1 South Fork QHEI Metric Scores

Metric	SF-4.5	SF-1.0	SF-0.1	Max.
1. Substrate	15	15	15	20
2. Instream Cover	13	13	9	20
3. Channel Morphology	13	14	11.5	20
4. Riparian Zone	9	9	8	10
5a. Pool Quality	12	10	11	12
5b. Riffle Quality	3	4	3.5	8
6. Gradient	10	10	10	10
Total	**75**	**75**	**68**	**100**

* QHEI scores >60 are expected to sustain fish and macroinvertebrate populations representative of WWH

Table 3.2 South Fork IBI Metric Scores and MIwb Scores

IBI Metric	SF-4.5		SF-1.0		SF-0.1	
	7/8/97	9/3/97	-	9/3/97	7/07/97	9/2/97
1. Total Number of Indigenous Fish Species	5	5	-	5	3	5
2. Number of Darter Species	5	3	-	5	3	5
3. Number of Sunfish Species	5	5	-	5	3	5
4. Number of Sucker Species	3	3	-	3	1	5
5. Number of Intolerant Species	3	3	-	3	3	3
6. Percent Tolerant Species	5	5	-	5	3	5
7. Percent Omnivores	5	5	-	5	3	3
8. Percent Insectivorous Species	5	5	-	5	5	5
9. Percent Top Carnivores	3	5	-	3	3	5
10. Number of Individuals	3	3	-	3	3	3
11. Proportion of Simple Lithophilic Species	5	5	-	5	3	3
12. Percent DELT Anomalies on All Species	3	3	-	3	3	3
Total for each round	50	50	-	50	36	50
Mean IBI Scores	50		50		43	
MIwb Scores	9.01	8.65	-	8.20	7.55	8.68
Mean MIwb Scores	8.80		8.20		8.10	

* IBI scores >34 and MIwb scores >7.4 are considered representative of WWH

- Electrofishing only conducted during the second pass

Table 3.3 South Fork ICI Metric Scores

ICI Metric	SF-4.5	SF-0.1
1. Total number of taxa	6	4
2. Number of Mayfly taxa	2	4
3. Number of Caddisfly taxa	6	6
4. Number of Dipteran taxa	6	4
5. Percent Mayflies	2	2
6. Percent Caddisflies	4	6
7. Percent Tanytarsini midges	4	2
8. Percent other Diptera and non-insects	2	4
9. Percent tolerant organisms	0	6
10.Qualitative EPT taxa	2	2
Total ICI Scores	34	40

* ICI scores ≥30 are considered representative of WWH

Table 3.4 South Fork Field Chemistry Data

Parameter	SF-4.5		S-1.0		SF-0.1	
Date	7/8/97	9/3/97	-	9/3/97	7/7/97	9/2/97
Water Temperature, ° C	20.0	19.3	-	19.6	22.3	23.8
Conductivity, uhmns	591	623	-	647	628	705
Dissolved Oxygen, ppm	7.6	10.0	-	10.0	13.9	10.7
pH, S.U.	7.7	7.3	-	8.0	8.3	8.3

- no data collected

3.2 Racoon Creek

Tables 3.5 to 3.8 show Qualitative Habitat Evaluation Index (QHEI), Index of Biotic Integrity (IBI), Modified Index of well being (MIwb), Invertebrate Community Index (ICI), and In-field chemistry from the two sites on Racoon Creek

Table 3.5 Racoon Creek QHEI Metric Scores

Metric	RC-5.7	RC-0.1	Max.
1. Substrate	16	15	20
2. Instream Cover	14	9	20
3. Channel Morpbology	13.5	13.5	20
4. Riparian Zone	8.5	9	10
5a. Pool Quality	10	10	12
5b. Riffle Quality	4	5	8
6. Gradient	8	8	10
Total	74	69.5	100

* QHEI scores >60 are expected to sustain fish and macroinvertebrate populations representative of WWH

Table 3.6 Racoon Creek IBI Metric Scores and MIwb Scores

IBI Metric	**RC-5.7**		**RC-0.1**	
	7/8/97	9/4/97	7/8/97	9/3/97
1. Total Number of Indigenous Fish Species	3	3	3	5
2. Number of Darter Species	5	5	5	3
3. Number of Sunfish Species	3	3	3	5
4. Number of Sucker Species	3	3	3	3
5. Number of Intolerant Species	3	3	1	3
6. Percent Tolerant Species	1	3	5	5
7. Percent Omnivores	1	3	5	5
8. Percent Insectivorous Species	3	5	5	5
9. Percent Top Carnivores	5	3	3	5
10. Number of Individuals	3	3	3	3
11. Proportion of Simple Lithophilic Species	5	5	5	5
12. Percent DELT Anomalies on All Species	3	3	3	5
Total for each round	38	42	44	52
Mean IBI Scores	**40**		**48**	
MIwb Scores	**8.14**	**8.83**	**8.13**	**7.86**
Mean MIwb Scores	**8.50**		**8.00**	

* IBI scores >34 and MIwb scores >7.4 are considered representative of WWH

Table 3.7 Racoon Creek ICI Metric Scores

ICI Metric	RC-5.7	RC-0.1
1. Total number of taxa	2	6
2. Number of Mayfly taxa	2	4
3. Number of Caddisfly taxa	6	6
4. Number of Dipteran taxa	2	6
5. Percent Mayflies	2	2
6. Percent Caddisflies	6	6
7. Percent Tanytarsini midges	0	2
8. Percent other Diptera and non-insects	4	4
9. Percent tolerant organisms	4	6
10. Qualitative EPT taxa	2	0
Total ICI Scores	30	42

* ICI scores ≥ 30 are considered representative of WWH

Table 3.8 Racoon Creek In-Field Chemistry Data

Parameter	RC-5.7		RC-0.1	
Date	7/8/97	9/4/97	7/8/97	9/3/97
Water Temperature, ° C	22.7	14.8	20.9	19.3
Conductivity, nhmos	576	669	639	717
Dissolved Oxygen, ppm	11.1	8.2	11.2	11.0
pH, S.U.	8.5	8.5	8.3	8.0

3.3 North Fork and Licking River Mainstem

Table 3.9 to 3.12 show the results of Qualitative Habitat Evaluation Index (QHEI), Index of Biotic Integrity (IBI), Modified Index of well being (MIwb), Invertebrate Community Index (ICI), and In-field chemistry for the North Fork and Licking River mainstem study sites.

Table 3.9 North Fork and Mainstem QHEI Metric Scores

Metric	NF-2.6	NF-0.1	LR-28.6	Max.
1. Substrate	15	15	15	20
2. Instream Cover	13	7	13	20
3. Channel Morphology	14	11.5	15.5	20
4. Riparian Zone	8.5	6.5	9	10
5a. Pool Quality	10	9	8	12
5b. Riffle Quality	5.5	4	5	8
6. Gradient	8	10	10	10
Total	74	63	75.5	100

* QHEI scores >60 are expected to sustain fish and macroinvertebrate populations representative of WWH

Table 3.10 North Fork and Mainstem IBI Metric Scores and MIwb Scores

IBI Metric	NF-2.6		NF-0.1		LR-28.6	
	7/8/97	9/4/97	7/7/97	9/2/97	7/7/97	9/2/97
1. Total Number of Indigenous Fish Species	3	5	3	5	5	5
2. Number of Darter Species	3	5	3	5	1	3
3. Number of Sunfisb Species	3	5	3	3	5	5
4. Number of Sucker Species	3	3	1	3	3	3
5. Number of Intolerant Species	3	3	3	3	3	3
6. Percent Tolerant Species	5	5	5	5	3	5
7. Percent Omnivores	5	5	5	3	3	3
8. Percent Insectivorous Species	3	5	5	3	5	5
9. Percent Top Carnivores	3	3	3	3	5	5
10. Number of Individuals	3	5	3	3	1	3
11. Proportion of Simple Lithophilic Species	5	5	3	3	5	5
12. Percent DELT Anomalies on All Species	3	5	5	5	5	3
Total for each round	42	54	42	44	44	48
Mean IBI Scores	**48**		**43**		**46**	
MIwb Scores	**8.42**	**9.11**	**7.84**	**8.05**	**6.50**	**9.03**
Mean MIwb Scores	**8.80**		**7.95**		**7.80**	

* IBI scores >34 and MIwb scores >7.4 are considered representative of WWH

Table 3.11 North Fork and Mainstem ICI Individual Metric Scores

ICI Metric	[1]NF-2.6	NF-0.1	[2]NF-0.1-II	LR-28.6
1. Total number of taxa	4	4	2	4
2. Number of Mayfly taxa	4	2	0	2
3. Number of Caddisfly taxa	6	2	4	6
4. Number of Dipteran taxa	4	4	2	6
5. Percent Mayflies	2	4	2	2
6. Percent Caddisflies	6	2	6	6
7. Percent Tanytarsini midges	2	2	2	2
8. Percent other Diptera and non-insects	6	0	2	2
9. Percent tolerant organisms	6	0	6	6
10. Qualitative EPT taxa	4	2	2	0
Total ICI Scores	44	22	28	40

1- ICI scores ≥30 are considered representative of WWH

2-duplicate sample was set later in season due to problem with first sampler

Table 3.12 North Fork and Mainstem In-Field Chemistry Data

Parameter	NF-2.6		NF-0.1		LR-28.6	
Date	7/8/97	9/4/97	7/7/97	9/2/97	7/7/97	9/2/97
Water Temperature, ° C	24.3	16.7	23.5	25.8	19.9	19.5
Conductivity, uhmos	537	598	536	618	580	723
Dissolved Oxygen, ppm	9.0	9.5	10.8	11.2	9.8	9.2
pH, S.U.	8.1	8.2	8.3	8.2	7.9	7.7

4.0 DISCUSSION

As previously noted, the water quality of the Licking River was evaluated using a combination of QHEI scores to rate habitat quality, IBI and MIwb scores to measure fish communities, and ICI scores to measure benthic macroinvertebrate communities. All four of these ecological assessment tools are extensively used by the Ohio EPA and the resulting data are compared to previously studied reference sites within Ohio. This allows for valid comparisons between the Licking River and other Erie/Ontario Lake Plain reference sites previously studied by the Ohio EPA.

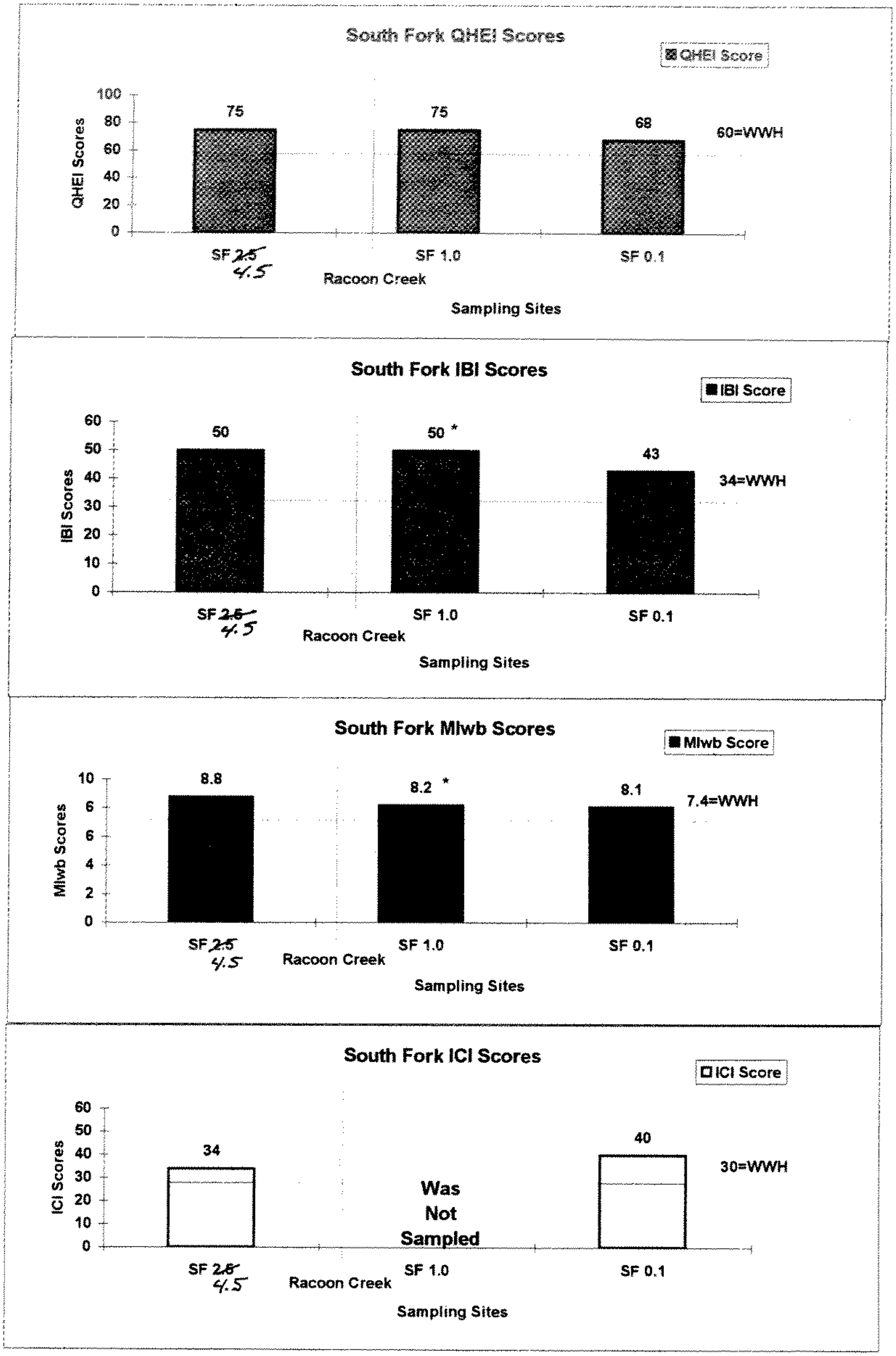
4.1 South Fork of the Licking River

4.1.1 QHEI Scores

Habitat quality dropped between the two upstream sites (SF-4.5 and SF-1.0), which scored 75, and the downstream site which scored 68 (Figure 4.1). This significant habitat change is reflected in lower scores for instream cover and channel morphology (metrics one and three) at SF-0.1. This site received scores of 9 and 11.5 (out of 20), for these two metrics. It is a heavily channelized section of the stream just upstream of the confluence with the North Fork. The cover available to aquatic communities consists of a pool, undercut bank, and small boulders associated with the north bank of the stream. The stream bank in this area is re-enforced by rip rap. In general, this stream reach lacks adequate cover. It is noted that the same rip rap that helps increase the score for cover, lowers the score for channel morphology.

In contrast to the downstream site, SF-1.0 scored 13 for instream cover and 14 for channel morphology, while SF-4.5 scored 13 for both instream cover and channel morphology. These stream reaches have more pools, woody debris and/or boulders for fish cover and are less channelized than SF-0.1 (Table 3.1).

Figure 4.1 Biological Data for South Fork of Licking River



*Only One Round of Electrofishing

4.1.2 IBI and MIwb Scores

The overall IBI score is achieved from the sum of the individual IBI metrics. Following Ohio EPA methods, the IBI and MIwb scores were calculated for each electrofishing pass, averaged and compared to WWH criteria.

Overall, IBI and MIwb scores for the South Fork sites are "good" to "exceptional" and indicate attainment of WWH. The upstream reference site (SF-4.5) had the highest overall IBI score of 50 ("exceptional") and an MIwb score of 8.83 ("good"). Between the first and second electrofishing passes on the South Fork, demolition and construction was initiated on the Route 13 bridge, which spans the South Fork at RM 0.8. An additional site was selected on the South Fork (SF-1.0) upstream of the bridge reconstruction. This was to ensure that a valid sample could be collected from the South Fork below Racoon Creek, above any effects from the bridge reconstruction. Only one electrofishing pass was completed at this additional site, however, the IBI and MIwb scores are comparable to the upstream mean values. The IBI score was calculated to be 50 ("exceptional") and the MIwb was 8.2 ("good"). The downstream site (SF-0.1) had an IBI score of 43 and an MIwb score of 8.1, both in the "good" category (Figure 4.1).

The South Fork sites showed little difference between IBI metrics. Percent insectivorous species (metric eight) targets the primary food base (insects) in streams. If stream conditions cannot sustain a healthy macroinvertebrate community, insectivorous fish species are replaced by omnivores. Fish populations at all of the South fork Sites had greater than 50% insectivores, resulting in the highest possible score of 5 for this metric. An unusually low metric score of 1 was recorded for the number of sucker species (metric four) during the first round of electrofishing at SF-0.1. Only two sucker species were collected. The Black Redhorse (*Moxostoma duquesnei*) and Northern Hog Sucker (*Hypentelium nigricans*) were collected from this site during the first round. Five sucker species were collected during the second round of electrofishing at this site. These included the Northern Hog Sucker and Black Redhorse, plus the Common White Sucker (*Catostomus commersoni*), Golden Redhorse (*Moxostoma erythrurum*), and Central Quillback Carpsucker (*Carpoides cyprinus*). These additional species resulted in an improved score of 5 for this metric in the second electrofishing pass.

The MIwb is based on the relationship between weights (mass) and relative numbers (individuals/.3km) of fish populations. Ohio EPA protocols require that tolerant fish be excluded from the MIwb calculation process. Therefore, MIwb scores are typically lower for fish communities comprised primarily of tolerant fish species. The percentage of tolerant individuals at all South Fork sites was relatively low. During the first electrofishing pass, the downstream site (SF-0.1), was composed of 22% tolerant individuals, including 47 Bluntnose Minnows (*Pimephales notatus*). This was the highest percentage of tolerant species found in the South Fork and results in the lower MIwb score of 7.6 ("marginally good") for the first electrofishing pass. During the second round, 2.6% tolerant individuals were collected, resulting in a higher MIwb score of 8.7. Site SF-4.5 had only 4% tolerant species, resulting in a higher first round MIwb score of 9.0 ("very good"). The score for the second electrofishing pass at SF-4.5, was 8.7 ("good"). Site SF-1.0 was not sampled in the first pass so no comparison between rounds can be made.

4.1.3 ICI Scores

The Invertebrate Community Index (ICI) evaluates macroinvertebrate communities using a series of metrics derived from IBI scoring techniques. The sum of these metric scores is the final ICI score. Appendix F contains the hand-scored ICI sheets from this study.

Two sites on the South Fork were sampled for macroinvertebrates during the 1997 season. Samples from this site were collected on October 7, 1997, since the samplers deployed during July were washed out by flooding. South Fork ICI scores were found to be "good" and "very good" at both sites. Site SF-4.5 received a score of 34, while SF-0.1 attained a score of 40 (Table 4.1). There was notable variation among individual metrics and between sampling sites.

The Tanytarsini midges in the family Chironomidae are often the most dominant midge group at less impacted Ohio EPA reference sites. At SF-4.5, 18% of the sample consisted of Tanytarsini midges, resulting in a score of 4 out of 6 possible points for metric seven (percent Tanytarsini midges). The percent Tanytarsini midges at Sites SF-0.1 was 3.2%, resulting in a score of 2 out of 6 possible points (Table 3.3).

Certain tolerant organisms can exist and even become dominant at disturbed sites (Ohio EPA 1987). Percent tolerant taxa (metric nine) is included to gauge the effects of organic as well as chemical pollutants. Site SF-0.1 had less than 1% tolerant organisms, resulting in the maximum possible score of 6 for this metric. This is considerably less than the 26% tolerant organisms found at SF-4.5 which resulted in a metric score of 0. In both cases, tolerant taxa were composed entirely of midges in the tribe Chironomini.

4.1.4 In-field Chemistry

The results of the in-field chemistry parameters measured at each of the South Fork sites indicate that stream conditions are within ranges conducive to aquatic life, and no discernable trends or patterns were noted (Table 3.4). Site SF-1.0 was added to the scope of work after the first electrofishing pass was completed, therefore, no in-field chemistry was recorded during the first round of electrofishing.

4.2 Racoon Creek

4.2.1 QHEI Scores

The habitat at RC-5.7 and RC-0.1 are similar. The QHEI scores for these sites were 74 and 69.5 respectively (Figure 4.2). Some variation in the instream cover metric (metric two) was noted. Site RC-5.7 scored a 14 for this metric, compared to 8 at RC-0.1 (Table 3.5). The stream bed at RC-5.7 has a variety of cobble and boulders within deep pools, and two fallen trees, which are excellent habitat for fish. In contrast, the majority of the substrate at RC-0.1 is a rather homogeneous mix of sand, with scattered boulders. The upstream end of the reach, has one deep pool, which stretches the width of the stream.

4.2.2 IBI and MIwb Scores

The upstream reference site for Racoon Creek (RC-5.7) had an IBI score of 40, which is in the "good" range and an MIwb score of 8.5, which also falls in the "good" category. Both are representative of WWH conditions. The sampling zone downstream of the Newark CSO area (RC-0.1) had an IBI score of 48, which is in the "very good" category. The MIwb score at this site was 8.0, placing it in the "good" category (Figure 4.2).

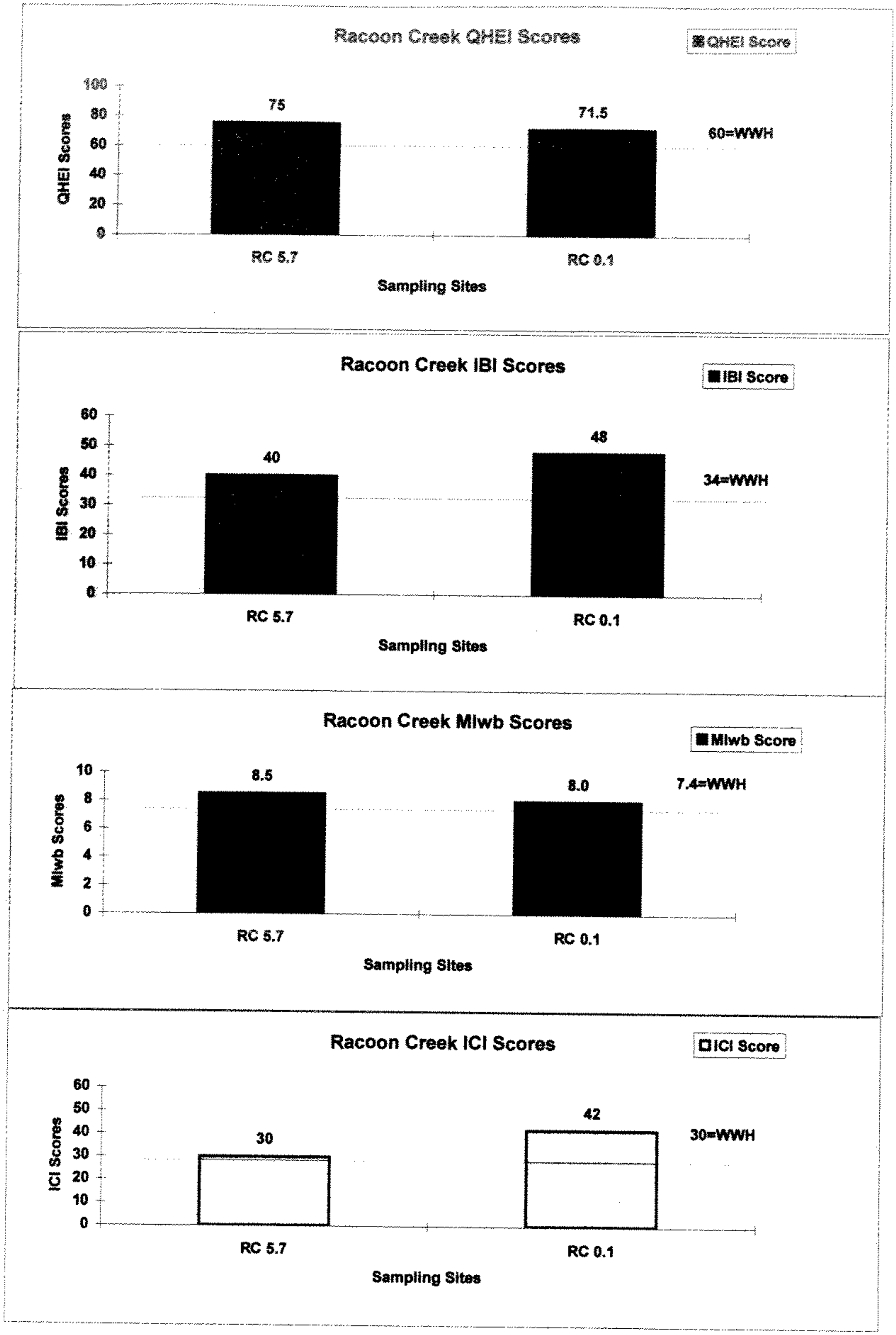
Notable differences in IBI metric values between sites and sampling rounds are seen in percent tolerant species (metric six), percent omnivores (metric seven), and proportion of simple lithophilic spawners (metric eleven).

The overall IBI score improved at the downstream site indicating a higher quality fish community and the percent tolerant species metric shows a similar trend. At Site RC-5.7, a higher percentage of tolerant species (44% in round one, 29% in round two) resulted in a score of 1 out of 5 for the first electrofishing pass and 3 in the second pass. In both cases, the tolerant species were a mix of Bluntnose Minnows (*Pimephales notatus*), Common White Sucker (*Catostomus commersoni*), and Northern Creek Chub (*Semotilis atromaculatus*). Site RC-0.1 had 5.5% tolerant species in the first electrofishing pass and 9.7% in the second. These resulted in high metric values of 5 for both rounds.

Omnivores have the ability to exploit a wide variety of food sources. High percentages of omnivores (metric seven) are often associated with streams with disturbed benthic insect communities. Collections during the first round of sampling at RC-5.7 were composed 39% omnivores compared to 24% for the second round. This is reflected in the lowest value of 1 for the first round and 3 second in metric seven. The dominant omnivores in both cases were the Bluntnose Minnow and Common White Sucker. These fish were less abundant at the downstream site (RC-0.1), and resulted in maximum scores of 5 for both electrofishing passes.

Both of the Racoon Creek sites received the maximum possible metric score of 5 for percent simple lithophilic spawners (metric eleven). This metric is a measure of stream substrate quality. These species release their eggs randomly about the substrate and leave them to

Figure 4.2 Biological Data for Racoon Creek



develop in the interstitial spaces of the gravel or sand. The eggs require well oxygenated, silt-free riffles, and can easily be smothered by the influx of silt or other fine organic matter (OEPA, 1988.).

The scores for this metric reflect the relatively high scores that these sites received for substrate, metric one of the QHEI (Tables 3.5 and 3.6).

Racoon Creek MIwb scores are considered to be in the "good" range, but decrease slightly from upstream to downstream. This opposes the trend seen in the IBI scores. At Site RC-5.7, the mean MIwb score of 8.5 can be attributed to relatively higher numbers of species like the Northern Hog Sucker, and the Ohio Stoneroller Minnow (*Campostoma anomalum anomalum*) that have a larger mass. The mass of these larger species tends to influence the MIwb calculation when tolerant species such as Common Carp (*Cyprinus carpio*) and Common White Sucker are removed as required by the MIwb formula. Site RC-0.1 has considerable numbers of relatively small fish which do not score quite as well in the MIwb, resulting in the slightly lower score of 8.0.

4.2.3 ICI Scores

Site RC-5.7 received an ICI score of 30 and RC-0.1 received a score of 42. The ICI score of 30 at the upstream site falls in the "marginally good" category and the 42 downstream is considered "very good". Both sites meet WWH criteria for ICI scores since they fall either in the "marginally good" or "very good" categories (Figure 4.2).

The Racoon Creek reference site (RC-5.7) had 20 macroinvertebrate taxa, exactly half of what was collected downstream at RC-0.1. The number of taxa (metric one) is 2 at RC-5.7 compared to the maximum of 6 at RC-0.1. Only 54 individual macroinvertebrates were collected at RC-5.7 compared to 179 at RC-0.1. This may be a contributing factor in the increased percentage of omnivorous fish collected at RC-5.7.

As a group, the Dipteran taxa exhibit the greatest diversity of feeding guilds and pollution tolerances. When habitat becomes homogeneous or pollution is more severe, certain Dipteran taxa disappear from the community. Even under the worst environmental conditions some Dipteran taxa may remain (Ohio EPA 1987). Only eight Dipteran taxa (metric four) were collected at RC-5.7, none of which were Tanytarsini midges (metric seven). These resulted in low metric values of 2 for the number of Dipteran taxa, and 0 for percent Tanytarsini midges.

Site RC-0.1 had 21 Dipteran taxa including 5 Tanytarsini midges. These resulted in scores of 6 for the number of Dipteran taxa and 2 for percent Tanytarsini midges (Table 3.7).

4.2.4 In-field Chemistry

The results of the in-field chemistry parameters measured at each of the Racoon Creek sites were favorable for WWH communities. There were no noticeable trends which would negatively influence aquatic life (Table 3.8).

4.3 North Fork and Licking River Mainstem

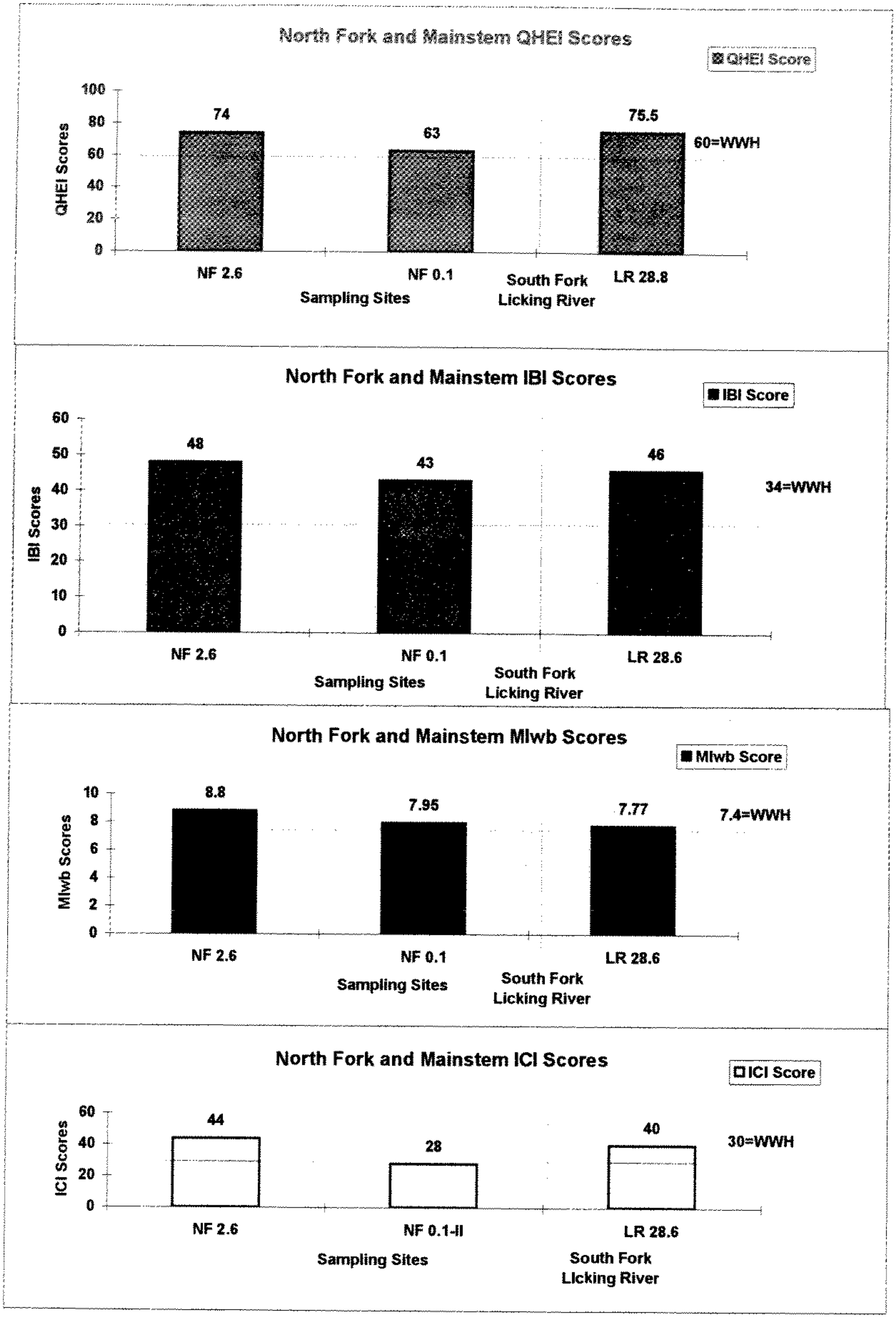
4.3.1 QHEI Scores

The QHEI scores at Sites NF-2.6, NF-0.1, and LR-28.6 were 74, 63, and 75.5, respectively (Figure 4.3).

The habitat score for NF-2.6 reflects anthropogenic influences. A portion of the left bank of the stream has been shaped and re-enforced to prevent erosion into a road that runs its length. This causes a straightening of the channel, which is reflected in the value of 8.5 out of 10 for riparian zone, and 14 for out of 20 channel morphology. The original habitat at NF-0.1 has been significantly disturbed. All trees have been removed from the banks, leaving no overhanging vegetation to shade the stream. The North Fork is sballow in this area, and the substrate is composed of mostly small cobble and gravel. Both the lack of vegetative canopy and homogeneous substrate result in a low score for instream cover of 7 out of a possible 20 points (Table 3.9). The predominant vegetation on both banks is grass. This riparian zone is considered "park or new field" and results in another relatively low score of 6.5 for riparian zone quality (metric four).

Site LR-28.6 is the only site on the Licking River Mainstem. It is downstream from most point and non-point influences from within the city of Newark, and is upstream of the Newark WWTP discharge. The habitat at LR-28.6 is the least impacted of any site within the study area. There are boulders, undercut banks, and fallen trees which provide ample cover for

Figure 4.3 Biological Data for North Fork and the Licking River Mainstem



aquatic life. This results in the relatively high score of 13 out of 20 for instream cover (metric two). The riparian zone is 100% forest, which produced a score of 9 out of 10 possible points for metric four. Overall, the habitat here is good, but siltation is evident, resulting in a score of 5 for riffle quality (Table 3.9).

4.3.2 IBI and MIwb Scores

Following Ohio EPA methods, the IBI and MIwb scores were calculated for each electrofishing pass, averaged and compared to WWH criteria.

IBI scores for the North Fork and Licking River Mainstem sites were within the "good" range. Site NF-2.6 had an IBI score of 48 and an MIwb score of 8.8. The sampling zone at Site NF-0.1 scored an IBI of 43 and a MIwb of 7.9. Site LR-28.6 had an IBI score of 46 and MIwb of 7.8 (Figure 4.3).

IBI scores in the two North Fork sites are relatively similar. Both North Fork sites attained the highest value of 5 for percent tolerant species (metric six). The fish community sampled during the second electrofishing pass at NF-2.6 scored a 54 ("exceptional"). This was the highest IBI score recorded during the entire survey. Also notable, is the relative number of fish (825) calculated for first electrofishing pass at this site (metric ten). This was the highest value calculated in the entire survey, making this the only site to receive the maximum value of 5 for this metric (Table 3.10).

Mean MIwb values for the North Fork scored in the "good" range. The mean MIwb value calculated for the second electrofishing pass was 9.1. This is indicates "very good" community structure. However, when it is averaged with the first round value of 8.4, the mean falls in the "good" range. The MIwb scores at both sites reflect relatively balanced fish communities, with adequate numbers of individuals, relative weights, and few tolerant species which would lower the score.

Two IBI metrics from the Licking River Mainstem (LR-28.6) showed considerable variation between rounds. These were the number of darter species (metric two), and the relative number of individuals (metric ten). Darters are reliable indicators of good water quality. None of the darters thrive in severely degraded conditions (Ohio EPA, 1987). During the first electrofishing pass, three darter species were collected, resulting in a low value of 1 for metric two. The relative number of individuals excluding tolerant species is a measure of productivity within healthy streams. Tolerant fish species are excluded from this metric since some may thrive in perturbed situations and falsely increase relative numbers. The relative number was 140 individuals during the first electrofishing pass, resulting in a low score of 1 for metric ten. During the second electrofishing pass, metrics two and ten showed marked improvement. Six darter species and 350 individuals were collected, which increased the darter species and relative number metric values to 3 (Table 3.10).

The somewhat lower MIwb score of 7.8 at LR-28.6 most likely results from the presence of Common Carp which made up nearly 88% of the mass in round one collections. The Common Carp is considered a tolerant species and is excluded when calculating MIwb scores. Excluding Common Carp lowers the relative weights at this site, resulting in a lower MIwb score (Appendix B). Round two MIwb value (9.0) was in the "very good" range. During this round, Common Carp made up nearly 45% of the mass, but were offset by the higher masses and of non-tolerant species such as the Black Redhorse (*Moxostoma duquesnei*), Smallmouth Blackbass (*Micropterous dolomieu*), and Eastern Gizzard Shad (*Dorosoma cepedianum*). Each made up 21%, 4.3%, and 4.8% of the weight respectively.

4.3.3 ICI Scores

As previously noted, the Invertebrate Community Index (ICI) evaluates macroinvertebrate communities using a series of metrics derived from IBI scoring techniques. The sum of these metric scores is the final ICI score. Appendix F contains the hand scored ICI sheets from this study.

ICI scores at NF-2.6, and LR-28.6 were in the "very good" range for macroinvertebrate communities, having scores of 44 and 40 respectively. The downstream North Fork site (NF-

0.1) scored 22 and 28 for two rounds of macroinvertebrate sampling. On August 26, 1997, during macroinvertebrate sample collection, it was noted that a plastic fiber bag was wrapped around the remaining set of Hester Dendy samplers at NF-0.1. This obstruction did interfere with the water flow over the samplers, and influenced macroinvertebrate colonization. Since other samplers were being reset that day (on the South Fork and Mainstem), and there was no way to determine how long the bag had been wrapped around the samplers, EnviroScience, Inc. personnel deployed a second set of samplers at this site. Subsequently, two ICI scores have been calculated and recorded for NF-0.1. Both scores fall in the "fair" category for invertebrate community quality (Figure 4.3).

Site NF-2.6 had notable values for mayfly (metric two) and caddisfly taxa (metric three). There were 8 mayfly taxa and 6 caddisfly taxa collected at this site, which are reflected in the high scores of 4 for the mayfly metric, and 6 for the caddisfly metric. Site NF-2.6 had less than 1% tolerant organisms, resulting in the highest possible value of 6 for metric nine, indicating minimal pollution influence (Table 3.11).

In both sample sets from NF-0.1, the scores for mayfly taxa (metric two) were low. The value for round one was 2, and the value for round two was 0. Percent caddisflies (metric six) scored a 0 in the first set and 6 out of 6 from the second set. There were only 4% caddisflies in the first sampler set, and 53% in the second. This may be a direct result of the fiber bag limiting the flow of Coarse Particulate Organic Matter (CPOM) into the first round samplers. Most hydropsychid caddisflies (the most abundant caddisfly group in the survey) feed by collecting CPOM from the water column. Reduced import of these particles to the samplers most likely reduced caddisfly densities. There were 26% tolerant organisms (metric nine) in the first sample set and less than 2% in the second. The high percentage of tolerant species in the first set resulted on a low value of 0 for metric nine, where the minimal tolerant species in the second resulted in the maximum value of 6. The low score from the first set is a function of the fiber bag; the limited flow creating a suitable habitat for tolerant taxa (mostly Chironomidae).

The samplers at LR-28.6 were reset on August 26, 1997, when it was discovered that flooding had washed out the original set. Notable scores are seen for number of Dipteran taxa (metric four), and percent tolerant organisms (metric nine). As previously mentioned, the dipterans as a group exploit a wide array of habitats and feeding preferences. The loss of certain Dipteran taxa often indicates pollution. Sixteen Dipteran taxa were collected at LR-28.6, resulting in a score of 6 for metric four. Only 1% of the organisms in the sample were considered tolerant, which resulted in a high value of 6 for metric nine (Table 3.11).

4.3.4 In-field Chemistry

The results of the in-field chemistry parameters measured at each of the North Fork and Licking River sites indicate that stream conditions are within ranges conducive to supporting diverse aquatic communities (Table 3.12).

5.0 CONCLUSION

The relatively high QHEI scores (all >60) calculated for the sites in the Licking River study area indicate that the fish and macroinvertebrate communities at all sites can be expected to compare favorably to other Erie-Ontario Lake Plain sites, and attain WWH. As listed in Table 5.1, all of the sites achieved at least PARTIAL attainment of WWH. Despite the relatively high QHEI scores, all of the sites in the study area have some degree of anthropogenic influence. Each upstream reference site (SF-4.5, RC-5.7, and NF-2.6) has modifications such as bank shaping, canopy removal, or minor siltation effecting the QHEI scores. The downstream sites on the North Fork and South Fork (SF-0.1 and NF-0.1) exhibit the most extensive modification, and this coincides with the lowest habitat scores. These areas are highly channelized, and have been leveed to prevent flooding in the surrounding residential areas. These sites are also exposed to full sunlight and lack extensive cover.

The results of the IBI and MIwb reveal that point and non-point source pollution may have minor impacts on the fish communities in the Licking River and its three major tributaries within the city limits of Newark, Ohio. Fish communities were characterized as "good" to "exceptional" throughout the study area. The highest mean IBI score (50 "exceptional") was

Table 5.1 Comparative Results for Licking River Sampling Sites

Site	QHEI	IBI	MIwb	ICI	Attainment Status
SF-4.5	75	50 "Exceptional"	8.8 "Good"	34 "Good"	Attainment of WWH
SF-1.0	75	50 "Exceptional"	8.2 "Good"	N/A	Cannot be scored without ICI Score
SF-0.1	68	43 "Good"	8.1 "Good"	40 "Very Good"	Attainment of WWH
RC-5.7	75	40 "Good"	8.5 "Good"	30 "Marginally Good"	Attainment of WWH
RC-0.1	71.5	48 "Very Good"	8.0 "Good"	42 "Good"	Attainment of WWH
NF-2.6	74	48 "Very Good"	8.8 "Good"	44 "Very Good"	Attainment of WWH
NF-0.1	63	43 "Good"	8.0 "Good"	22/28 "Fair"	PARTIAL Attainment of WWH
LR-28.6	75.5	46 "Very Good"	7.8 "Good"	40 "Very Good"	Attainment of WWH

recorded at SF-4.5, the South Fork reference site. The highest single IBI value (54"exceptional") was recorded at the North Fork reference site (NF-2.6). The lowest mean IBI value of 40 "good", was recorded at the Racoon Creek reference site (RC-5.7). The highest mean MIwb value (8.8 "good") was calculated at two sites, NF-2.6 and SF-4.5. The lowest mean MIwb value of 7.8 was recorded at LR-28.6. This value falls in the "good" category.

One area of concern is the reference site on Racoon Creek (RC-5.7). Despite adequate habitat, the site supported the highest percentages of tolerant species in the entire study (Appendix C). The stream did exhibit a degree of recovery downstream at RC-0.1, prior to its confluence with the South Fork.

During the second electrofishing pass, the fish community at SF-0.1 showed no impact from the instream disturbance from the Route 13 bridge reconstruction. Despite the turbid water caused by the construction, the fish data generated from the second round of sampling produced higher IBI and MIwb scores than did the first round.

Macroinvertebrate community performance in the Licking River study area ranged from "fair" to "very good", indicating FULL attainment of WWH at six of the sites. The highest ICI value (44 "very good") was calculated at NF-2.6, the North Fork reference site. The lowest ICI value (28 "fair") was calculated at the downstream North Fork site (NF-0.1), and determined the PARTIAL attainment of WWH status (Table 5.1). As mentioned in section 4.3.2, the Hester-Dendy samplers were reset at NF-0.1 due to a plastic fiber bag covering the first set. Both samples were identified in an effort to better define the macroinvertebrate community of the site. Since ICI values from both sets scored in the "fair" category, it is believed that the macroinvertebrate communities at NF-0.1 are being limited by pollution and/or habitat.

To be in FULL attainment for WWH, all biological indices calculated at a site must fall in or above the "marginally good" range. In the Licking River survey, six sites achieved FULL WWH attainment status (Table 5.1). PARTIAL Attainment status is assigned when one or two of the indices score in the "fair" category, or as in the case of SF-1.0, one of the indices (in this case the ICI) cannot be calculated. Site NF-0.1 achieved PARTIAL attainment of WWH due to a "fair" ICI score.

Sites that appeared to be impacted by environmental stressors were RC-5.7 and NF-0.1. The Racoon Creek reference site had the highest percentage of tolerant species in both electrofishing passes. The percent tolerant individuals was significantly lower at RC-0.1, the downstream Racoon Creek site, suggesting that CSOs do not negatively impact the site and recovery is occurring between the sampling sites. The ICI calculated at RC-5.7 was 30 "marginally good", indicating that some degree of disturbance in the macroinvertebrate community exists. The mean IBI scores dropped slightly and the ICI scores dropped considerably between NF-2.6 and NF-0.1. The lower IBI score (43) and ICI (28) at NF-0.1 may be habitat related, since this site also had the lowest QHEI value (63) in the entire survey.

6.0 ACRONYMS AND TERMS

DELT: DELT Anomalies- the presence of externally visible skin or subcutaneous disorders in the sampled fish community; included are, Deformities, Eroded Fins, Lesions and Ulcers, and Tumors

EPT: Ephemeroptera, Plecoptera, Trichoptera- commonly called mayflies, stoneflies, and caddisflies; these are collected in conjunction with the artificial substrates and are a measure of the quality of the macroinvertebrate communities in the naturally occurring habitats

IBI: Index of Biotic Integrity- the index most commonly used by the Ohio EPA to evaluate the fish community of a stream (used in conjunction with the MIwb for wading and boat electrofishing sites only)

ICI: Invertebrate Community Index- the index most commonly used by the Ohio EPA to evaluate the macroinvertebrate assemblage of a stream

MIwb: Modified Index of well being- index for the fish community of a stream used in conjunction with the IBI

QHEI: Qualitative Habitat Evaluation Index- index designed as a measure of macro-habitat quality that generally corresponds to those physical factors that affect fish communities and are generally important to other aquatic life

RM: River Mile- standard measurement of stream length, beginning at the mouth or confluence and ending at the headwaters

WQS: Ohio Water Quality Standards- designated uses and chemical, physical, and biological criteria designed to represent measurable properties of the environment consistent with the goals of a particular use designation; In reference to resource water management, aquatic life use criteria most often control the protection and restoration requirements.

WWH: Warmwater Habitat- the aquatic life use designation developed by the Ohio EPA to define the "typical" warmwater assemblage of Aquatic Organisms for Ohio rivers and streams; this use represents the principal restoration target for the majority of resource water management efforts in Ohio; Biological Criteria are stratified across five ecoregions for the WWH use designation.

Benthic Macroinvertebrates- animals without a backbone that are large enough to be seen with an unaided eye and can be retained in a U.S. Standard No. 30 sieve (28 meshes per inch) and live at least part of their life cycles within or on the available substrates in a body of water (e.g. snails, clams, worms, and adult and larval insects).

Diversity- the variety of species within a community

Ecoregion- a relatively homogeneous geographical area where several key geographic variables coincide; The variables define the general characteristics of the watersheds within the ecoregion

Hester-Dendy Sampler- the Modified Hester-Dendy multiple-plate artificial substrate sampler is the principle device used by the Ohio EPA for the quantitative collection of benthic macroinvertebrates.

Insectivore- metric eight of the IBI, species which feed primarily on insects; In reference to aquatic habitats, the insectivores are the fish that subsist on the adult and larval insects in the benthic macroinvertebrate community.

Lithophilic Spawners- metric eleven of the IBI, fish that require clean gravel and/or cobble for successful reproduction since the eggs develop in the interstitial spaces of the substrate

Omnivores- metric seven of the IBI, species which feed indiscriminately on available food sources; In reference to aquatic habitats, the omnivores are fish which are consistently generalist feeders throughout their existence.

Taxa- hierarchical categories of organisms containing one or more group of organisms

Top Carnivores- metric nine of the IBI, fish species which feed primarily on other vertebrates or crayfish

7.0 REFERENCES

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APPENDIX D

Newark CSO
Additional NFLR Sampling 4/15/98
Sediment Samling

Parameter	Sediment Quality Standard					OEPA	Sample Location					
	Kelly-Hite (6)			Canadian (5)		1993	NF US 7	CSO 7	NF US 6 Main St.	CSO 6	NF DS 6 Flek&Ohio	NF DS 6 RR&Fleek
	Normal	Slight	High	Low	High	RM 1.6	Newark	Newark	Newark	Newark	Newark	Newark
Acenaphthacene									<1.0			<1.0
Acenaphthene									<1.0			<1.0
Anthracene				0.22	37	<0.5			<1.0			<1.0
Benzo(a)anthracene				0.32	148	<0.5			<0.15			<0.15
Benzo(a)pyrene				0.37	144	<0.5			<0.3			<0.3
Benzo(b)pyrene									<0.3			<0.3
Benzo(k)fluoroanthene				0.24	134	<0.5			<0.3			<0.3
Benzo(g,h,i)perylene				0.17	32	<0.5			<1.0			<1.0
Chrysene				0.34	46	<0.5			<5.0			<5.0
Dibenzo(a,h)anthracene									<0.3			<0.3
Fluoranthene				0.75	102	<0.5			1.163			1.216
Fluorene									<1.0			<1.0
Ideno(1,2,3-c,d)pyrene				0.2	32	<0.5			<0.3			<0.3
Naphthalene									<1.0			<1.0
Phenathrene				0.56	95	<0.5			<1.0			<1.0
Pyrene				0.49	85	<0.5			1.046			1.001
PCB-1242									<0.002		<0.002	
PCB-1254									<0.002		<0.002	
PCB-1221									<0.002		<0.002	
PCB-1232									<0.002		<0.002	
PCB-1248									<0.002		<0.002	
PCB-1260				0.005	2.4				<0.002		<0.002	
PCB-1016									<0.002		<0.002	
4,4-DDT									0.496			<0.04
Aluminum							3,400	5,050	2,860	1,320	4,180	1,840
Magnesium							12,000	18,800	10,000	12,100	13,700	10,700
Mercury	<0.25	0.25-0.4	>0.4	0.2	2.4		0.06	2.7	0.04	0.07	0.11	0.02
Cadmium	<1.8	1.8-2.6	>2.6			0.5	0.9	8.0	0.7	0.7	1.0	0.5
Chromium	14-30	30-38	>38			11.2	5.0	31.9	3.9	5.6	6.4	3.3
Copper	<100	100-150	>150	16	110	16.3	18.8	139.0	13.1	59.8	36.4	12.6
Nickel						13.4	18.9	34.8	15.7	12.9	19.3	12.2
Lead	16-100	100-150	>150			16.2	25.0	313.0	19.1	32.8	38.8	15.2
Zinc	50-175	175-250	>250			82.5	76.2	640.0	62.4	92.5	179.0	42.6
Arsenic	<27	24-41	>41			15.4	8.0	9.3	6.1	2.3	8.0	3.5
Selenium							0.2	1.5	0.1	0.1	AA	0.1
Molybdenum							4.0	15.6	3.0	4.4	4.4	2.3
Thallium							0.3	0.8	0.2	0.1	AA	0.1

Notes
1. All values in mg/kg
2. Blank space indicates sample was not collected and analyzed.
3. Main St. sample collected from East bank NFLR; Fleek and Ohio sample collected from the West bank of the NFLR; Fleek and RR - East bank of the NFLR.
4. AA - Below Detection
5. Canadian Sediment Quality Guidelines Low = lowest effect level; high = severe effect level based on 10% total organic carbon.
6. Sediment classification system by Kelly and Hite (1984) Elevated = slightly elevated, highly = highly elevated.

APPENDIX E

Newark CSO
Additional NFLR Sampling 4/16/98
Wet Weather River Sampling

5-day Carbonaceous Biological Oxygen Demand (mg/l)

Time (min)	Aquatic Life Std.	Location						
		NF US 7	CSO 7	STM 7	NF US 6	CSO 6	STM 6	NF DS 6
0		6.3	35	2.2	8.9	232	38	7.5
15		4.8	42	2.5	8.7	110	25	4.7
30		4.0	24	3.7	6.7	57	18	5.8
45		6.3	18	3.6	7.5	34.2	24	3.1
60		NS	11	2.1	NS	29.4	17	NS
90		NS	27	3.8	NS	22	20	NS
120		NS	14	3.8	NS	22.2	NS	NS
240		NS	13	1.9	NS	16	NS	NS
360		NS	11	2.5	NS	24.6	NS	NS
480		NS	14	3.6	NS	27.7	NS	NS
600		NS	NS	4.9	NS	NS	NS	NS

NS - No Sample Collected

Suspended Solids (mg/l)

Time (min)	Aquatic Life Std.	Location						
		NF US 7	CSO 7	STM 7	NF US 6	CSO 6	STM 6	NF DS 6
0		88	386	8	98	920	270	86
15		168	544	4	144	470	236	114
30		96	780	2	102	132	112	162
45		192	526	4	220	138	92	118
60		NS	308	2	NS	104	82	NS
90		NS	142	8	NS	76	84	NS
120		NS	96	2	NS	54	NS	NS
240		NS	62	8	NS	88	NS	NS
360		NS	224	2	NS	150	NS	NS
480		NS	192	4	NS	214	NS	NS
600		NS	NS	4	NS	NS	NS	NS

NS - No Sample Collected

Total Kjeldahl Nitrogen (mg/l)

Time (min)	Aquatic Life Std.	Location						
		NF US 7	CSO 7	STM 7	NF US 6	CSO 6	STM 6	NF DS 6
0		1.2	5.8	0.1	1.3	53.7	4.1	1.3
15		1.8	4.2	0.1	1.4	12.6	3.0	1.2
30		1.7	3.9	0.2	1.3	6.9	1.9	1.4
45		1.5	3.3	0.5	2.5	3.7	1.4	1.4
60		NS	2.2	0.5	NS	2.9	1.2	NS
90		NS	1.8	0.1	NS	2.7	1.8	NS
120		NS	1.3	0.2	NS	1.8	NS	NS
240		NS	1.0	0.1	NS	2.6	NS	NS
360		NS	2.0	0.3	NS	3.0	NS	NS
480		NS	2.5	0.4	NS	5.9	NS	NS
600		NS	NS	0.6	NS	NS	NS	NS

NS - No Sample Collected

Newark CSO
Additional NFLR Sampling 4/16/98
Wet Weather River Sampling

Fecal Coliform (col/100 ml)

Time (min)	Aquatic Life Std.	Location						
		NF US 7	CSO 7	STM 7	NF US 6	CSO 6	STM 6	NF DS 6
0								
15								
30								
45								
60								
Composite	1,000	NS	13,650	10,650	NS	TNTC	19,900	NS

TNTC - to numerous to count
NS - No Sample Collected

Aluminum (ug/l)

Time (min)	Aquatic Life Std.	Location						
		NF US 7	CSO 7	STM 7	NF US 6	CSO 6	STM 6	NF DS 6
0		1,240	2,770	AA	1,370	4,830	1,970	1,510
15		1,919	4,150	AA	1,910	3,130	1,690	1,680
30		1,760	5,790	AA	2,300	1,600	1,190	2,830
45		2,890	4,080	AA	3,250	856	1,330	2,510
60		NS	3,370	AA	NS	916	1,140	NS
90		NS	1,870	AA	NS	825	1,000	NS
120		NS	1,590	74	NS	443	NS	NS
240		NS	1,010	55	NS	848	NS	NS
380		NS	2,530	69	NS	1,840	NS	NS
480		NS	1,710	AA	NS	2,090	NS	NS
600		NS	NS	AA	NS	NS	NS	NS

NS - No Sample Collected

Magnesium (ug/l)

Time (min)	Aquatic Life Std.	Location						
		NF US 7	CSO 7	STM 7	NF US 6	CSO 6	STM 6	NF DS 6
0		14,400	16,600	26,600	14,100	10,200	3,890	14,100
15		13,300	13,200	28,200	13,800	10,400	6,780	15,600
30		13,300	15,500	28,000	15,300	3,690	1,890	16,300
45		15,900	20,300	28,400	15,100	2,410	880	14,300
60		NS	12,800	27,200	NS	1,880	1,400	NS
90		NS	5,400	27,600	NS	1,410	1,130	NS
120		NS	4,340	27,600	NS	760	NS	NS
240		NS	3,930	33,000	NS	2,620	NS	NS
360		NS	10,200	27,700	NS	3,090	NS	NS
480		NS	7,920	27,300	NS	5,170	NS	NS
600		NS	NS	23,900	NS	NS	NS	NS

NS - No Sample Collected

Newark CSO
Additional NFLR Sampling 4/16/98
Wet Weather River Sampling

Mercury (ug/l)

Time (min)	Aquatic Life Std.	Location						
		NF US 7	CSO 7	STM 7	NF US 6	CSO 6	STM 6	NF DS 6
0	0.2	AA	AA	0.060	0.190	**1.050**	**0.470**	AA
15	0.2	AA	**0.37**	AA	AA	0.170	**0.240**	AA
30	0.2	AA	AA	0.150	AA	AA	0.130	AA
45	0.2	AA	AA	AA	AA	AA	0.100	AA
60	0.2	NS	AA	0.090	NS	AA	**0.210**	NS
90	0.2	NS	AA	AA	NS	AA	0.190	NS
120	0.2	NS	AA	AA	NS	AA	NS	NS
240	0.2	NS	AA	AA	NS	AA	NS	NS
360	0.2	NS	AA	0.080	NS	**0.270**	NS	NS
480	0.2	NS	AA	AA	NS	0.150	NS	NS
600	0.2	NS	NS	AA	NS	NS	NS	NS

NS - No Sample Collected

Cadmium (ug/l)

Time (min)	Aquatic Life Std.	Location						
		NF US 7	CSO 7	STM 7	NF US 6	CSO 6	STM 6	NF DS 6
0	3.6	1.9	3.1	1.4	1.4	2.2	2.2	1.5
15	3.6	1.3	2.8	1.5	1.9	1.4	**4.6**	1.7
30	3.6	1.8	3.6	1.4	2.5	1.2	1.8	2.8
45	3.6	2.4	2.3	1.4	1.9	1.0	0.9	2.5
60	3.6	NS	**5.1**	1.3	NS	1.2	2.1	NS
90	3.6	NS	1.9	1.3	NS	1.0	1.6	NS
120	3.6	NS	1.7	1.8	NS	0.7	NS	NS
240	3.6	NS	2.0	1.7	NS	1.0	NS	NS
360	3.6	NS	2.7	1.9	NS	0.5	NS	NS
480	3.6	NS	2.4	1.9	NS	1.7	NS	NS
600	3.6	NS	NS	2.0	NS	NS	NS	NS

NS - No Sample Collected

Chromium (ug/l)

Time (min)	Aquatic Life Std.	Location						
		NF US 7	CSO 7	STM 7	NF US 6	CSO 6	STM 6	NF DS 6
0	11	AA	1.3	2.1	AA	3.2	0.1	AA
15	11	AA	AA	1.3	AA	AA	AA	AA
30	11	AA	1.3	1.0	1.6	AA	AA	AA
45	11	AA	AA	1.1	0.9	AA	AA	AA
60	11	NS	AA	0.2	NS	AA	AA	NS
90	11	NS	0.4	AA	NS	AA	AA	NS
120	11	NS	AA	AA	NS	AA	NS	NS
240	11	NS	AA	AA	NS	1.1	NS	NS
360	11	NS	AA	AA	NS	0.9	NS	NS
480	11	NS	AA	AA	NS	AA	NS	NS
600	11	NS	NS	1.7	NS	NS	NS	NS

NS - No Sample Collected

Newark CSO
Additional NFLR Sampling 4/16/98
Wet Weather River Sampling

Copper (ug/l)

Time (min)	Aquatic Life Std.	Location						
		NF US 7	CSO 7	STM 7	NF US 6	CSO 8	STM 6	NF DS 6
0	34.5	9.5	**42**	4.1	10.3	**102**	28	11.3
15	34.5	9.5	**62**	3.9	14.3	**103**	43	10.1
30	34.5	9.1	**46**	4.1	10.4	**63**	21	13.4
45	34.5	12.8	**38**	4.8	12.7	**42**	11	11.7
80	34.5	NS	25	3.9	NS	31	12	NS
90	34.5	NS	19	4.7	NS	27	13	NS
120	34.5	NS	14	4.3	NS	15.8	NS	NS
240	34.5	NS	19	4.4	NS	22.2	NS	NS
360	34.5	NS	25	4.6	NS	**40.3**	NS	NS
480	34.5	NS	23	4.5	NS	**43.7**	NS	NS
600	34.5	NS	NS	5.4	NS	NS	NS	NS

NS - No Sample Collected

Nickel (ug/l)

Time (min)	Aquatic Life Std.	Location						
		NF US 7	CSO 7	STM 7	NF US 6	CSO 6	STM 6	NF DS 6
0	500	5.0	23	9.8	2.6	25	13.6	4.2
15	500	6.9	21	9.6	6.0	20	9.8	3.3
30	500	5.1	34	9.1	12.9	17	4.9	6.9
45	500	10.1	28.0	9.6	10.5	12.5	7.0	6.0
60	500	NS	19	7.8	NS	9.7	6.8	NS
90	500	NS	13.3	8.6	NS	13.9	8.2	NS
120	500	NS	9.7	9.5	NS	9.2	NS	NS
240	500	NS	11	8.9	NS	9.7	NS	NS
360	500	NS	12	8.0	NS	12.3	NS	NS
480	500	NS	13	12.4	NS	14.8	NS	NS
600	500	NS	NS	11.5	NS	NS	NS	NS

NS - No Sample Collected

Lead (ug/l)

Time (min)	Aquatic Life Std.	Location						
		NF US 7	CSO 7	STM 7	NF US 6	CSO 6	STM 6	NF DS 6
0	33	5.2	**120**	16	AA	**128**	**78**	3.3
15	33	6.4	**113**	20	AA	**68**	**115**	AA
30	33	4.9	**85**	20	15.3	**59**	32	AA
45	33	8.2	**69**	20	15.0	**43**	21	AA
60	33	NS	**38**	19	NS	31	24	NS
90	33	NS	25	22	NS	22.3	17	NS
120	33	NS	16	22	NS	16.5	NS	NS
240	33	NS	18	22	NS	26.8	NS	NS
360	33	NS	**38**	23	NS	**49**	NS	NS
480	33	NS	**38**	21	NS	**66**	NS	NS
600	33	NS	NS	21	NS	NS	NS	NS

NS - No Sample Collected

Newark CSO
Additional NFLR Sampling 4/16/98
Wet Weather River Sampling

Zinc (ug/l)

Time (min)	Aquatic Life Std.	Location						
		NF US 7	CSO 7	STM 7	NF US 6	CSO 8	STM 6	NF DS 6
0	290	38.9	250	7.9	47.9	447	197	61.6
15	290	44.3	414	6.5	44.7	331	282	42.1
30	290	48.8	240	8.9	51.9	214	96	43.0
45	290	72.4	248	7.2	60.7	146	68	46.5
60	290	NS	133	8.7	NS	157	111	NS
90	290	NS	87	4.9	NS	75	79	NS
120	290	NS	85	7.9	NS	71	NS	NS
240	290	NS	93	8.8	NS	76	NS	NS
360	290	NS	133	8.8	NS	132	NS	NS
480	290	NS	120	10.3	NS	133	NS	NS
600	290	NS	NS	9.3	NS	NS	NS	NS

NS - No Sample Collected

Arsenic (ug/l)

Time (min)	Aquatic Life Std.	Location						
		NF US 7	CSO 7	STM 7	NF US 6	CSO 6	STM 6	NF DS 6
0	190	2.2	7.1	AA	4.0	4.5	3.1	2.3
15	190	3.8	7.9	0.2	4.2	3.1	2.6	2.9
30	190	1.4	12.9	0.9	2.7	1.1	2.8	3.6
45	190	4.1	9.4	AA	4.2	2.0	2.3	3.3
60	190	NS	6.2	0.3	NS	1.2	2.2	NS
90	190	NS	3.7	0.2	NS	0.3	1.6	NS
120	190	NS	2.3	AA	NS	1.1	NS	NS
240	190	NS	2.9	0.3	NS	2.5	NS	NS
360	190	NS	5.9	AA	NS	4.9	NS	NS
480	190	NS	4.7	AA	NS	5.8	NS	NS
600	190	NS	NS	AA	NS	NS	NS	NS

NS - No Sample Collected

Selenium (ug/l)

Time (min)	Aquatic Life Std.	Location						
		NF US 7	CSO 7	STM 7	NF US 6	CSO 6	STM 6	NF DS 6
0	5	AA	2.1	3.2	0.6	0.2	2.8	AA
15	5	AA	2.1	1.0	1.6	AA	AA	1.4
30	5	AA	1.1	0.1	AA	0.5	0.2	4.4
45	5	AA	1.0	0.4	0.8	AA	0.4	2.6
60	5	NS	0.2	0.6	NS	AA	1.4	NS
90	5	NS	3.2	0.5	NS	AA	1.3	NS
120	5	NS	1.8	4.8	NS	2.9	NS	NS
240	5	NS	1.3	1.9	NS	AA	NS	NS
360	5	NS	2.4	0.8	NS	1.6	NS	NS
480	5	NS	1.0	1.8	NS	0.6	NS	NS
600	5	NS	NS	2.6	NS	NS	NS	NS

NS - No Sample Collected

Newark CSO
Additional NFLR Sampling 4/16/98
Wet Weather River Sampling

Molybdenum (ug/l)

Time (min)	Aquatic Life Std.	Location						
		NF US 7	CSO 7	STM 7	NF US 6	CSO 8	STM 6	NF DS 6
0		AA	5.7	35	24.5	27.6	12	7.4
15		AA	5.6	13	12.2	23.3	6.3	17.7
30		AA	5.6	8.4	8.9	14.9	2.8	11.0
45		AA	26	6.6	8.8	14.4	2.7	7.7
60		NS	14	5.8	NS	11.0	3.0	NS
90		NS	8.5	5.5	NS	9.2	7.7	NS
120		NS	6.8	21	NS	16.8	NS	NS
240		NS	4.4	7.4	NS	14.8	NS	NS
360		NS	3.7	4.8	NS	14.1	NS	NS
480		NS	3.4	4.0	NS	7.4	NS	NS
600		NS	NS	4.9	NS	NS	NS	NS

NS - No Sample Collected

Thalium (ug/l)

Time (min)	Aquatic Life Std.	Location						
		NF US 7	CSO 7	STM 7	NF US 6	CSO 6	STM 6	NF DS 6
0	16	AA	AA	1.7	AA	AA	1.6	AA
15	16	AA	0.1	1.8	0.1	AA	AA	0.9
30	16	AA	1.3	4.5	2.2	AA	AA	2.0
45	16	AA	1.1	1.9	0.9	AA	AA	1.5
60	16	NS	1.2	4.8	NS	AA	0.3	NS
90	16	NS	2.1	4.5	NS	AA	0.3	NS
120	16	NS	1.6	AA	NS	0.1	NS	NS
240	16	NS	AA	0.2	NS	AA	NS	NS
360	16	NS	4.0	AA	NS	AA	NS	NS
480	16	NS	1.8	2.0	NS	0.3	NS	NS
600	16	NS	NS	0.7	NS	NS	NS	NS

NS - No Sample Collected

APPENDIX F

Newark CSO Long Term Control Plan
Additional NFLR Sampling 5/18/98
Background River Water Samples

5-day CBOD (mg/l)

Time (min)	Aquatic Life Std.	Location	
		NF US 7	NF DS 6
0		3.6	3.4
15		5.0	3.6
30		3.9	3.2
45		3.3	3.8
60		5.0	4.7
Average		4.16	3.74

Suspended Solids (mg/l)

Time (min)	Aquatic Life Std.	Location	
		NF US 7	NF DS 6
0		2.0	2.0
15		2.0	2.0
30		4.0	2.0
45		2.0	2.0
80		2.0	4.0
Average		2.4	2.4

Total Kjheldahl Nitrogen (mg/l)

Time (min)	Aquatic Life Std.	Location	
		NF US 7	NF DS 6
0		0.41	0.36
15		0.34	0.34
30		0.38	0.56
45		0.37	0.04
60		0.46	0.95
Average		0.392	0.45

Aluminum (ug/l)

Time (min)	Aquatic Life Std.	Location	
		NF US 7	NF DS 6
0		51	38
15		44	42
30		40	20
45		33	14
60		48	14
Average		43.2	25.6

Nickel (ug/l)

Time (min)	Aquatic Life Std.	Location	
		NF US 7	NF DS 6
0	500	4.6	4.9
15	500	3.7	4.6
30	500	4.2	3.2
45	500	10.9	5.1
60	500	7.7	7.0
Average	500	6.22	4.96

Lead (ug/l)

Time (min)	Aquatic Life Std.	Location	
		NF US 7	NF DS 6
0	33	10.7	15.4
15	33	11.6	12.7
30	33	8.2	12.7
45	33	13.6	15.8
60	33	16.8	13.7
Average	33	12.18	14.06

Zinc (ug/l)

Time (min)	Aquatic Life Std.	Location	
		NF US 7	NF DS 6
0	290	7.8	9.1
15	290	5.3	8.4
30	290	6.0	11.7
45	290	6.8	16.9
60	290	7.3	23.2
Average	290	6.64	13.86

Arsenic (ug/l)

Time (min)	Aquatic Life Std.	Location	
		NF US 7	NF DS 6
0	190	2.6	1.3
15	190	0.7	2.7
30	190	0.7	1.8
45	190	0.2	4.0
80	190	0.4	2.6
Average	190	0.92	2.48

Newark CSO Long Term Control Plan
Additional NFLR Sampling 5/18/98
Background River Water Samples

Magnesium (ug/l)

Time (min)	Aquatic Life Std.	Location	
		NF US 7	NF DS 6
0		24,000	27,200
15		26,000	25,800
30		25,900	24,500
45		25,900	25,900
60		27,300	27,500
Average		25820	26180

Mercury (ug/l)

Time (min)	Aquatic Life Std.	Location	
		NF US 7	NF DS 6
0	0.2		
15	0.2		
30	0.2	**0.76**	**0.43**
45	0.2		
80	0.2		
Average	0.2	0.76	0.43

Cadmium (ug/l)

Time (min)	Aquatic Life Std.	Location	
		NF US 7	NF DS 6
0	3.6	0.8	1.4
15	3.6	0.8	1.1
30	3.6	0.9	1.0
45	3.6	1.7	1.0
60	3.6	1.5	1.0
Average	3.6	1.14	1.1

Chromium (ug/l)

Time (min)	Aquatic Life Std.	Location	
		NF US 7	NF DS 6
0	11	AA	1.0
15	11	AA	0.2
30	11	AA	AA
45	11	1.5	AA
60	11	0.9	AA
Average	11	1.2	0.6

Selenium (ug/l)

Time (min)	Aquatic Life Std.	Location	
		NF US 7	NF DS 6
0	5	0.2	AA
15	5	AA	AA
30	5	0.1	AA
45	5	0.1	AA
60	5	AA	AA
Average	5	0.1	

Molybdenum (ug/l)

Time (min)	Aquatic Life Std.	Location	
		NF US 7	NF DS 6
0		17.4	13.5
15		9.7	4.9
30		8.0	3.3
45		6.6	2.1
60		6.2	1.5
Average		9.58	5.06

Thalium (ug/l)

Time (min)	Aquatic Life Std.	Location	
		NF US 7	NF DS 6
0	16	8.2	0.6
15	16	AA	AA
30	16	0.5	AA
45	16	AA	AA
60	16	1.3	0.3
Average	16	3.33	0.45

Silver (ug/l)

Time (min)	Aquatic Life Std.	Location	
		NF US 7	NF DS 6
0	1.3	1.0	**1.5**
15	1.3	1.0	1.2
30	1.3	0.8	1.1
45	1.3	1.2	0.8
60	1.3	1.2	0.9
Average	1.3	1.04	1.1

Newark CSO Long Term Control Plan
Additional NFLR Sampling 5/18/98
Background River Water Samples

Copper (ug/l)

Time (min)	Aquatic Life Std.	Location	
		NF US 7	NF DS 6
0	36	4.2	5.1
15	36	4.3	4.3
30	36	4.4	4.5
45	36	3.7	5.1
60	36	3.6	4.8
Average	36	4.04	4.76

APPENDIX G

ES EnviroScience, Inc.
1212 Portage Trail • Cuyahoga Falls, Ohio 44223
Phone (330) 940-4300 • Fax (330) 940-4304
1 (800) 940-4025

August 3, 1998

Mr. Mike Wilson
Malcolm Pirnie Inc.
445 Hutchinson Ave.
Columbus, OH 43235-5677

re: City of Newark toxicity tests

Dear Mr. Wilson:

Enclosed please find two copies of EnviroScience's report for the following toxicity tests that were conducted with water samples collected from storm sewer and CSO discharges and their receiving waters:

(4) 3-brood static, renewal chronic screening bioassay using *Ceriodaphnia dubia* (water flea)
(4) 7-day static, renewal chronic screening bioassay using *Pimephales promelas* (fathead minnow).

Four water samples were received on 06/13/98 at 1230 hours. Samples were collected 06/12-13/98 between 2300 and 0036 hours, and were identified as upstream 1006, CSO 1006, storm sewer, and downstream 1006. Sample temperature upon receipt was below 4 °C.

Fathead minnow tests were initiated on 06/14/98 at 1130 hours, while water flea tests were initiated on 06/14/09 at 2200 hours. The sample holding time exceeded 36 hours for the *C. dubia* test (approximately 45.5 hour holding period). A water flea test was initiated within the 36 hour holding time, but the test proved to be invalid with excessive control mortality after eight hours of exposure. This initial set-up was discarded and another test was initiated with specimens from an alternate source.

Each sample was tested at full-strength.

Test results are summarized below.

Toxicity test results for *Ceriodaphnia dubia* (water flea). Sample date: 06/13/98, City of Newark. Test period: 06/14-21/98.		
sample	% surviving 7 days	mean reproduction #young/specimen exposed (%CV)[a]
lab water control 1 (DMW)	100	22.1 (14.7)
lab water control 2 (MHRW)	100	18.0 (26.1)
upstream	100	31.7 (24.3)
CSO	100	38.3 (18.9)
storm sewer	100	35.4 (11.9)
downstream	80 (90% day 6)	29.1 (26.2)

[a] CV = coefficient of variation (sample standard deviation ÷ mean)*100)).

Toxicity test results for *Pimephales promelas* (fathead minnow). Sample date: 06/13/98, City of Newark. Test period: 06/14-21/98.				
Sample	% surviving at 96 hours	% surviving at 7 days (%CV)[a]	mean growth per survivor (%CV)	mean growth per fish exposed (%CV)
lab water control 1 (DMW)	96	94 (6.6)	0.323 (10.5)	0.303 (6.6)
lab water control 2 (MHRW)	98	94 (5.8)	0.342 (6.4)	0.322 (9.9)
upstream	94	74 (26.3)	0.458 (17.7)	0.319 (20.1)
CSO	96	94 (9.5)	0.347 (6.1)	0.327 (13.4)
storm sewer	90	82 (20.3)	0.332 (7.5)	0.273 (18.7)
downstream	94	63 (7.5)	0.492 (7.3)	0.314 (16.5)

[a] CV = coefficient of variation (sample standard deviation ÷ mean)*100)).

<u>Acute endpoints (48 and 96 hour exposure periods):</u> None of the water samples was acutely toxic to either species. Exposure periods for acute toxicity are typically 48 hours for *C. dubia* and 96 hours for *P. promelas*. No dead or otherwise adversely affected *C. dubia* specimens

were observed in any of the test solutions during the first 48 hours of exposure. The response among *P. promelas* specimens ranged from 2% to 10% affected through the first 96 hours of exposure.

Chronic endpoints (survival, reproduction, growth through 7 days): None of the storm water or river water samples was chronically toxic to water fleas. *C. dubia* specimens exposed to storm water and river water samples out-performed specimens in the laboratory control groups. Each treatment group was associated with good survivorship and appreciably high reproduction totals. Mean reproduction by specimens in downstream water was not significantly less than mean reproduction by the upstream receiving water group (Wilcoxon's Rank Sum test, alpha 0.05).

When compared to the laboratory water control group, a statistically significant reduction in fathead minnow survival was associated with the upstream and downstream river water samples (Dunnett's and Bonferroni's tests, alpha 0.05). Survival was lowest in the downstream sample, but it was not significantly less than survival among fish in the upstream water sample (2 sample t-test, alpha 0.05) Survival was not reduced among fish in the CSO discharge sample and was not significantly reduced among fish in the storm sewer sample.

Mean growth values for fish was calculated in two ways: mg dry weight per surviving fish and mg dry weight per fish exposed, which factors mortality into the mean growth value. Mean growth per survivor was highest for fish in river water samples, but these groups also had the most deaths; therefore, it may not be appropriate to evaluate growth among fish in the storm water samples to that of fish in the upstream water sample. Mean growth among surviving fish in the storm sewer discharge sample was about equal to mean growth for survivors in the two lab water controls (pooled data). However, there was a statistically significant reduction in mean growth for this group compared to the pooled lab water control data when means were calculated for the number of fish exposed (2 sample t-test, alpha 0.05). But note that for this analysis the reduction in growth represented just 12.5% of the control mean value, therefore, the statistical significance associated with this group may not represent a biologically important result.

Please call me if you have any questions.

Sincerely,

Alice Beals

Alice Beals, Aquatic Biologist
enclosures

RESULTS OF CHRONIC TOXICITY TESTS:

3-brood - *Ceriodaphnia dubia* static screening renewal
7 day - *Pimephales promelas* static screening renewal

Testing period: June 14-21, 1998
Sampling period: June 12-13, 1998
Report date: August 3, 1998

Conducted For:

Malcolm Pirnie Inc.
445 Hutchinson Ave.
Columbus, OH 43235-5677

re.: City of Newark

Conducted and Prepared By:

ENVIROSCIENCE, INCORPORATED
1212 Portage Trail
Cuyahoga Falls, OH 44223
1-800-940-4025

For ENVIROSCIENCE, INC.

S. Villareal/aws, Laboratory Director

TABLE 1.

Toxicity Test Report - General Information

1. Facility/Discharger: City of Newark CSO Report Date: 08/03/98

2. Address: ____________________

3. NPDES Permit #: ________ 4. Receiving Stream: ________

5. Facility Contact: Mike Wilson,
Malcolm Pirnie, Inc.
6 . Phone #: (614) 888-4953

7. Testing Lab Name: EnviroScience, Inc., 1212 Portage Trail, Cuyahoga Falls, OH 44223

8. Lab contact: Susan Villarreal 9. Phone #: 1-800-940-4025

10. Outfall(s) Tested: sample locations: CSO and storm sewer discharges, upstream and downstream receiving waters

11. Test Species: #1 *Ceriodaphnia dubia* #2 *Pimephales promelas*

12. Test Conditions: chronic, static-renewal, 3-brood *C. dubia* and 7-day *P. promelas*

13. Dechlorination? NA Original Chlorine Level: NA

14. Report Contents:

Attachments: Chain-of-Custody, bench sheets/data analysis, SRT control charts

---

Alice Beals
Signature of preparer

8/3/98
Date

Alice Beals
Name (typed or printed)

Aquatic Biologist
Title

TABLE 2.

Sampling Summary

Outfall	Sample Type grab/comp.	Volume Received	Sample Collection		Flow - MGD; weather
			Begin MM/DD/YY-Time	End MM/DD/YY-Time	
river upstream 1006	composite 1.5 hours	3 gal	06/12/98-2300	06/13/98-0036	
CSO 1006	composite 1.5 hours	3 gal	06/12/98-2300	06/13/98-0036	
storm sewer	composite 1.5 hours	3 gal	06/12/98-2300	06/13/98-0036	
river downstream 1006	composite 1.5 hours	3 gal	06/12/98-2300	06/13/98-0036	

Dates/Times of Test Performance:

Ceriodaphnia dubia		*Pimephales promelas*	
Start Date: MM/DD/YY	06/14/98	Start Date: MM/DD/YY	06/14/98
Start Time:	2200hrs	Start Time:	1130hrs
End Date: MM/DD/YY	06/21/98	End Date: MM/DD/YY	06/21/98
End Time:	1545hrs	End Time:	1100hrs

Comments:

Samples were received in the laboratory on 06/13/98 at 1230 hours; temperature upon receipt was below 4 °C.

Each sample was held in three 1-gallon plastic Cubitainers®; the contents of the three containers was mixed in the toxicity laboratory prior to use. Samples were held in cold storage.

TABLE 3.

Summary of toxicity test conditions for chronic testing with *Ceriodaphnia dubia* or *Pimephales promelas*.

		Ceriadaphnia dubia	*Pimephales promelas*
1.	Age and origin of test organisms:	<24 hours, EnviroScience 06/14/98 between 1600-2130 hrs	<24 hours, EnviroScience 06/13/98-1530
2.	Test type and duration:	static, daily renewal, until 60% of control specimens produce 3rd brood	static, daily renewal, 7 days
3.	Light quality and intensity:	wide spectrum fluorescent/50-100 fc	wide spectrum fluorescent/50-100 fc
4.	Photoperiod:	16/8 hours light/dark	16/8 hours light/dark
5.	Test solution temperatures °C.:	24.0-26.2	24.2-26.2
6.	Feeding regime:	daily: alga *Selenastrum capricornutum* to provide approx. 2.3x10^5 cells/ml; and 0.1ml YCT concentrate	700-1000 newly batched brine shrimp, *Artemia salina* per vessel twice daily, at start and end of work day
7.	Size of test vessel:	30 ml plastic cup	600 ml glass beaker
8.	Volume and depth of test solutions:	15 ml and 24 mm	250 ml and 4.2 cm
9.	No. of test organisms per vessel:	1	10
10.	No. of vessels per solution:	10	5
11.	Total no. of organisms per solution:	10	50
12.	Test concentrations as percent effluent:	100% (screening tests)	100% (screening tests)
13.	Renewal MM/DD-test days:	06/12-13 samples used for all daily renewals	06/12-13 samples used for all daily renewals
14.	Laboratory control water:	dilute mineral water (DMW) and moderately hard reconstituted water (MHRW)	dilute mineral water (DMW) and moderately hard reconstituted water (MHRW)
15.	Secondary control:	upstream river water served as toxicity control	upstream river water served as toxicity control
16.	Aeration:	not necessary	not necessary
17.	Endpoints:[1]	mortality - no movement with gentle prodding; survival and reproduction NOEC	mortality - no movement with gentle prodding; survival and growth NOEC
18.	Disease treatment:		no
19.	Drying time and temperature:		24 hours at 60°C, cooled in desiccator

Notes: [1] Adverse effects were also recorded but were not used to calculate chronic toxicity endpoints (e.g. NOEC, TU_c). Adverse effects include cumulative mortality plus behavioral effects such as immobility, atypical swimming, loss of equilibrium, or some other specified condition.

TABLE 4.

Initial Water Quality. Values of pH, dissolved oxygen (DO) concentration, conductivity, total alkalinity, total hardness, and total residual chlorine (TRC) for each sample. Values listed for lab water represent a range of initial values for new batches. Values recorded for renewal solutions for final solutions are tabulated on bench sheets which are attached.

Sample	DO mg/l	pH s.u.	Conductivity µmho/cm	Total Alkalinity mg $CaCO_3/l$	Total Hardness mg $CaCO_3/l$	TRC mg/l
DMW lab water ranges	7.7-8.0	7.9-8.3	169-182	68-70	84-92	<0.02
MHRW lab water ranges	7.6-8.2	7.8-8.3	291-304	60-62	80-92	<0.02
river upstream	7.8	8.1	493	188	256	NA
CSO	7.1	7.4	102	34	44	NA
storm sewer	8.0	7.3	59	26	40	NA
river downstream	7.8	8.1	436	174	232	NA

Comments: Lab waters: DMW = dilute mineral water (i.e. 20% Perrier® in Milli-Q); MHRW = moderately hard reconstituted water (salts dissolved in Milli-Q). DO, pH, and conductivity measured at test initiation; alkalinity, hardness, and chlorine measured after preparation of each batch.

NA = not analyzed.

Methods and instrumentation listed in Table 7 on page 7.

TABLE 5.

Results of a 3-Brood *Ceriodaphnia dubia* Survival and Reproduction Test Conducted 06/14/98 - 06/21/98

Test Solutions	Cumulative Percent Mortality Test Day							Reproduction (#young/specimen)		
	1	2	3	4	5	6	7	Mean	SD	%CV
DMW lab water control	0	0	0	0	0	0	0	22.1	3.2	14.7
MHRW lab water control	0	0	0	0	0	0	0	18.0	4.7	26.1
river upstream	0	0	0	0	0	0	0	31.7	7.7	24.3
SO	0	0	0	0	0	0	0	38.3	7.2	18.9
storm sewer	0	0	0	0	0	0	0	35.4	4.2	11.9
river downstream	0	0	0	0	0	10	20	29.1	7.6	26.2

Statistical methods: Wilcoxon's Rank Sum test comparing upstream and downstream river groups (1 sided, alpha 0.05) with Toxstat® 3.5.

Comments:

SD = sample standard deviation. CV = coefficient of variance, SD/mean.

Results of statistical analysis:

- mean reproduction among specimens in downstream river water was not significantly less than mean reproduction among specimens in upstream river water.

TABLE 6.

Results of a 7-Day *Pimephales promelas* Survival and Growth Test Conducted 06/14/98 - 06/21/98

Test Solutions	Cumulative Percent Mortality Test Day							Dry Weight (mg D.W./fish) per survivor per fish exposed		
	1	2	3	4	5	6	7	Mean[a]	SD	%CV
DMW lab water control	0	0	0	4	4	6	6	0.323 0.303	0.034 0.020	10.5 6.6
MHRW lab water control	0	0	0	2	2	2	6	0.342 0.322	0.022 0.032	6.4 9.9
river upstream	0	2	4	6	20	26	26	0.458 0.319	0.081 0.064	17.7 20.1
CSO	0	2	4	4	6	6	6	0.347 0.327	0.021 0.044	6.1 13.4
storm sewer	0	2	6	10	16	16	18	0.332 0.273	0.025 0.051	7.5 18.7
river downstream	0	0	4	6	31	37	37	0.492 0.314	0.036 0.052	7.3 16.5

Statistical methods: Bonferroni's comparing survival in treatment groups to survival in lab water control groups. 2 sample t-test comparing survival in downstream group to survival in upstream group. Dunnett's comparing growth means for CSO and storm sewer groups to upstream group (for means based on survivors). 2 sample t-test comparing mean growth per fish exposed in storm sewer group to mean growth per fish exposed in pooled lab water groups. Toxstat® 3.5; 1 sided, alpha 0.05.

Comments: SD = sample standard deviation. CV = coefficient of variance, SD/mean.

[a] mean growth as mg dry weight per survivor is the top value; mean growth as mg dry weight per fish exposed (factoring in mortality) is the bottom value.

able 6 completed:

Results of statistical analysis:

- survival in upstream and downstream was significantly reduced when compared to the pooled lab water control groups,

- from a 2 sample, one-sided comparison, survival in downstream water was not significantly less than survival in upstream water,

- mean growth per survivor was not significantly reduced in any of the treatment groups when compared to the pooled lab water control data,

- mean growth per survivor in CSO and storm sewer groups was significantly less than mean growth per survivor in upstream water, but these comparisons may be inappropriate because of reduced survival in the upstream sample,

- when mean growth was based on the number of fish exposed, which is the current U.S. EPA method, a statistically significant reduction was associated with fish in the storm sewer sample when compared to the pooled lab water control data, but note that the analysis was very sensitive (MSD 11.2%), and the actual reduction represented only 12.5% of the control mean value.

TABLE 7.
Additional Toxicity Test Information

7.1 Methods/Instrumentation used in chemical analysis:

Dissolved oxygen:	APHA (1992) 4500-G., Orion Model 820/YSI Model 51B
pH:	APHA (1992) 4500-H., Orion Model 920A/Orion Model SA250
Conductivity:	APHA (1992) 2510-B., Orion Model 160
Total Hardness:	APHA (1992) 2340-C.
Total Alkalinity:	APHA (1992) 2320-B.
Total Residual Chlorine:	EPA 330.1, Wallace & Tiernan model titrator

7.2 Deviations from protocol and other relevant information.

7.2.1 The samples were filtered prior to use to remove interfering organisms (60μ mesh Nitex®).

7.2.2 The 36-hour holding period was exceeded for the *Ceriodaphnia dubia* test. A water flea test was initiated at 1215 hours on 06/14/98 but mortality among specimens in laboratory control water exceeded acceptable limits within the first eight hours of exposure; therefore, a second water flea test was initiated at 2200 hours, approximately 45.5 hours after sample collection).

7.2.3 Samples collected on 06/12-13/98 were used throughout the test period. Typically, two additional sampling events would be included, however, the unpredictable nature of storm water runoff precludes the three sample procedure.

7.3 Summary

Four water samples were received on 06/13/98 at 1230 hours. Samples were collected 06/12-13/98 between 2300 and 0036 hours, and were identified as upstream 1006, CSO 1006, storm sewer, and downstream 1006. Sample temperature upon receipt was below 4 °C.

Fathead minnow tests were initiated on 06/14/98 at 1130 hours, while water flea tests were initiated on 06/14/09 at 2200 hours.

Each sample was tested at full-strength.

Acute endpoints (48 and 96 hour exposure periods): None of the water samples was acutely toxic to either species. Exposure periods for acute toxicity are typically 48 hours for *C. dubia* and 96 hours for *P. promelas*. No dead or otherwise adversely affected *C. dubia* specimens were observed in any of the test solutions during the first 48 hours of exposure. The response among *P. promelas* specimens ranged from 2% to 10% affected through the first 96 hours of exposure.

Chronic endpoints (survival, reproduction, growth through 7 days): None of the storm water or river water samples was chronically toxic to water fleas. *C. dubia* specimens exposed to storm water and river water samples out-performed specimens in the laboratory control groups. Each treatment group was associated with good survivorship and appreciably high reproduction totals. Mean reproduction by specimens in downstream water was not significantly less than mean reproduction by the upstream receiving water group (Wilcoxon's Rank Sum test, alpha 0.05).

When compared to the laboratory water control group, a statistically significant reduction in fathead minnow survival was associated with the upstream and downstream river water samples (Dunnett's and Bonferroni's tests, alpha 0.05). Survival was lowest in the downstream sample, but it was not significantly less than survival among fish in the upstream water sample (2 sample t-test, alpha 0.05) Survival was not reduced among fish in the CSO discharge sample and was not significantly reduced among fish in the storm sewer sample.

Mean growth values for fish was calculated in two ways: mg dry weight per surviving fish and mg dry weight per fish exposed, which factors mortality into the mean growth value. Mean growth per survivor was highest for fish in river water samples, but these groups also had the most deaths; therefore, it may not be appropriate to evaluate growth among fish in the storm water samples to that of fish in the upstream water sample. Mean growth among surviving fish in the storm sewer discharge sample was about equal to mean growth for survivors in the two lab water controls (pooled data). However, there was a statistically significant reduction in mean growth for this group compared to the pooled lab water control data when means were calculated for the number of fish exposed (2 sample t-test, alpha 0.05). But note that for this analysis the reduction in growth represented just 12.5% of the control mean value, therefore, the statistical significance associated with this group may not represent a biologically important result.

ATTACHMENTS

Chain-of-Custody/Sample Submission form(s).
Bench sheets/data analyses.
Standard Reference Toxicant Test Control Charts.

ENVIROSCIENCE, INC.
1212 Portage Trail
Cuyahoga Falls, OH 44223
Phone (330) 940-4300
FAX (330) 940-4304
1-800-940-4025

EnviroScience, Inc.

Client: Newark, WWTP
Address: 1003 East Main St.

Newark, OH 43055
Contact: Roger Loomis
Phone: 740-349-6774
NPDES Prmt#: 4PE00001

SAMPLE SUBMISSION AND CHAIN OF CUSTODY FORM

Test(s) to be performed:

- ☑ Chronic
- ☑ Acute Definitive
- ☐ 48 hr. Screening
- ☐ 24 hr. Stormwater

- ☐ P. Promelas and C.dubia
- ☐ P. promelas
- ☐ C. dubia
- ☐ D. magna
- ☐ ____

Wastewater Type

- ___ Industrial
- ✓ Municipal
- ___ Other ___

When listing a composite sample in the table below, please provide the start and end time of the composite period.

Date		Time		Station No.	Sample ID	✓ Sample Type		Number of Cubitainers	Chemistry			
Start	End	Start	End			Comp	Grab		D.O.	pH	Conductivity	Temp. °C
6/12/98	6/13/98	2300	0036		UPstream 1006			3				
6/12/98	6/13/98	2300	0036		CSO 1006			3				
6/12/98	6/13/98	2300	0036		Storm Sewer			3				
6/12/98	6/13/98	2300	0036		Downstream 1006			3				

Comp. = Composite, D.O. = Dissolved Oxygen measured in mg/l , pH measured in s.u., Conductivity measured in uohm/cm

Sampling Collector's Information: please ✓ all appropriate collection boxes

- ☐ Effluent
- ☐ Upstream
- ☐ Near Field
- ☐ Far Field

Collector's Name: Ed Nutter
Collector's Signature: Ed Nutter
M.G.D. = ____
Weather Conditions: ____

EnviroScience Personnel Only

- ☐ Effluent
- ☐ Upstream
- ☐ Near Field
- ☐ Far Field

Collected By: ____
Collector's Signature: ____

Plume determined by what method ? ____ Comments ____

Received from:	Received by:	Date	Time
Ed Nutter	S. Villarreal	061398	1230

Shipping Information
Date and Time Shipped: ____
Method of Shipment: ____
____ EnviroScience Vehicle

EnvirosScience Use Only
CLIENT ID Nerk
SAMPLE ID's 061398
Cond. of Container: ____
Temp.°C 2.0°C

Chronic *Ceriodaphnia dubia* Survival and Reproduction Data: pg. 1 of ~~4~~ 3

ient: Newark #2 neerxx61398#2 **Start Date:** 061498 **Time:** 2200

Dilution water: N/A **End Date:** 062198 **Time:** 1215

Origin of C. dubia: ES culture

Control	Day	1	2	3	4	5	6	7	8	9	10	Number Adults	# Dead/ # Adversely Affected
	1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	10	0,0
	2	0	0	0	0	0	0	0	0	0	0	10	0,0
DMW Dilute Mineral Water	3	0g	0g	0g	0g	0g	0g	0g	0g	0g	0g	10	0,0
	4	5g	4g	5g	4g	4g	4g	4g	5g	5g	5g	10	0,0
	5	8g	8g	0y	8g	0y	0y	0y	0y	0y	0g	10	0,0
	6	0y	0y	9g	0y	10g	9g	8g	9g	8g	10g	10	0,0
	7	7	13	11	13	13	5	8	9	6	4m	10	0,0
	8										✓		1
Totals		20	25	25	25	27	18	20	23	19	19		
Number of Broods		3	3	3	3	3	3	3	3	3	3		

x̄ 22.1 ± 3.25
CV 14.7%

'ontral	1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	10	0,0
	2	0	0	0	0	0	0	0	0	0	0	10	0,0
m#rew	3	0g	0g	0g	0g	0g	0g	0g	0g	0g	0g	10	0,0
	4	5g	3g	4g	3g	5g	4g	4g	5g	4g	5g	10	0,0
	5	0y	0y	0y	0y	0y	0y	0y	0y	0y	0y	10	0,0
	6	7y	6y	6g	7g	8y	7y	8y	8g	6g	9g	10	0,0
	7	13	3A	7	1m	6	10	12	7	5	2	10	0,1
	8										✓		1
otals		25	12	17	11	19	21	24	20	15	16		
umber of Broods		3	3	3	3	3	3	3	3	3	3		

x̄ 18.0 ± 4.69
cv 26.1%

	1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	10	0,0
IBS ~~%~~	2	0	0	0	0	0	0	0	0	0	0	10	0,0
~~effluent~~	3	0g	0g	0g	0g	0g	0g	0g	0g	0g	0g	10	0,0
	4	5g	7g	5g	6g	8g	6g	5g	6g	7g	6g	10	0,0
pstream	5	12g	13g	12g	15g	10g	12g	12g	13g	13g	12g	10	0,0
	6	0y	0y	0y	0y	0y	0y	0y	0y	0y	0y	10	0,0
	7	16	15	0	15	0	17	22	18	14	~~16~~ 15	10	0,0
6/22 AM	8	D		7*		21				D	✓		1
Totals 7 today		33	35	17	36	18	35	39	37	34	33		
Number of Broods		3	3	2	3	2	3	3	3	3	3		

x̄ 31.7 ± 7.70
CV 24.3%

Chronic *Ceriodaphnia dubia* Survival and Reproduction Data: pg. 2 of ~~4~~ 3

Client: Newark #2 ~~Newark~~ 398 #2 **Start Date:** 061498-2200

STORM Sewer ~~%~~ ~~effluent~~	Replicate											Number Adults	# Dead/ # Adversely Affected
	Day	1	2	3	4	5	6	7	8	9	10		
	1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	10	0,0
	2	0	0	0	0	0	0	0	0	0	0	10	0,0
	3	0	0	0	0	0	0	0	0	0	0	10	00
	4	7	7	7	7	4	5	6	7	7	6	10	0,0
	5	11	14	11R	13	8	9	12	10	11	13	10	0,0
	6	0	0	4	0	0	0	0	0	0	0	10	0,0
	7	20	20	21	12	17	20	16	16	17	16	10	0,0
	8										✓		/
Totals		38	41	43	32	29	34	34	33	35	35		
Number of Broods		3	3	3	3	3	3	3	3	3	3		

x̄ 35.4 ± 4.20
CV 11.9%

CSO ~~%~~ ~~effluent~~													
	1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	10	0,0
	2	0	0	0	0	0	0	0	0	0	0	10	0,0
	3	0	Has? 0	0	0	0	0	0	0	0	0	10	0,0
	4	7	8	10	6	8	8	7	8	7	8	10	0,0
	5	13	12	13	10	13	12	12	11	13	12	10	0,0
	6	0	0	0	20	0	22	0	0	18	23	10	0,0
	7	21	20	19	2	23	0	17	0	0	0	10	0,0
	8										✓		/
Totals		41	40	42	38	44	42	36	19	38	43		
Number of Broods		3	3	3	3	3	3	3	3?	3	3		

x̄ 38.3 ± 7.23
CV 18.9%

Downstream. ____ % effluent													
	1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	10	0,0
	2	0	0	0	0	0	0	0	0	0	0	10	0,0
	3	0	0	0	0	0	0	0	0	0	0	10	0,0
	4	0	7	7	6	7	7	6	6	7	5	10	0,0
	5	13	10	12	10	11	12	12	13	13	12	10	0,0
	6	0R	10R?	16	0	15	0	0	D	D	16R	9	1,1
	7	0	0	0	16	0	12	D12		18	0	8	2,2
	8												/
Totals		13	27	35	32	33	31	30	19	38	33	✓	
Number of Broods		2?	3	3	3	3	3	3	2	3	3		

x̄ 29.1 ± 7.62
CV 26.2%

Chronic *Ceriodaphnia dubia* Survival and Reproduction Data: pg. ~~4 of 4~~ 3/3

Client: Newark #2 NEWK061398 #2

Start Date: 061498-2200

Brood Board Information:

Replicate	1	2	3	4	5	6	7	8	9	10	BB #: Kitt2025C
Brood Board cup used	R	A	N	D	O	m	i	z	e	d	Date: 061498 Time: 1600-2130

#'s DC1,2,4,6&7; DB2,3,4,5,6 mixed.

Test Information:

Food Information

061498 061598

Day	Initiation	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
YCT Batch #	ES 061498	ES 061498	ES 061498	ES061498	ES 061798	ES 061798	ES 061798	▨
Algae Batch #	AQ 061398	AQ 061398	~~AQ 061398~~	ES 060598	ES 060598A	ES 060598A	ES 060598	▨
Chlorophyll	061498 50ul	061498	(ES060598/ 061498)	061498	061498	061498	061498	

Temperature (Celsius)

Test Level	Initiation	Day 1 Initial	Day 1 Final	Day 2 Initial	Day 2 Final	Day 3 Initial	Day 3 Final	Day 4 Initial	Day 4 Final	Day 5 Initial	Day 5 Final	Day 6 Initial	Day 6 Final	Day 7 Initial	Day 7 Final
DMW	25.3	26.0	25.1	26.0	~~26.0~~ 25.2	24.9	24.8	25.1	25.4	25.1	25.7	25.2	25.0	▨	25.6
MTR	25.1	25.6	25.4	25.9	25.3	24.9	25.1	25.3	25.6	25.2	25.9	24.0	25.2	▨	25.8
UPS	24.7	25.8	26.0	25.7	25.4	25.2	25.4	25.0	25.7	25.1	26.1	25.0	25.3	▨	25.5
Storm	24.6	25.4	25.9	25.5	25.5	25.4	25.2	25.2	25.9	25.2	26.1	24.8	24.8	▨	25.4
CSO	24.7	26.0	25.6	25.5	25.8	25.6	25.5	25.5	26.0	25.4	26.0	25.3	25.5	▨	25.9
Down	24.1	25.5	26.1	25.2	26.0	25.9	26.2	25.4	26.2	25.9	26.2	25.7	25.7	▨	26.0
N/A														▨	
Initials		OB		EB		OB		SV		OB		SV		VPB	
Change Time	OB	1600		1715		1445		1700		1600		1730		1545	
Transfer Verified	—	✓				✓		✓		✓		SV		+	

Initial is the initiation temperature, or the temperature of the new board C. dubia are being transferred into.

Comments Section:

Day	Date	Comments	Initials
1	061598	@ 1000'; all alive °C DMW 24.5; UPS 25.4; Storm 25.7 MTR 25.2; CSO 25.6; Down 26.5	OB.
3	061798	all bugs @ least gravid	OB
		down not significantly less than ups	
		w/ Wilcoxon's @ 0.05 TOX3.5.	OB.
		samples held ~ 45.5 hrs.	

DMW = Dilute Mineral Water; EFFLUENT dilutions expressed as percentage effluent e.g. 100% = 100% Effluent, 80%= 80% Effluent + 20% Dilution Water;
T= Sodium Thiosulfate, a dechlorinating agent.
Key: M=Missing, D=Dead, KIT=Killed in transfer, m=empty, g=gravid, y=eyed, r=releasing, N=Sample number, A=Adversely affected

```
Title:  Malcolm Pirnie 6/14/98 C. dubia, upstream vs. downstream, Toxstat® 3.5:

                 Shapiro - Wilk's Test for Normality
-----------------------------------------------------------------
      D = 1057.0000
      W =    0.8006

      Critical W  = 0.8680 (alpha = 0.01 , N = 20)
               W  = 0.9050 (alpha = 0.05 , N = 20)
-----------------------------------------------------------------

Data FAIL normality test (alpha = 0.01). Try another transformation.

Warning   -  The F-test of homogeneity is sensitive to non-normality
             and should not be performed with this data as is.

-----------------------------------------------------------------
  GRP  IDENTIFICATION   REP        VALUE         TRANS VALUE
  ---  --------------  -----   -----------     -------------
   1        upstream     1        33.0000          33.0000
   1        upstream     2        35.0000          35.0000
   1        upstream     3        17.0000          17.0000
   1        upstream     4        36.0000          36.0000
   1        upstream     5        18.0000          18.0000
   1        upstream     6        35.0000          35.0000
   1        upstream     7        39.0000          39.0000
   1        upstream     8        37.0000          37.0000
   1        upstream     9        34.0000          34.0000
   1        upstream    10        33.0000          33.0000
   2      downstream     1        13.0000          13.0000
   2      downstream     2        27.0000          27.0000
   2      downstream     3        35.0000          35.0000
   2      downstream     4        32.0000          32.0000
   2      downstream     5        33.0000          33.0000
   2      downstream     6        31.0000          31.0000
   2      downstream     7        30.0000          30.0000
   2      downstream     8        19.0000          19.0000
   2      downstream     9        38.0000          38.0000
   2      downstream    10        33.0000          33.0000
-----------------------------------------------------------------

         Summary Statistics on Data             TABLE 1 of 2
-----------------------------------------------------------------
       GRP  IDENTIFICATION    N      MIN        MAX        MEAN
       ---  --------------  ----  ---------  ---------  ---------
        1         upstream   10    17.0000    39.0000    31.7000
        2       downstream   10    13.0000    38.0000    29.1000
-----------------------------------------------------------------

         Summary Statistics on Data             TABLE 2 of 2
-----------------------------------------------------------------
   GRP  IDENTIFICATION      VARIANCE       SD        SEM        C.V. %
   ---  --------------  ------------  ---------  ---------  ----------
    1         upstream       59.3444     7.7035     2.4361     24.3014
    2       downstream       58.1000     7.6223     2.4104     26.1936
-----------------------------------------------------------------

Wilcoxon's Rank Sum Test w/ Bonferroni Adjustment     Ho: Control<Treatment
-----------------------------------------------------------------
                             MEAN IN       RANK    CRIT.           SIG
GROUP    IDENTIFICATION   ORIGINAL UNITS   SUM     VALUE   REPS   0.05
-----  -----------------  --------------  -------  -----   -----  ---
  1            upstream      31.7000
  2          downstream      29.1000       86.00     82     10
-----------------------------------------------------------------
Critical values are 1 tailed ( k = 1 )
```

X use non-parametric rand rank test.

not significant.

Chronic *Pimephales promelas* Larval Survival Data: pg. 1 of 2

Client: Newark DERK061398
Dilution water: NA
Hatch #: 061398 1530 #8

Start Date: 6/14/98 **Time:** 1130
End Date: 6/21/98 **Time:** 1100
Origin of P. promelas: EB Cultures

Control:	Rep	n_1	# of *P. promelas* Dead / # of *P. promelas* Adversely Affected 1	2	3	4	5	6	7	Proportion Surviving	Notes
DMW	A	10	0/0	0/0	0/0	1/1	1/1	1/1	1/1	0.9	
	B	10	0/0	0/0	0/0	0/0	0/0	0/0	0/0	1.0	
	C	11	0/0	0/0	0/1	1/1	1/1	1/1	1/1	0.909	
	D	10	0/0	0/0	0/0	0/0	0/0	0/0	0/0	1.0	
n=51	E	10	0/0	0/0	0/0	0/0	0/0	1/1	1/1	0.9	
	total %'s				0/2	4/4	4/4	6/6	6/6	x̄ 0.94	
Control: MHRW	A	10	0/0	0/0	0/0	0/0	0/0	0/0	0/0	1.0	
	B	10	0/0	0/0	0/0	1/1	1/1	1/1	1/1	0.9	
	C	10	0/0	0/0	0/0	0/0	0/0	0/0	1/1	0.9	
	D	10	0/0	0/0	0/0	0/0	0/0	0/0	0/0	1.0	
	E	10	0/0	0/0	0/0	0/0	0/0	0/0	1/1	0.9	
	total %'s					2/2	2/2	2/2	4/4	x̄ 0.94	
Upstream	A	11	0/0	0/0	0/0	0/1	1/1	2/2	2/2	0.818	
	B	11	0/0	0/0	0/0	0/0	2/2	2/2	2/2	0.818	
	C	12	0/0	0/0	0/0	0/0	0/0	0/0	0/0	1.0	
	D	10	0/0	1/1	2/2	3/3	5/5	6/6	6/6	0.4	
n=54	E	10	0/0	0/0	0/0	0/2	3/3	4/4	4/4	0.6	
	total %'s			2/2	4/4	4/11	20/20	24/26	26/24	x̄ 0.73	
Storm sewer	A	10	0/0	0/0	1/1	2/2	3/3	3/3	3/3	0.7	
	B	10	0/0	0/0	0/0	0/0	0/0	0/0	0/0	1.0	
	C	10	0/0	0/0	0/0	0/0	0/0	0/0	0/0	1.0	
	D	11	0/0	1/1	1/1	1/1	3/3	3/3	4/4	0.636	
n=51	E	10	0/0	0/0	1/1	2/2	2/2	2/2	2/2	0.8	
	total %'s			2/2	6/6	10/10	16/16	16/16	18/18	x̄ 0.83	
CSO	A	10	0/0	1/1	2/2	2/2	2/2	2/2	2/2	0.8	
day2: 0/1	B	10	0/0	0/0	0/0	0/0	0/0	0/0	0/0	1.0	
day2: 0/0	C	11	0/0	0/0	0/0	0/0	0/0	0/0	0/0	1.0	
EB	D	~~13~~ ~~12~~ 12	0/0	0/0	~~2/2~~ 0/0	0/0	0/0	0/0	0/0	1.0	
n=53	E	10	0/0	0/0	0/0	0/0	1/1	1/1	1/1	0.9	
	total %'s			2/4	4/4	4/4	6/6	6/6	6/6	x̄ 0.94	
	Initials		ab	EB	Sok	JD	JD	JD	ab		

Initials for n#

Review VB. 2

Chronic *Pimephales promelas* Larval Survival Data: pg. 2 of 2

Client: Newark NERK060398 **Start Date:** 6/14/98

	Rep	n_1	# of *P. promelas* Dead / # of *P. promelas* Adversely Affected 1	2	3	4	5	6	7	Proportion Surviving	Notes
Down-stream	A	10	0,0	0,0	1,1	2,2	4,4	4,4	4,4	0.6	
	B	11	0,0	0,0	0,0	0,0	2,2	5,5	5,5	0.545	
	C	10	0,0	0,0	0,0	0,0	3,3	3,3	3,3	0.7	
	D 11	~~10~~	0,0	0,0	1,1	1,1	4,4	4,4	4,4	0.636	
n=52	E	10	0,0	0,0	0,0	0,0	3,3	3,3	3,3	0.7	
	total %'s				4/4	6/6	~~8~~ 31/31	37/37	37/37	~~8~~ 0.636	
Initials	SV/OB		OB	EB	SCL	JD	JD	JD	OB		
Initials for n#	OB							Review		1 OB	2

Temperature (Celsius)

Test Level	Initiation	1 I	1 F	2 I	2 F	3 I	3 F	4 I	4 F	5 I	5 F	6 I	6 F	7 Final
DMW	24.5	25.8	26.2	25.9	25.8	25.9	25.1	25.7	25.3	25.5	24.5	24.3	24.8	25.4
MHRW	24.2	25.2	26.0	25.4	25.8	25.8	25.3	25.8	25.3	25.7	24.9	25.7	24.9	26.0
Upstream	25.7	25.3	26.1	24.5	25.8	25.2	25.0	25.8	25.2	25.8	24.9	25.8	24.9	26.0
Storm sewer	24.8	25.4	26.0	25.9	25.9	26.1	25.1	26.2	24.9	25.7	24.9	25.6	25.2	26.2
CSO	25.9	25.4	25.9	26.9	25.9	26.2	25.1	25.5	25.3	25.7	24.7	25.3	25.0	26.2
Downstream	25.3	25.1	26.0	25.8	25.5	26.2	25.0	25.9	25.1	25.7	24.9	24.0	24.9	26.2
Initials	SV/OB	OB		EB		SCL		JD		JD		JD		OB
Time		1350		1520		1415		1345		1300		1115		1100

Comments / Corrections:

Day	Date	Comments	Initials
0	6/14/98	1520 fish ok, DO mg/l UPS 7.2 Down 7.1 CSO 6.2 STORMS 7.2	OB
0	6/14/98¥	1845 fish ok, no dead obs. DO mg/l UPS 7.2 Down 7.0 STORMS 7.0 CSO 6.5 85% SAT	OB
0	6/14/98	2150 fish OK, no dead OBS. DO mg/l UPS 6.6/84% STORMS 6.6 85% Down 6.4 83% CSO 5.5 71%	OB.
1	6/15/98	0445 fish ok, no dead OBS DO mg/l UPS 5.8 76% Down 5.8 STORMS 5.7 CSO 5.1 65%	OB
1	6-15-98	2310 D.O. CSO Rep B = 4.7 mg/l CSO Rep E = 5.0 mg/l	SCL
7	6-21-98	although MHRW fish are larger than DMW	
		I saw beards on them	OB

¥ DO @ 1845 from cups poured @ 1520 & replaced in water bath
DO @ 2150 poured from E rep. beakers.

Melcolm-Pirnie, City of Newark 6/14/98 Fish Weights - based on # surviving:

sample	tare weight (g) ✓	total weight (g) ✓	weight fish (mg)	number fish ✓	dry wt. fish (mg)	mean dry wt. (mg)
<u>DMW lab water</u>						
a	1.10966	1.11296	3.30	9	0.36667	
b	1.10550	1.10825	2.75	10	0.27500	
c	1.10818	1.11155	3.37	10	0.33700	
d	1.09726	1.10033	3.07	10	0.30700	
e	1.10017	1.10313	2.96	9	0.32889	0.323 DMW lab water
		sum dry wt.>	15.45			0.034 s.d.
						10.500 C.V.
<u>MHRW lab water</u>						
a	1.11801	1.12144	3.43	10	0.34300	
b	1.11685	1.11966	2.91	9	0.31222	
c	1.11599	1.11883	2.97	8	0.33000	
d	1.10775	1.11133	3.58	10	0.35800	
e	1.09837	1.10168	3.31	9	0.39778	0.342 MHRW lab water
		sum dry wt.>	16.10			0.022 s.d.
						6.400 C.V.
<u>upstream</u>						
a	1.11426	1.11784	3.58	9	0.39778	
b	1.10596	1.10967	3.71	9	0.41222	
c	1.10890	1.11371	4.91	12	0.40917	
d	1.10440	1.10679	2.39	4	0.59000	
e	1.10955	1.11243	2.69	9	0.48000	0.458 <u>upstream</u>
		sum dry wt.>	17.44			0.081 s.d.
						17.700 C.V.
<u>storm sewer</u>						
a	1.09927	1.10090	2.93	7	0.37571	
b	1.11684	1.12013	3.29	10	0.32900	
c	1.09479	1.09799	3.19	10	0.31800	
d	1.10701	1.10927	2.29	7	0.32286	
e	1.10675	1.10929	2.51	9	0.31375	0.332 <u>storm sewer</u>
		sum dry wt.>	13.97			0.025 s.d.
						7.500 C.V.
<u>CSO</u>						
a	1.10226	1.10477	2.51	9	0.31375	
b	1.11002	1.11347	3.45	10	0.34500	
c	1.10356	1.10757	4.01	11	0.36455	
d	1.09507	1.09923	4.19	12	0.34867	
e	1.11381	1.11710	3.29	8	0.36558	0.347 <u>CSO</u>
		sum dry wt.>	17.42			0.021 s.d.
						8.100 C.V.
<u>downstream</u>						
a	1.10728	1.11033	3.05	6	0.50833	
b	1.10760	1.11029	2.89	6	0.44833	
c	1.11181	1.11539	3.59	7	0.51143	
d	1.10562	1.10883	3.21	7	0.45857	
e	1.10642	1.11014	3.72	7	0.53143	0.492 <u>downstream</u>
		sum dry wt.>	16.25			0.038 s.d.
						7.300 C.V. ✓

n = [illegible]
x 0.33[illegible]
s 0.029
CV 8.7%

26% mortality

18% mortality

6% mortality

37% mortality

✓ data entry verified as.

Malcolm-Pirnie, City of Newark 6/14/98 Fish Weights - based on # exposed:

sample	tare weight (g)	total weight (g)	weight fish (mg)	number fish	dry wt. fish (mg)	mean dry wt. (mg)
	✓	✓		✓		
DMW lab water						
a	1.10966	1.11296	3.30	10	0.33000	
b	1.10550	1.10825	2.75	10	0.27500	
c	1.10818	1.11155	3.37	11	0.30636	
d	1.09726	1.10033	3.07	10	0.30700	
e	1.10017	1.10313	2.96	10	0.29600	0.303 DMW lab water
		sum dry wt.>	15.45			0.02 s.d.
						6.800 C.V.
MHRW lab water						
a	1.11801	1.12144	3.43	10	0.34300	
b	1.11686	1.11966	2.81	10	0.28100	
c	1.11596	1.11893	2.97	10	0.29700	
d	1.10775	1.11133	3.58	10	0.35800	
e	1.09837	1.10168	3.31	10	0.33100	0.322 MHRW lab water
		sum dry wt.>	16.10			0.032 s.d.
						9.900 C.V.
upstream						
a	1.11426	1.11784	3.58	11	0.32545	
b	1.10596	1.10967	3.71	11	0.33727	
c	1.10880	1.11371	4.81	12	0.40917	
d	1.10440	1.10676	2.36	10	0.23600	
e	1.10955	1.11243	2.88	10	0.28800	0.318 upstream
		sum dry wt.>	17.44			0.064 s.d.
						20.100 C.V.
storm sewer						
a	1.09827	1.10090	2.63	10	0.26300	
b	1.11684	1.12013	3.29	10	0.32900	
c	1.09478	1.09798	3.18	10	0.31800	
d	1.10701	1.10927	2.26	11	0.20545	
e	1.10675	1.10926	2.51	10	0.25100	0.273 storm sewer *
		sum dry wt.>	13.87			0.051 s.d.
						18.700 C.V.
CSO						
a	1.10226	1.10477	2.51	10	0.25100	
b	1.11002	1.11347	3.45	10	0.34500	
c	1.10356	1.10757	4.01	11	0.36455	
d	1.09507	1.09923	4.16	12	0.34667	
e	1.11361	1.11710	3.29	10	0.32900	0.327 CSO
		sum dry wt.>	17.42			0.044 s.d.
						13.400 C.V.
downstream						
a	1.10728	1.11033	3.05	10	0.30500	
b	1.10760	1.11029	2.69	11	0.24455	
c	1.11161	1.11539	3.58	10	0.35800	
d	1.10562	1.10683	3.21	11	0.29162	
e	1.10642	1.11014	3.72	10	0.37200	0.314 downstream
		sum dry wt.>	16.25			0.052 s.d.
						16.500 C.V.

* when compar to pooled control $\bar{x}$ 2 sample t-te msd = 11.2% of control actual diff. is 12.5%

✓ data entry verified 03.

none are ~~no~~ less than 75% of control $\bar{x}$ – i.e. IC_{25}'s if applicable would be > 100% conc.

$IC_{25} \simeq$ NOEC.

Chronic *Pimephales promelas* Growth Data: pg. 1 of 2

Client: Newark nerr061398 **Start Date:** 6/14/98

Concentration	Rep. no.	Pan no.	Weight of pan (g)	Total dry wt. (g)	Number of larvae
DMW	A	root	1.10966	1.11296	9
	B	Jason	1.10550	1.10825	10
	C	casa	1.10818	1.11155	10
	D	sue	1.09726	1.10033 *	10
	E	coke	1.10017	1.10313	9
MHRW	A	brain	1.11801 *	1.12144	10
	B	la	1.11685	1.11966	9
	C	rain	1.11596	1.11893 *	9
	D	tank	1.10775	1.11133	10
	E	fan	1.09837	1.10168	9
Upstream	A	sea	1.11426	1.11784	9
	B	blue	1.10596	1.10967	9
	C	apple	1.10880	1.11371	12
	D	houset	1.10440 *	1.10676	4
	E	snow	1.10955	1.11243 *	6
Storm sewer	A	info	1.09827	1.100~~870~~90	7
	B	shrimp	1.11684	1.12013	10
	C	new	1.09478	1.09796	10
	D	yellow	1.10701	1.10927	7
	E	david	1.10675	1.10926	8
CSO	A	orange	1.10226	1.10477	8
	B	song	1.11002	1.11347	10
	C	money	1.10356	1.10757	11
	D	pinky	1.09507	1.099~~4~~823	12
	E	york	1.11381	1.11710	9
Initials		nv	nv	SV	Ob

mments:

Review:

* respective pan weight was reweighed for accuracy nv

Chronic *Pimephales promelas* Growth Data: pg. 2 of 2

Client: Newark newkow1398 **Start Date:** 6/14/98

Concentration	Rep. no.	Pan no.	Weight of pan (g)	Total dry wt. (g)	Number of larvae
Downstream	A	sand	1.10728	1.11033	6
	B	beer	1.10760*	1.11029	6
	C	lights	1.11181	1.11539 *	7
	D	rake	1.10562	1.10883	7
	E	red	1.10642	1.11014	7

Quality Assurance Section

W_{final} minus $W_{initial}$

Pan Tare Check	A	clouds	1.10452	1.10454	0.00002
	B	corridor	1.11856*	1.11858	0.00002
	C	Son	1.10924	1.10915	(0.00009)
	D	chief	1.10788	1.10779	(0.00009)
Initials		DV	DV	SV	

1. pans without fish are dried at 100 °C for 24 hours, and placed in dessicator to cool before they are tared on AND ER-182-A balance

2. pans with fish are dried at 100 °C for 2 hours, and placed in dessicator to cool before weighing on AND ER-182-A balance

Please note time of drying:

In oven: on 062198 at 1150 hours; at 60 °C; initials aB.

Out of oven: on 062298 at 1250 hours; at 60 °C: initials KB/aB.

S Weight calibrations	S wgt	Date: 6/19/98	S wgt	Date: 6/24/98
	1g	1.00004	1g	1.00007
	500mg	0.49999	500mg	0.50002
	100mg	0.01003	100mg	0.10001
Initials		DV		SV

Comments:

Review: aB

```
Title: Newark 6/14/98 P. promelas survival, lab controls
Transform:      ARC SINE(SQUARE ROOT(Y))

                      Shapiro - Wilk's Test for Normality
 ----------------------------------------------------------------------
      D =   0.5994
      W =   0.9611

      Critical W  = 0.8880 (alpha = 0.01 , N = 25)
               W  = 0.9180 (alpha = 0.05 , N = 25)
 ----------------------------------------------------------------------
 Data PASS normality test (alpha = 0.01). Continue analysis.


                       Kolmogorov Test for Normality
 ----------------------------------------------------------------------
      D  =     0.1512                   (p-value > 0.100)
      D* =     0.7804

      Critical D*  = 1.035 (alpha = 0.01 , N =  25)
                   = 0.895 (alpha = 0.05 , N =  25)
 ----------------------------------------------------------------------
 Data PASS normality test (alpha = 0.01). Continue analysis.


                Bartlett's Test for Homogeneity of Variance
 ----------------------------------------------------------------------
 Calculated B1 statistic = 12.3756               (p-value = 0.0062)

 Data FAIL B1 homogeneity test at 0.01 level. Try another transformation.
 ----------------------------------------------------------------------

 Critical B = 11.3449  (alpha = 0.01, df =  3)
            =  7.8147  (alpha = 0.05, df =  3)

 ----------------------------------------------------------------------
                     Using Average Degrees of Freedom
                 (Based on average replicate size of     6.25)

 Calculated B2 statistic = 11.2944               (p-value = 0.0102)
 Data PASS B2 homogeneity test at 0.01 level. Continue analysis.


 ----------------------------------------------------------------------
   GRP  IDENTIFICATION   REP       VALUE          TRANS VALUE
   ---  --------------  -----  ------------      ------------
    1        lab water     1         0.9000            1.2490
    1        lab water     2         1.0000            1.4120
    1        lab water     3         0.9090            1.2644
    1        lab water     4         1.0000            1.4120
    1        lab water     5         0.9000            1.2490
    1        lab water     6         1.0000            1.4120
    1        lab water     7         0.9000            1.2490
    1        lab water     8         0.9000            1.2490
    1        lab water     9         1.0000            1.4120
    1        lab water    10         0.9000            1.2490
    2         upstream     1         0.8180            1.1301
    2         upstream     2         0.8180            1.1301
    2         upstream     3         1.0000            1.4120
    2         upstream     4         0.4000            0.6847
    2         upstream     5         0.6000            0.8861
    3      storm sewer     1         0.7000            0.9912
    3      storm sewer     2         1.0000            1.4120
    3      storm sewer     3         1.0000            1.4120
    3      storm sewer     4         0.6360            0.9231
    3      storm sewer     5         0.8000            1.1071
    4       downstream     1         0.6000            0.8861
    4       downstream     2         0.5450            0.8305
    4       downstream     3         0.7000            0.9912
    4       downstream     4         0.6360            0.9231
    4       downstream     5         0.7000            0.9912
 ----------------------------------------------------------------------
```

```
Title:  Newark 6/14/98 P. promelas survival, lab control
Transform:      ARC SINE(SQUARE ROOT(Y))

            Summary Statistics on Transformed Data  TABLE 1 of 2
-----------------------------------------------------------------------
        GRP  IDENTIFICATION    N      MIN        MAX        MEAN
        ---  --------------  ----  ---------  ---------  ---------
         1       lab water    10    1.2490     1.4120     1.3158
         2        upstream     5    0.6847     1.4120     1.0486
         3     storm sewer     5    0.9231     1.4120     1.1691
         4      downstream     5    0.8305     0.9912     0.9244
-----------------------------------------------------------------------


            Summary Statistics on Transformed Data  TABLE 2 of 2
-----------------------------------------------------------------------
   GRP  IDENTIFICATION       VARIANCE       SD        SEM       C.V. %
   ---  --------------  ------------  ---------  ---------  ---------
    1        lab water        0.0069     0.0830     0.0262     6.3060
    2         upstream        0.0760     0.2758     0.1233    26.2979
    3      storm sewer        0.0535     0.2313     0.1034    19.7856
    4       downstream        0.0048     0.0693     0.0310     7.4964
-----------------------------------------------------------------------


                              ANOVA Table
-----------------------------------------------------------------------
  SOURCE              DF            SS                MS           F
-----------------------------------------------------------------------
  Between              3          0.5820            0.1940      6.7969

  Within (Error)      21          0.5994            0.0285
-----------------------------------------------------------------------
  Total               24          1.1813
-----------------------------------------------------------------------
                                                   (p-value = 0.0022)

  Critical F  = 4.8740  (alpha = 0.01, df = 3,21)
              = 3.0725  (alpha = 0.05, df = 3,21)
  Since  F > Critical F  REJECT  Ho: All equal (alpha = 0.05)


    Bonferroni t-Test    -    TABLE 1 OF 2           Ho: Control<Treatment
------------------------------------------------------------------------
                            TRANSFORMED    MEAN CALCULATED IN   TRANS   SIG
GROUP    IDENTIFICATION        MEAN          ORIGINAL UNITS     t STAT  0.05
-----  -----------------   -----------   ---------------   ------  ---
  1            lab water     1.3158             0.9409
  2             upstream     1.0486             0.7272          2.8875   *
  3          storm sewer     1.1691             0.8272          1.5851
  4           downstream     0.9244             0.6362          4.2296   *
------------------------------------------------------------------------
Bonferroni t critical value = 2.2775   (1 Tailed, alpha = 0.05, df = 3,21)


    Bonferroni t-Test    -    TABLE 2 OF 2           Ho: Control<Treatment
------------------------------------------------------------------------
                             NUM OF    MIN SIG DIFF     % OF    DIFFERENCE
GROUP    IDENTIFICATION       REPS   (IN ORIG. UNITS)  CONTROL  FROM CONTROL
-----  -----------------   -------  ---------------   -------  ------------
  1            lab water       10
  2             upstream        5         0.1381         14.7       0.2137
  3          storm sewer        5         0.1381         14.7       0.1137
  4           downstream        5         0.1381         14.7       0.3047
------------------------------------------------------------------------
```

all grps

```
Title:  Newark 6/14/98 P. promelas survival, lab control
 Transform:      ARC SINE(SQUARE ROOT(Y))

                  Shapiro - Wilk's Test for Normality
----------------------------------------------------------------------
     D =   0.6751
     W =   0.9578

     Critical W  = 0.9000 (alpha = 0.01 , N = 30)
             W  = 0.9270 (alpha = 0.05 , N = 30)
----------------------------------------------------------------------
Data PASS normality test (alpha = 0.01). Continue analysis.


              Bartlett's Test for Homogeneity of Variance
----------------------------------------------------------------------
Calculated B1 statistic = 12.6249              (p-value = 0.0133)

Data PASS B1 homogeneity test at 0.01 level. Continue analysis.
----------------------------------------------------------------------

Critical B = 13.2767  (alpha = 0.01, df =  4)
           =  9.4877  (alpha = 0.05, df =  4)
----------------------------------------------------------------------
                  Using Average Degrees of Freedom
             (Based on average replicate size of     6.00)

Calculated B2 statistic = 11.9612              (p-value = 0.0176)
Data PASS B2 homogeneity test at 0.01 level. Continue analysis.

----------------------------------------------------------------------
   GRP  IDENTIFICATION   REP        VALUE          TRANS VALUE
   ---  --------------  -----   ------------      ------------
    1        lab water    1          0.9000             1.2490
    1        lab water    2          1.0000             1.4120
    1        lab water    3          0.9090             1.2644
    1        lab water    4          1.0000             1.4120
    1        lab water    5          0.9000             1.2490
    1        lab water    6          1.0000             1.4120
    1        lab water    7          0.9000             1.2490
    1        lab water    8          0.9000             1.2490
    1        lab water    9          1.0000             1.4120
    1        lab water   10          0.9000             1.2490
    2         upstream    1          0.8180             1.1301
    2         upstream    2          0.8180             1.1301
    2         upstream    3          1.0000             1.4120
    2         upstream    4          0.4000             0.6847
    2         upstream    5          0.6000             0.8861
    3      storm sewer    1          0.7000             0.9912
    3      storm sewer    2          1.0000             1.4120
    3      storm sewer    3          1.0000             1.4120
    3      storm sewer    4          0.6360             0.9231
    3      storm sewer    5          0.8000             1.1071
    4       downstream    1          0.6000             0.8861
    4       downstream    2          0.5450             0.8305
    4       downstream    3          0.7000             0.9912
    4       downstream    4          0.6360             0.9231
    4       downstream    5          0.7000             0.9912
    5              cso    1          0.8000             1.1071
    5              cso    2          1.0000             1.4120
    5              cso    3          1.0000             1.4120
    5              cso    4          1.0000             1.4120
    5              cso    5          0.9000             1.2490
----------------------------------------------------------------------


        Summary Statistics on Transformed Data  TABLE 1 of 2
----------------------------------------------------------------------
   GRP  IDENTIFICATION    N      MIN        MAX        MEAN
   ---  --------------  ----  ---------  ---------  ---------
    1        lab water   10     1.2490     1.4120     1.3158
    2         upstream    5     0.6847     1.4120     1.0486
    3      storm sewer    5     0.9231     1.4120     1.1691
    4       downstream    5     0.8305     0.9912     0.9244
    5              cso    5     1.1071     1.4120     1.3185
----------------------------------------------------------------------
```

```
Title: Newark 6/14/98 P. promelas survival, lab control
Transform:      ARC SINE(SQUARE ROOT(Y))

           Summary Statistics on Transformed Data  TABLE 2 of 2
----------------------------------------------------------------------
  GRP  IDENTIFICATION      VARIANCE       SD        SEM        C.V. %
  ---  --------------  ------------  ---------  ---------  ---------
   1        lab water        0.0069     0.0830     0.0262     6.3060
   2         upstream        0.0760     0.2758     0.1233    26.2979
   3      storm sewer        0.0535     0.2313     0.1034    19.7856
   4       downstream        0.0048     0.0693     0.0310     7.4964
   5              cso        0.0189     0.1376     0.0615    10.4362
----------------------------------------------------------------------


                            ANOVA Table
----------------------------------------------------------------------
  SOURCE              DF            SS              MS          F
----------------------------------------------------------------------
  Between              4          0.6937          0.1734      6.4220

  Within (Error)      25          0.6751          0.0270
----------------------------------------------------------------------
  Total               29          1.3687
----------------------------------------------------------------------
                                                  (p-value = 0.0011)

  Critical F  = 4.1774  (alpha = 0.01, df = 4,25)
              = 2.7587  (alpha = 0.05, df = 4,25)
  Since  F > Critical F  REJECT  Ho: All equal (alpha = 0.05)


     Bonferroni t-Test   -   TABLE 1 OF 2          Ho: Control<Treatment
----------------------------------------------------------------------
                             TRANSFORMED   MEAN CALCULATED IN  TRANS   SIG
GROUP   IDENTIFICATION          MEAN         ORIGINAL UNITS    t STAT  0.05
-----  ------------------   -----------  ------------------  ------  ---
  1             lab water      1.3158          0.9409
  2              upstream      1.0486          0.7272          2.9685   *
  3           storm sewer      1.1691          0.8272          1.6296
  4            downstream      0.9244          0.6362          4.3483   *
  5                   cso      1.3185          0.9400         -0.0298
----------------------------------------------------------------------
Bonferroni t critical value = 2.3846   (1 Tailed, alpha = 0.05, df = 4,25)

     Bonferroni t-Test   -   TABLE 2 OF 2          Ho: Control<Treatment
----------------------------------------------------------------------
                            NUM OF   MIN SIG DIFF    % OF    DIFFERENCE
GROUP   IDENTIFICATION       REPS   (IN ORIG. UNITS) CONTROL FROM CONTROL
-----  ------------------  -------  ---------------- ------- ------------
  1             lab water     10
  2              upstream      5        0.1412        15.1      0.2137
  3           storm sewer      5        0.1412        15.1      0.1137
  4            downstream      5        0.1412        15.1      0.3047
  5                   cso      5        0.1412        15.1      0.0009
----------------------------------------------------------------------
```

all groups

```
Title: Newark 6/14/98 P. promelas survival, ups vs down)
Transform:     ARC SINE(SQUARE ROOT(Y))

                  Shapiro - Wilk's Test for Normality
-------------------------------------------------------------------------
     D =   0.3234
     W =   0.9382

     Critical W  = 0.7810 (alpha = 0.01 , N = 10)
              W  = 0.8420 (alpha = 0.05 , N = 10)
-------------------------------------------------------------------------
Data PASS normality test (alpha = 0.01). Continue analysis.

                  F-Test for Equality of Two Variances
-------------------------------------------------------------------------
        GROUP    IDENTIFICATION          VARIANCE          F
        -----    --------------        ------------    ---------
          1           upstream             0.0760
          2         downstream             0.0048        15.8353
-------------------------------------------------------------------------
                                               (p-value = 0.0203)
  Critical F = 23.1545   (P=0.01, 4, 4)
                9.6045   (P=0.05, 4, 4)
  Since F <= Critical F, FAIL TO REJECT Ho: Equal Variances (alpha = 0.01).

-------------------------------------------------------------------------
  GRP  IDENTIFICATION   REP        VALUE         TRANS VALUE
  ---  --------------  -----   ------------     ------------
   1         upstream     1        0.8180           1.1301
   1         upstream     2        0.8180           1.1301
   1         upstream     3        1.0000           1.4120
   1         upstream     4        0.4000           0.6847
   1         upstream     5        0.6000           0.8861
   2       downstream     1        0.6000           0.8861
   2       downstream     2        0.5450           0.8305
   2       downstream     3        0.7000           0.9912
   2       downstream     4        0.6360           0.9231
   2       downstream     5        0.7000           0.9912
-------------------------------------------------------------------------

          Summary Statistics on Transformed Data  TABLE 1 of 2
-------------------------------------------------------------------------
       GRP  IDENTIFICATION      N      MIN         MAX        MEAN
       ---  --------------    ----  ---------   ---------   ---------
        1         upstream      5    0.6847      1.4120      1.0486
        2       downstream      5    0.8305      0.9912      0.9244
-------------------------------------------------------------------------

          Summary Statistics on Transformed Data  TABLE 2 of 2
-------------------------------------------------------------------------
  GRP  IDENTIFICATION      VARIANCE        SD         SEM          C.V. %
  ---  --------------   ------------  ---------   ---------    ----------
   1         upstream       0.0760      0.2758      0.1233       26.2979
   2       downstream       0.0048      0.0693      0.0310        7.4964
-------------------------------------------------------------------------

                             ANOVA Table
-------------------------------------------------------------------------
  SOURCE            DF              SS              MS            F
-------------------------------------------------------------------------
  Between            1            0.0386          0.0386        0.9538

  Within (Error)     8            0.3234          0.0404
-------------------------------------------------------------------------
  Total              9            0.3619
-------------------------------------------------------------------------
                                                     (p-value = 0.3573)

  Critical F  = 11.2586  (alpha = 0.01, df = 1,8)
              = 5.3177   (alpha = 0.05, df = 1,8)
  Since  F < Critical F  FAIL TO REJECT  Ho: All equal (alpha = 0.05)
```

```
Title: Newark 6/14/98 P. promelas survival, ups vs down
Transform:       ARC SINE(SQUARE ROOT(Y))

        2 Sample t-Test   -   TABLE 1 OF 2            Ho: Control<Treatment
 ---------------------------------------------------------------------------
                                TRANSFORMED    MEAN CALCULATED IN  TRANS   SIG
 GROUP   IDENTIFICATION            MEAN         ORIGINAL UNITS     t STAT  0.05
 ----- ------------------      -----------   ------------------  ------  ---
   1               upstream       1.0486           0.7272
   2             downstream       0.9244           0.6362          0.9766
 ---------------------------------------------------------------------------
   Equal Var: t critical value = 1.8595   (1 Tailed, alpha = 0.05, df = 8)
                                                    (p-value = 0.1787)

                                TRANSFORMED    MEAN CALCULATED IN  TRANS   SIG
 GROUP   IDENTIFICATION            MEAN         ORIGINAL UNITS     T STAT  0.05
 ----- ------------------      -----------   ------------------  ------  ---
   1               upstream       1.0486           0.7272
   2             downstream       0.9244           0.6362          0.9766
 ---------------------------------------------------------------------------
 Unequal Var: t critical value = 2.0150   (1 Tailed, alpha = 0.05, df = 5)
                                                    (p-value = 0.1868)

        2 Sample t-Test   -   TABLE 2 OF 2            Ho: Control<Treatment
 ---------------------------------------------------------------------------

  Equal Variances:
 ---------------------------------------------------------------------------
                               NUM OF    MIN SIG DIFF     % OF    DIFFERENCE
 GROUP   IDENTIFICATION         REPS    (IN ORIG. UNITS)  CONTROL FROM CONTROL
 ----- ------------------     -------  ----------------  ------- -----------
   1               upstream      5
   2             downstream      5           0.2245        29.9       0.0910
 ---------------------------------------------------------------------------

  Unequal Variances:
 ---------------------------------------------------------------------------
                               NUM OF    MIN SIG DIFF     % OF    DIFFERENCE
 GROUP   IDENTIFICATION         REPS    (IN ORIG. UNITS)  CONTROL FROM CONTROL
 ----- ------------------     -------  ----------------  ------- -----------
   1               upstream      5
   2             downstream      5           0.2442        32.5       0.0910
 ---------------------------------------------------------------------------
```

US: upstream.

```
Title: Newark 6/14/98 P. promelas growth W/survivors

                 Shapiro - Wilk's Test for Normality
-------------------------------------------------------------------------
     D =   0.0303
     W =   0.8714

     Critical W  = 0.8350 (alpha = 0.01 , N = 15)
            W  = 0.8810 (alpha = 0.05 , N = 15)
-------------------------------------------------------------------------
Data PASS normality test (alpha = D.01). Continue analysis.


              Bartlett's Test for Homogeneity of Variance
-------------------------------------------------------------------------
Calculated B1 statistic =  7.8955              (p-value = 0.0193)

Data PASS B1 homogeneity test at 0.01 level. Continue analysis.
-------------------------------------------------------------------------
Critical B =  9.2103  (alpha = 0.01, df =  2)
           =  5.9915  (alpha = 0.05, df =  2)


-------------------------------------------------------------------------
  GRP  IDENTIFICATION   REP        VALUE          TRANS VALUE
  ---  --------------  -----   ------------     ------------
   1         upstream    1          0.3978           0.3978
   1         upstream    2          0.4122           0.4122
   1         upstream    3          0.4092           0.4092
   1         upstream    4          0.5900           0.5900
   1         upstream    5          0.4800           0.4800
   2      storm sewer    1          0.3757           0.3757
   2      storm sewer    2          0.3290           0.3290
   2      storm sewer    3          0.3180           0.3180
   2      storm sewer    4          0.3229           0.3229
   2      storm sewer    5          0.3137           0.3137
   3              CSO    1          0.3137           0.3137
   3              CSO    2          0.3450           0.3450
   3              CSO    3          0.3640           0.3640
   3              CSO    4          0.3467           0.3467
   3              CSO    5          0.3656           0.3656
-------------------------------------------------------------------------


          Summary Statistics on Data              TABLE 1 of 2
-------------------------------------------------------------------------
      GRP  IDENTIFICATION    N      MIN        MAX        MEAN
      ---  --------------  ----  ---------  ---------  ---------
       1         upstream    5    0.3978     0.5900     0.4578
       2      storm sewer    5    0.3137     0.3757     0.3319
       3              CSO    5    0.3137     0.3656     0.3470
-------------------------------------------------------------------------


          Summary Statistics on Data              TABLE 2 of 2
-------------------------------------------------------------------------
  GRP  IDENTIFICATION      VARIANCE       SD        SEM        C.V. %
  ---  --------------  ------------  ---------  ---------  ----------
   1         upstream       0.0065     0.0806     0.0361     17.6145
   2      storm sewer       0.0006     0.0252     0.0113      7.5814
   3              CSO       0.0004     0.0209     0.0093      6.0161
-------------------------------------------------------------------------


                           ANOVA Table
-------------------------------------------------------------------------
 SOURCE            OF            SS              MS             F
-------------------------------------------------------------------------
 Between            2          0.0473          0.0237         9.3703

 Within (Error)    12          0.0303          0.0025
-------------------------------------------------------------------------
 Total             14          0.0776
-------------------------------------------------------------------------
                                                     (p-value = 0.0035)

 Critical F  = 6.9266  (alpha = 0.01, df = 2,12)
             = 3.8853  (alpha = 0.05, df = 2,12)
 Since  F > Critical F  REJECT  Ho: All equal (alpha = 0.05)
```

```
Title:  Newark 6/14/98 P. promelas growth w/survivors

      Dunnett's Test    -    TABLE 1 OF 2            Ho:Control<Treatment
---------------------------------------------------------------------------
                                TRANSFORMED    MEAN CALCULATED IN          SIG
GROUP    IDENTIFICATION            MEAN          ORIGINAL UNITS    T STAT  0.05
-----  --------------------    -----------    ------------------   ------  ---
  1                upstream      0.4578             0.4578
  2             storm sewer      0.3319             0.3319          3.9644   *
  3                     CSO      0.3470             0.3470          3.4882   *
---------------------------------------------------------------------------
Dunnett critical value = 2.1100   (1 Tailed, alpha = 0.05, df = 2,12)

      Dunnett's Test    -    TABLE 2 OF 2            Ho:Control<Treatment
---------------------------------------------------------------------------
                              NUM OF    MIN SIG DIFF     % OF    DIFFERENCE
GROUP    IDENTIFICATION        REPS   (IN ORIG. UNITS)  CONTROL  FROM CONTROL
-----  --------------------  -------  ----------------  -------  ------------
  1                upstream     5
  2             storm sewer     5           0.0670        14.6      0.1260
  3                     CSO     5           0.0670        14.6      0.1108
---------------------------------------------------------------------------
```

note: this may be an inappropriate comparison because upstream water group was associated w/ reduced survivorship.

– CB.

```
Title: Newark 6/14/98 P. promelas growth  storm sewer vs lab control.

                  Shapiro - Wilk's Test for Normality
-------------------------------------------------------------------------
    D =   0.0169
    W =   0.9651

    Critical W  = 0.8350 (alpha = 0.01 , N = 15)
           W  = 0.8810 (alpha = 0.05 , N = 15)
-------------------------------------------------------------------------
Data PASS normality test (alpha = 0.01). Continue analysis.


                 F-Test for Equality of Two Variances
-------------------------------------------------------------------------
        GROUP    IDENTIFICATION          VARIANCE          F
        -----    --------------        ------------    ---------
          1      lab cont. pool           0.0007
          2         storm sewer           0.0026         3.4992
-------------------------------------------------------------------------
                                            (p-value = 0.1097)
  Critical F = 7.9559   (P=0.01, 4, 9)
               4.7181   (P=0.05, 4, 9)
  Since F <= Critical F, FAIL TO REJECT Ho: Equal Variances (alpha = 0.01).

-------------------------------------------------------------------------
    GRP  IDENTIFICATION   REP        VALUE           TRANS VALUE
    ---  --------------  -----   ------------       ------------
     1   lab cont. pool    1        0.3300             0.3300
     1   lab cont. pool    2        0.2750             0.2750
     1   lab cont. pool    3        0.3064             0.3064
     1   lab cont. pool    4        0.3070             0.3070
     1   lab cont. pool    5        0.2960             0.2960
     1   lab cont. pool    6        0.3430             0.3430
     1   lab cont. pool    7        0.2810             0.2810
     1   lab cont. pool    8        0.2970             0.2970
     1   lab cont. pool    9        0.3580             0.3580
     1   lab cont. pool   10        0.3310             0.3310
     2      storm sewer    1        0.2630             0.2630
     2      storm sewer    2        0.3290             0.3290
     2      storm sewer    3        0.3180             0.3180
     2      storm sewer    4        0.2054             0.2054
     2      storm sewer    5        0.2510             0.2510
-------------------------------------------------------------------------


            Summary Statistics on Data              TABLE 1 of 2
-------------------------------------------------------------------------
       GRP  IDENTIFICATION    N       MIN        MAX        MEAN
       ---  --------------  ----  ---------  ---------  ---------
        1   lab cont. pool   10    0.2750     0.3580     0.3124
        2      storm sewer    5    0.2054     0.3290     0.2733
-------------------------------------------------------------------------

            Summary Statistics on Data              TABLE 2 of 2
-------------------------------------------------------------------------
   GRP  IDENTIFICATION      VARIANCE       SD         SEM        C.V. %
   ---  --------------    -----------  ---------  ---------   ---------
    1   lab cont. pool       0.0007     0.0271     0.0086       8.6857
    2      storm sewer       0.0026     0.0508     0.0227      18.5748
-------------------------------------------------------------------------


       2 Sample t-Test   -   TABLE 1 OF 2          Ho: Control<Treatment
-------------------------------------------------------------------------
                            TRANSFORMED   MEAN CALCULATED IN           SIG
GROUP    IDENTIFICATION         MEAN        ORIGINAL UNITS     t STAT  0.05
-----  ------------------   ----------   ------------------   ------   ---
  1        lab cont. pool     0.3124           0.3124
  2           storm sewer     0.2733           0.2733          1.9802   *
-------------------------------------------------------------------------
  Equal Var: t critical value = 1.7709    (1 Tailed, alpha = 0.05, df = 13)
                                                 (p-value = 0.0346)

-------------------------------------------------------------------------
                               NUM OF    MIN SIG DIFF    % OF    DIFFERENCE
GROUP    IDENTIFICATION         REPS    (IN ORIG. UNITS) CONTROL FROM CONTROL
-----  ------------------     ------   --------------  -------  ----------
  1        lab cont. pool       10
  2           storm sewer        5          0.0350        11.2      0.0391
-------------------------------------------------------------------------
```

→ 125% of control x̄

Fairly sensitive MSD.

Chronic Ceriodaphnia dubia Chemistry-Physical Data:

Client: Newark ②   nerk061398#2

061498-2200

Start Date: ~~Clark~~

Control (DMW)		Day 0	1	2	3	4	5	6
Dissolved Oxygen	Initial	7.7	7.9	8.0	7.8	7.9	7.9	7.9
	Final	7.2	7.0	~~7.2~~	7.6	7.88	7.4	7.7
pH	Initial	8.3	7.9	7.9	7.7	~~7.4~~ ①	7.9	7.9
	Final	7.7	7.8	7.7	7.7	7.8	7.9	7.8
Initial Conductivity		169	169	171	182	180	173	172

CSO ~~% effluent~~		Day 0	1	2	3	4	5	6
Dissolved Oxygen	Initial	7.2	6.6	6.6	6.5	7.0	6.5	7.5
	Final	6.8	6.6	7.0	7.2	7.3	7.2	7.6
pH	Initial	7.4	7.0	7.1	7.1	7.1	7.2	7.1
	Final	7.3	7.3	7.4	7.4	~~7.3~~ 7.4	7.4	7.4
Initial Conductivity		103	106	113	106	109	108	110

Control MHRW		0	1	2	3	4	5	6
Dissolved Oxygen	Initial	7.8	7.9	7.5	7.5	7.6	7.9	8.0
	Final	7.1	7.0	7.3	7.6	7.48	7.5	7.6
pH	Initial	8.3	7.8	7.9	7.9	7.49	7.8	8.0
	Final	7.7	7.8	7.8	7.6	~~7.6~~ 18	7.9	7.8
Initial Conductivity		299	298	304	303	294	291	292

Downstream ~~% effluent~~		0	1	2	3	4	5	6
Dissolved Oxygen	Initial	8.0	7.6	7.3	7.3	7.3	7.1	8.1
	Final	7.0	6.8	7.0	7.2	7.3	7.4	7.8
pH	Initial	8.1	7.9	7.9	7.8	7.7	7.8	7.9
	Final	8.2	8.2	8.1	8.2	~~7.3~~	8.3	8.0
Initial Conductivity		481	482	457	483	490	486	485

upstream

~~% effluent~~		0	1	2	3	4	5	6
Dissolved Oxygen	Initial	7.9	7.6	7.6	7.7	7.7	7.8	8.0
	Final	7.1	6.8	7.2	7.3	~~7.6~~ ②	7.4	7.9
pH	Initial	8.1	7.9	7.9	7.8	7.8	7.8	8.1
	Final	8.2	8.2	7.8	8.0	~~7.4~~ 8	8.3	8.2
Initial Conductivity		512	516	517	517	515	515	517

% effluent		0	1	2	3	4	5	6
Dissolved Oxygen	Initial							
	Final							
pH	Initial							
	Final							
Initial Conductivity								

Storm sewer

~~% effluent~~		0	1	2	3	4	5	6
Dissolved Oxygen	Initial	8.1	7.6	7.5	7.7	7.7	8.2	7.8
	Final	6.9	6.9	7.0	7.4	7.4	7.3	7.6
pH	Initial	7.6	7.1	7.1	7.1	7.5	7.1	7.3
	Final	7.3	7.3	7.3	7.3	~~7.4~~ ③	~~7.4~~ OB 7.5	7.3
Initial Conductivity		60	61	63	66	106	73	67
Initials	Initial	OB	EOB	DV	DV	DV/OB	DV/OB	EB
	Final	EB	EB	DV	DV	OB	EB	EB

Please fill in or ✓ appropriate information

Initials	Initial							
	Final							
Dissolved Oxygen Meter	Orion 820	IF	IF	IF	IF	IF	IF	iF
	YSI 51B	–	–	–	–			
pH Meter	Orion SA250	–	–	–	–			
	Orion 920A	IF	IF	IF	IF	IF	IF	iF
Conductivity	Orion 160	I	I	I	I	I	I	i

Dissolved Oxygen read in mg/l, pH read in s.u., Conductivity read in umhos

① 8.0 OB
② 7.4 OB
③ 7.3 OB

Chronic *Pimephales promelas* Chemistry-Physical Data:

Client: Newark NERK061398 **Start Date:** 061498-1130

Control (DMW)		Day 0	1	2	3	4	5	6 7.9
Dissolved Oxygen	Initial	8.2	7.9	8.0	7.8	7.9	7.9	~~8.0~~
	Final	6.2	5.8	5.7	5.8	6.3	6.1	6.8
pH	Initial	8.1	7.9	7.9	7.9	8.0	7.9	~~8.0~~
	Final	7.4	7.7	7.6	7.6	7.7	7.8	7.6
Initial Conductivity		170	169	171	182	180	173	~~292~~ 172

MHR		0	1	2	3	4	5	6
Dissolved Oxygen	Initial	8.2	7.9	7.5	7.5	7.6	7.9	8.0
	Final	6.1	6.0	5.0	5.6	6.4	6.3	6.5
pH	Initial	8.1	7.8	7.9	7.9	7.9	7.8	8.0
	Final	7.3	7.7	7.6	7.2	7.8	7.8	7.4
Initial Conductivity		297	298	304	302	294	291	292

Upstream ~~% effluent~~		0	1	2	3	4	5	6
Dissolved Oxygen	Initial	7.8	7.6	7.6	~~6.~~ 7.7	7.7	7.8	8.0
	Final	6.1	5.8	4.9	5.2	6.4	6.2	6.6
pH	Initial	8.1	7.9	7.9	7.8	7.8	7.8	8.1
	Final	8.0	8.2	7.9	7.8	7.7	7.8	8.0
Initial Conductivity		493	516	517	517	515	515	517

Storm ~~% effluent~~		0	1	2	3	4	5	6
Dissolved Oxygen	Initial	8.0	7.6	7.5	7.7	7.7	8.2	7.8
	Final	5.9	5.1	4.4	5.0	6.2	6.1	6.5
pH	Initial	7.3	7.1	7.1	7.1	7.1	7.1	7.3
	Final 69	7.0	7.1	7.1	7.1	7.1	7.3	7.1
Initial Conductivity		59	~~105.5~~	~~69~~ 63	66~~0~~	66	73	67
Initials	Initial	LA	EB	DV	DV	DV	DV	EB
	Final	DB	DV	DV	DV	DV		

CSO ~~% effluent~~		Day 0	1	2	3	4	5	6
Dissolved Oxygen	Initial	7.1	6.6	6.6	6.5	7.0	6.5	7.5
	Final	5.1	4.5	4.3	5.0	5.1	5.0	6.6
pH 7.9	Initial	7.4	7.0	7.1	7.1	7.1	7.2	7.1
	Final	7.0	7.0	7.0	7.1	7.2	7.3	7.2
Initial Conductivity		102	~~105~~ 108	113	106	109	108	110

Downstream ~~% effluent~~		0	1	2	3	4	5	6
Dissolved Oxygen	Initial	7.8	7.6	7.3	7.3	7.3	7.1	8.1
	Final	5.6	4.4	4.8	4.7	5.8	6.0	6.4
pH	Initial	8.1	7.9	7.9	7.8	7.7	7.8	7.9
	Final	7.9	8.0	7.9	7.8	7.8	7.7	7.9
Initial Conductivity		436	482	487	483	490	486	485

% effluent		0	1	2	3	4	5	6
Dissolved Oxygen	Initial							
	Final							
pH	Initial							
	Final							
Initial Conductivity								

Please fill in or ✓ appropriate information

Initials	Initial							
	Final							
Dissolved Oxygen Meter	Orion 820	IF	iF	IF	IF	IF	IF	i
	YSI 51B	—	—	—	—	—	—	
pH Meter	Orion SA250	—	✓	—	—	—	—	
	Orion 920A	IF	iF	IF	IF	IF	IF	i
Conductivity	Orion 160	I	i	I	I	I	I	i

Dissolved Oxygen read in mg/l, pH read in s.u., Conductivity read in umhos

CHRON IAL CHEMISTRY - PHYSICAL DATA:

Client: Atef Newark **Start Date:** 061498

~~Effluent~~	Sample # DERK061398		
	1 UPS	2 Down	3
Alkalinity mg/L CaCO3	188 (9.4)	174 (8.7)	
Hardness mg/L CaCO3	256 (6.4)	232 (5.8)	
Cl2 TRC$_i$	N/A →	→	
TRC$_F$			
Total mls of Sodium Thiosulfate added per Liter			
~~Upstream~~	~~1~~ Storm	~~2~~ CSO	3
Alkalinity mg/L CaCO3	26 (1.3)	34 (1.7)	
Hardness mg/L CaCO3	40 (1.0)	44 (1.1)	
Cl2 TRC$_i$	N/A →	→	
TRC$_F$			
Total mls of Sodium Thiosulfate added per Liter			
Initials =>			

DMW= Dilute Mineral water; MHR= Moderately Hard Reconstituted Water.

If there is more than one outfall Effluent is designated by outfall #.

~~Addition of Sodium Thiosulfate is used to reduce Total Residual Chlorine:~~
~~For every 1 mg/ml TRC 1ml of a stock Sodium Thiosulfate solution is added for every Liter of Effluent.~~
~~The stock solution consists of 6.7 mg Sodium Thiosulfate per ml final solution.~~
~~TRC= Total Residual Chlorine; TRC$_i$= initial TRC reading; TRC$_F$= TRC after the addition of sodium thiosulfate.~~

Comments/Corrections:

TRC by amperometric titration

D.O. % Saturation prior to dispensing.

Upstream	99%
Downstream	~~100%~~ 98%
Storm Sewer	100%
CSO	84%

Review

Newark CSO

Chronic *Bioassay* dilution record

Client: Newark

Start Date: 6/14/98 **Dilution Water:** no dilution ☐ MHRW ☐ Upstream ☐ DMW

First Sample Information

EnviroScience ID # #NERK-061398	Description	✓ if Comp.	✓ if Filtered
CSO	~~Effluent~~ CSO	✓	✓
Upstream	Upstream	✓	✓
Downstream	~~Near Field~~ Downst.	✓	✓
Storm Sewer	~~Far Field~~ Storm	✓	✓

Dilution %	Initiation	Diluent Batch DMW/MHR 061398/061398	Day One	Diluent Batch Both M: D: 061398
	Effluent (ml)	Final (ml)	Effluent (ml)	Final (ml)
			—	—
			—	—
			—	—
			—	—
			—	—
MHRW+ST Information	MHRW(ml)	$Na_2S_2O_3$(ml)	MHRW (ml)	$Na_2S_2O_3$(ml)

Technician Initials	
Test Initiation	SJ
Day 1	LB
Day 2	YB
Day 3	KB
Day 4	0
Day 5	0
Day 6	

Second Sample Information

EnviroScience ID #	Description	✓ if Comp.	✓ if Filtered
	Effluent		
	Upstream		
	Near Field		
	Far Field		

Dilution %	Day Two	Diluent Batch DMW/MHR 061598 ~~061498~~/~~061398~~	Day Three	Diluent Batch DMW/MHR 061698/061398
	Effluent (ml)	Final (ml) 061398	Effluent (ml)	Final (ml)
MHRW+ST Information	MHRW(ml)	$Na_2S_2O_3$(ml)	MHRW (ml)	$Na_2S_2O_3$(ml)

Third Sample Information

EnviroScience ID #	Description	✓ if Comp.	✓ if Filtered
	Effluent		
	Upstream		
	Near Field		
	Far Field		

Dilution %	Day Four	Diluent Batch DMW/MHR 061798/061398	Day Five	Diluent Batch DMW/MHR 061898/061798	Day Six	Diluent Batch DMW/MHR 061998/061998
	Effluent (ml)	Final (ml)	Effluent (ml)	Final (ml)	Effluent (ml)	Final (ml)
MHRW+ST Information	MHRW (ml)	$Na_2S_2O_3$(ml)	MHRW (ml)	$Na_2S_2O_3$(ml)	MHRW (ml)	$Na_2S_2O_3$(ml)

Chemistry ranges:

	alkalinity	hardness	TRC
DMW 0613-0619	68-70	84-92	<0.02
MHRW 0613-0619	60-62	80-92	<0.02

} mg/L copied from QC log book. QB.

Test terminated - unaccepable mortality in control groups.

Chronic *Ceriodaphnia dubia* Survival and Reproduction Data: pg. 1 of ~~4~~ 3

ient: Newark #1 newark1398#1 **Start Date:** 6/14/98 **Time:** 1215
Dilution water: NA **End Date:** ________ **Time:** ________
Origin of C. dubia: Enviroscience Test re-started w/ new sol'n & new bugs @ 2200. OS.

Control 1	Replicate											Number Adults	# Dead/ # Adversely Affected
	Day	1	2	3	4	5	6	7	8	9	10		
	0915 1	D	✓	✓	✓	D	✓	✓	D	D	✓	6	4 / 4
DMW Dilute Mineral Water	2												/
	3												/
	4												/
	5												/
	6												/
	7												/
	8												/
Totals													
Number of Broods													

Control 2	1	D	✓	✓	✓	D	D	D	✓	✓	D	5	5 / 5
MHR + Se + B12	2												/
	3												/
	4												/
	5												/
	6												/
	7												/
	8												/
otals													
Number of Broods													

Upstream %	1	✓	✓	✓	✓	D	D	KIT	✓	✓	T	n=9 6	2 / 2
	2												/
	3												/
	4												/
	5												/
	6												/
	7												/
	8												/
tals													
Number of Broods													

Terminated

Chronic *Ceriodaphnia dubia* Survival and Reproduction Data: pg. 2 of ~~4~~ 3

Client: Newark NERR061398 #1 **Start Date:** 6/14/98

	Replicate											Number Adults	# Dead/ # Adversely Affected
	Day	1	2	3	4	5	6	7	8	9	10		
Storm ~~%~~ ~~effluent~~ Sewer	1	✓	D	✓	✓	✓	D	D	D	D	D	~~10~~ 4	6 / 6
	2												/
	3												/
	4												/
	5												/
	6												/
	7												/
	8												/
Totals													
Number of Broods													

CSO ~~%~~ ~~effluent~~	1	✓	✓	✓	✓	✓	D	✓	✓	D	D	7	3 / 3
	2												/
	3												/
	4												/
	5												/
	6												/
	7												/
	8												/
Totals													
Number of Broods													

Downstream ~~%~~ ~~effluent~~	1	D	D	D	D	D	D	D	D	D	D	0	10 / 10
	2												/
	3												/
	4												/
	5												/
	6												/
	7												/
	8												/
Totals													
Number of Broods													

Chronic *Ceriodaphnia dubia* Survival and Reproduction Data: pg. ~~4 of 4~~ 3/3 Terminated.

ient: Newark NERK061398 #1 **Start Date:** 6/14/98

rood Board Information:

Replicate	1	2	3	4	5	6	7	8	9	10	BB #: —
Brood Board cup used	25	26	27	14	7	16	21	22	23	27	Date: 061398 - 061498 Time: ↓

BB060598 (1–4) BB060398 (5–10)

BB060398 1630-2350
BB060598 1630-2345

est Information:

Food Information

Day	Initiation	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
YCT Batch #	Y6 061498							▨
Algae Batch #	AG 061398							▨

Temperature (Celsius)

Test Level	Initiation	Day 1		Day 2		Day 3		Day 4		Day 5		Day 6		Day 7	
		~~Initial~~ 0915	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final
DMW	25.4	26.2												▨	
MHW	25.0	—												▨	
UPS	25.6	25.8												▨	
CSO	25.7	—												▨	
STORM	25.3	—												▨	
DOWN	25.6	25.3												▨	
—														▨	
nitials	OB	OB													
hange Time	▨														
ransfer Verified	✓														

Initial is the initiation temperature, or the temperature of the new board C. dubia are being transferred into.

omments Section:

ay	Date	Comments	Initials
0	6/14/98	@ 1315 - 1 hr. all alive	OB.
0	6/14/98	@ 1720- 5hrs/ Down #4A #9A; #8D, STORM #2D; CSO 0D #6D, ups 0D) MHR 0D) DMW #1 9D	OB
0	6/14/98	@ 2040 ~8hrs/ ups #5D, CSO #6 D?/A; STORM #10D,	OB
"	"	Down #4 looks ok now, #6A, ; DMW #8D? ; MHR #1D; MHR #3D, #10D	
		Despite poor quality of this lot of specimens	
		none of the samples was acutely toxic during	

first 4 ~~5 hours of exp.~~ 5-8 hours of exposure.

MW= Dilute Mineral Water; EFFLUENT dilutions expressed as percentage effluent e.g. 100% = 100% Effluent, 80%= 80% Effluent + 20% Dilution Water;
T= Sodium Thiosulfate, a dechlorinating agent.
Ke M=Missing, D=Dead, KIT=Killed in transfer, m=empty, g=gravid, y=eyed, r=releasing, N=Sample number, A=Adversely affected

Chronic *Ceriodaphnia dubia* #1 Chemistry-Physical Data: -Terminated w/ high control mortality

Client: Newark NERK061398 #1

Start Date: 061498-1215

Control (DMW)		Day 0	1	2	3	4	5	6
Dissolved Oxygen	Initial	8.2	7.9					
	Final							
pH	Initial	8.1	7.9					
	Final							
Initial Conductivity		170	169					

DOWN ~~% effluent~~		Day 0	1	2	3	4	5	6
Dissolved Oxygen	Initial	7.8						
	Final							
pH	Initial	8.1						
	Final							
Initial Conductivity		436						

Upstream		0	1	2	3	4	5	6
Dissolved Oxygen	Initial	7.8						
	Final							
pH	Initial	8.1						
	Final							
Initial Conductivity		493						

MHR [illegible] ~~% effluent~~		0	1	2	3	4	5	6
Dissolved Oxygen	Initial	8.2						
	Final							
pH	Initial	8.1						
	Final							
Initial Conductivity		297						

Storm ~~% effluent~~		0	1	2	3	4	5	6
Dissolved Oxygen	Initial	8.0 9						
	Final							
pH	Initial	7.3						
	Final							
Initial Conductivity		[illegible] 59						

% effluent		0	1	2	3	4	5	6
Dissolved Oxygen	Initial							
	Final							
pH	Initial							
	Final							
Initial Conductivity								

CSO ~~% effluent~~		0	1	2	3	4	5	6
Dissolved Oxygen	Initial	7.1 4						
	Final							
pH	Initial	7.4						
	Final							
Initial Conductivity		102						
Initials	Initial	A						
	Final							

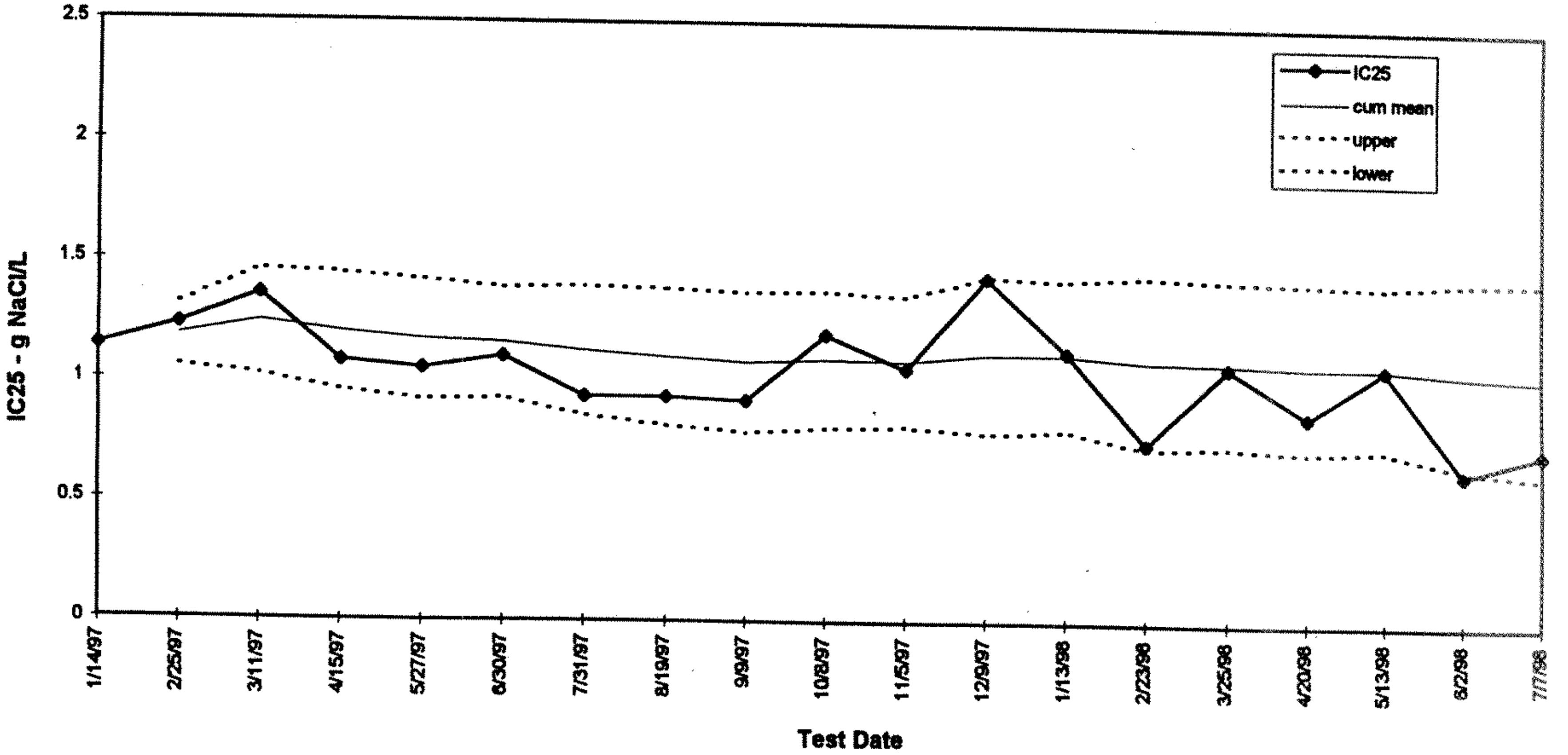
Please fill in or ✓ appropriate information

Initials	Initial							
	Final							
Dissolved Oxygen Meter	Orion 820							
	YSI 51B							
pH Meter	Orion SA250							
	Orion 920A							
Conductivity	Orion 160							

Dissolved Oxygen read in mg/l, pH read in s.u., Conductivity read in umhos

EnviroScience QC Chart - *Ceriodaphnia dubia*

Chronic Toxicity Endpoint - Reproduction IC $_{25}$

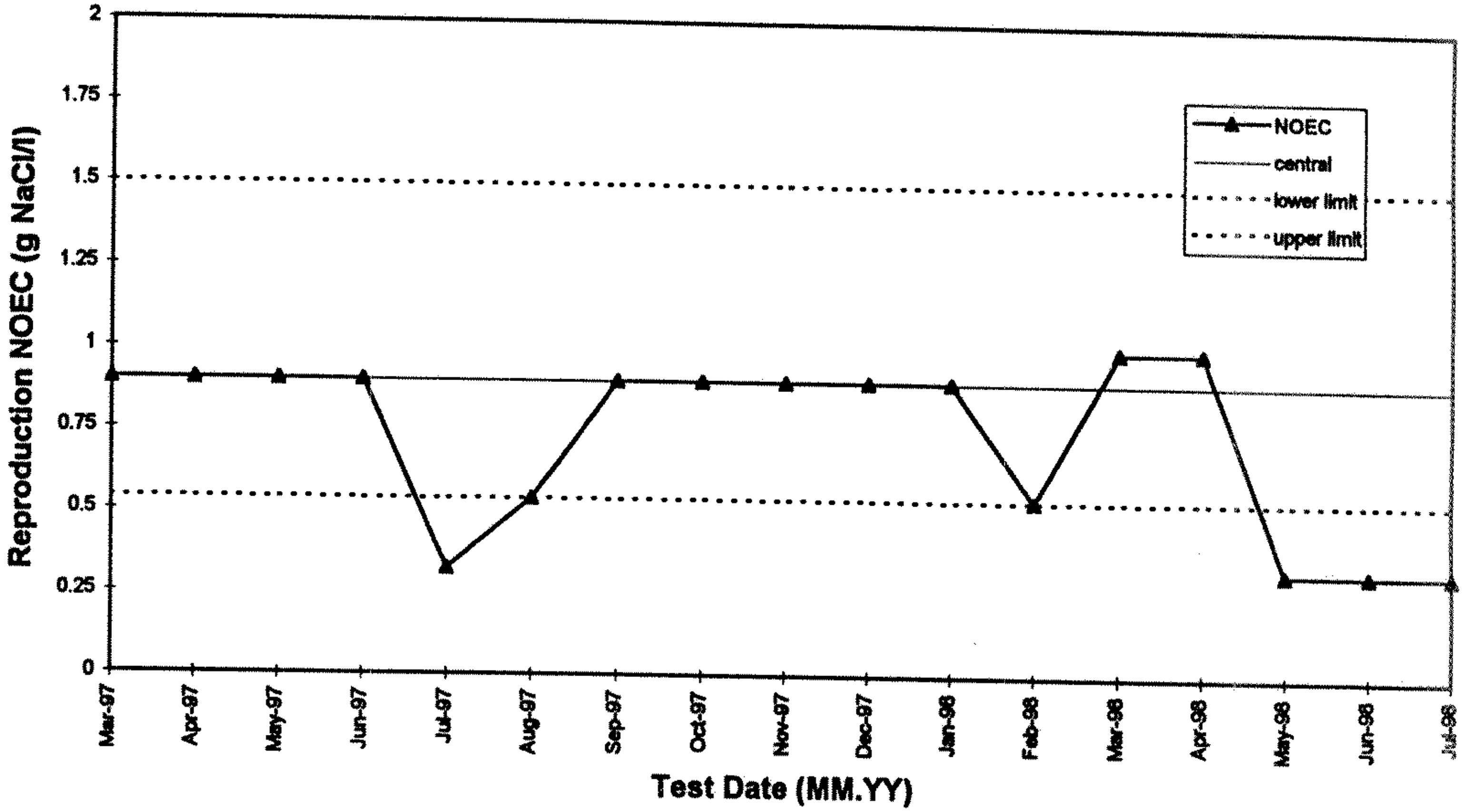


EnviroScience QC/SRT Chart rev. 7/30/98 CDIC2597

conc. 0.324, 0.54, 0.9, 1.5, 2.5 g NaCl/l
adopted 3/97

3/98 and 4/98 diluent MHRW

EnviroScience QC Chart - *Ceriodaphnia dubia*
Chronic Toxicity Endpoint (NaCl/DMW)
DMW adopted 10/95

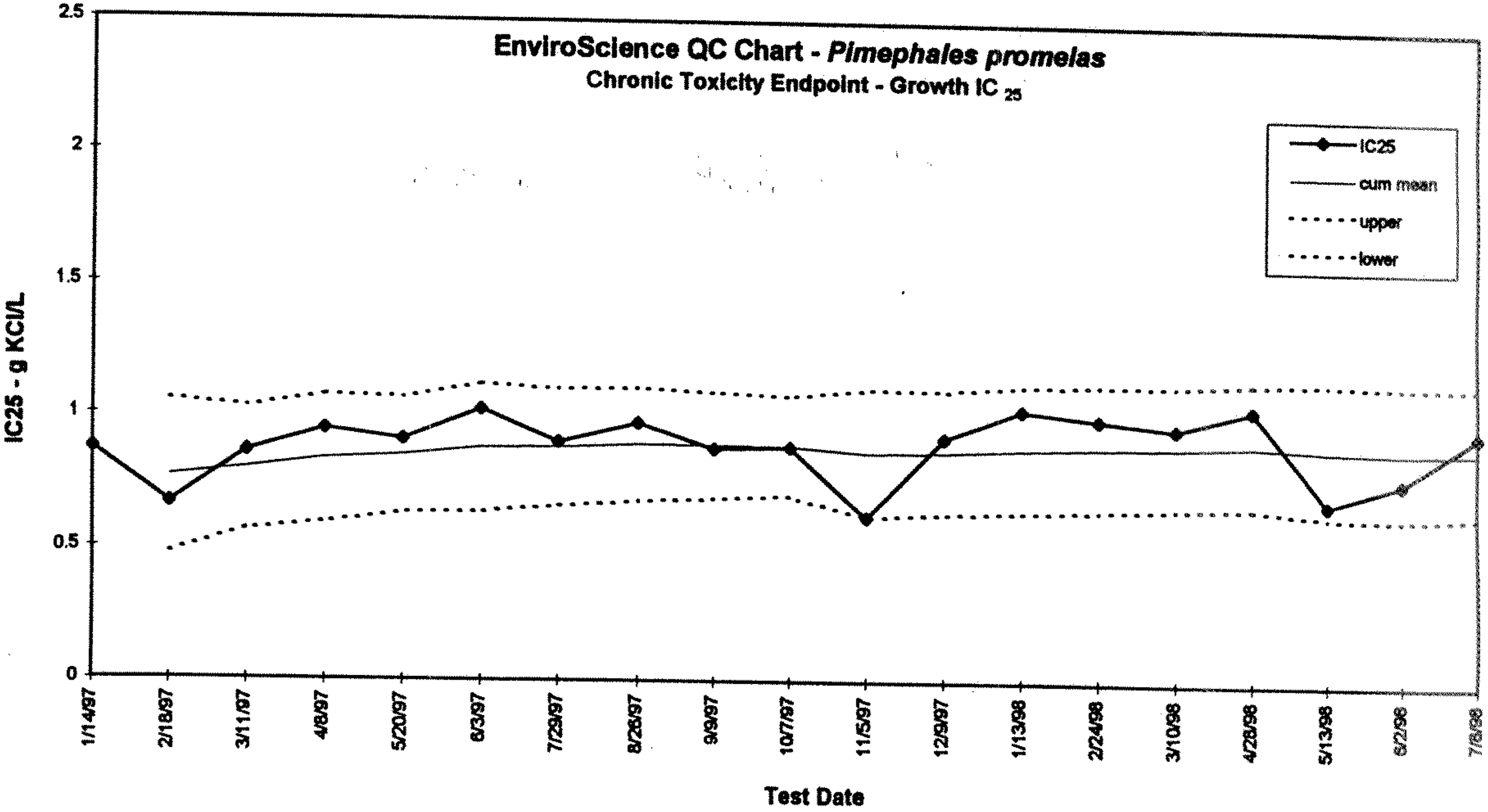


conc. 0.324, 0.54, 0.9, 1.5, 2.5 g NaCl/l
adopted 3/97

Note: central tendency based on first 5 tests
NOTE: MSD for 5/98 test <10%

Note: 3/98 and 4/98 tests used MHRW and 0.5 series from 2.0 g/l

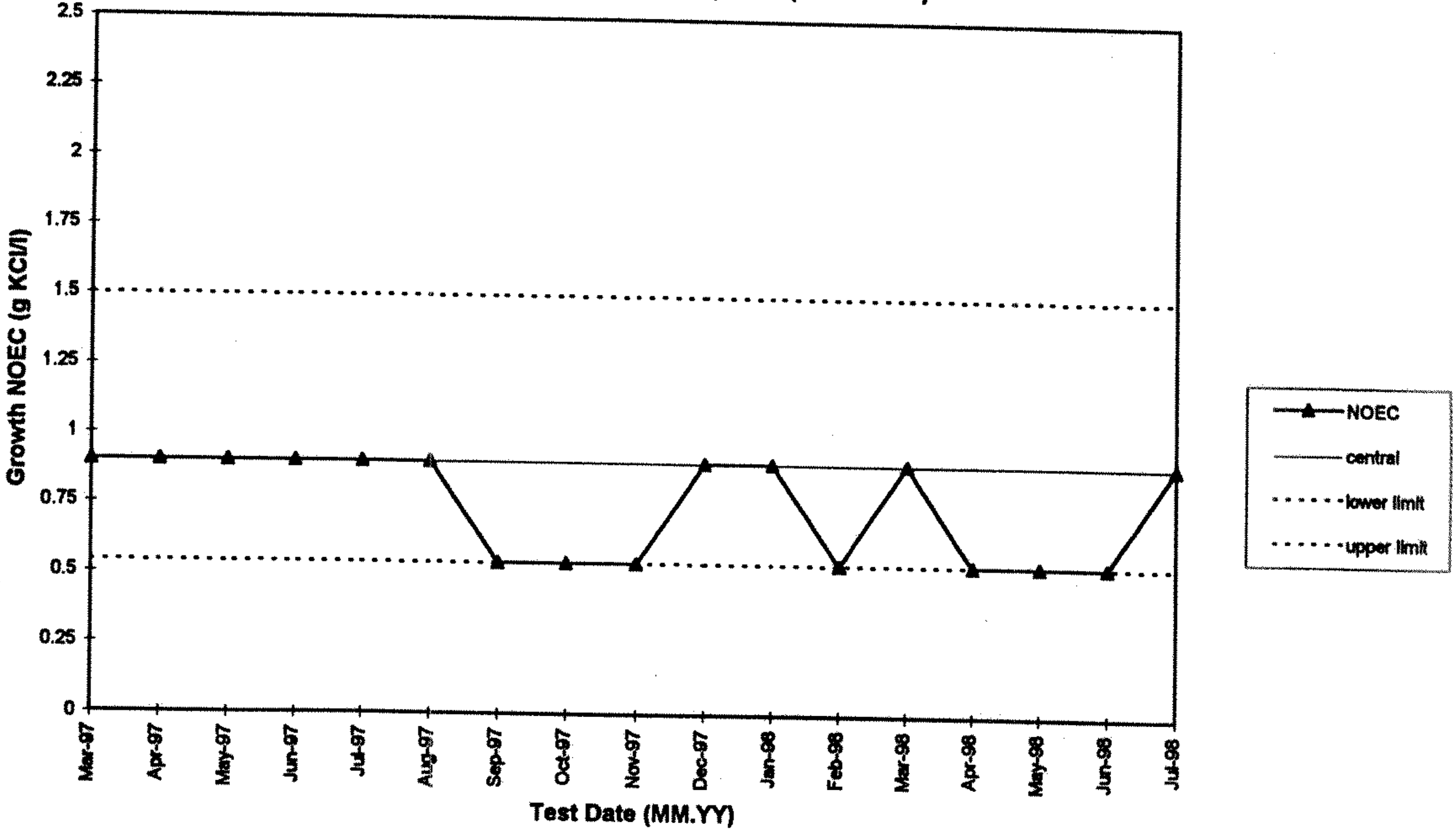
EnviroScience QC/SRT Chart CDNOEC rev. 7/30/98



conc. 0.324, 0.54, 0.9, 1.5, 2.5 g NaCl/l
adopted 3/97

EnviroScience QC/SRT Chart rev. 7/30/98 PPIC2597

EnviroScience QC Chart - *Pimephales promelas*
Chronic Toxicity Endpoint (KCl/DMW)



KCl/DMW adopted 11/95
conc. 0.324, 0.54, 0.9, 1.5, 2.5 g KCl/l
adopted 3/97

EnviroScience QC/SRT Chart PPNOEC rev. 7/30/98

APPENDIX H

OF NEWARK, OHIO
Water and Wastewater
Department
AT YOUR SERVICE

Roger Loomis
Plant Superintendent

Michael D. Fox
Assistant Plant Superintendent

WASTEWATER TREATMENT PLANT
1003 East Main Street, Newark, OH 43055

Plant (614) 349-6768
Lab (614) 349-6774

Office (614) 349-6769
Fax (614) 349-6771

Jan A. Rice, Environmental Specialist
Enforcement/Compliance Group
Division of Water Pollution Control
Ohio EPA, Central District Office
3232 Alum Creek Drive
Columbus, OH 43207-3417

August 9, 1996

RE: River Fecal Coliform Characterization Report

Dear Jan:

Please find enclosed four copies a report on the fecal coliform levels of the rivers that the City of Newark's CSOs discharge into. This report was completed to fulfill the requirements of the Schedule of Compliance, Part I, C, 4 of the City of Newark's NPDES permit. Please feel free to give me a call if more information is needed.

Sincerely,

Roger Loomis

Roger Loomis

Enc.
c	Joe Sawyer
	file

Fecal Characterization Study for Impact of CSOs on Licking River

Starting June 1, 1996 employees of the City of Newark WWTP began a study of the impact of Combined Sewer Overflow on the quality of water in the Licking River. The following is a description and discussion of the results of the bacterial study completed to meet this NPDES permit requirement.

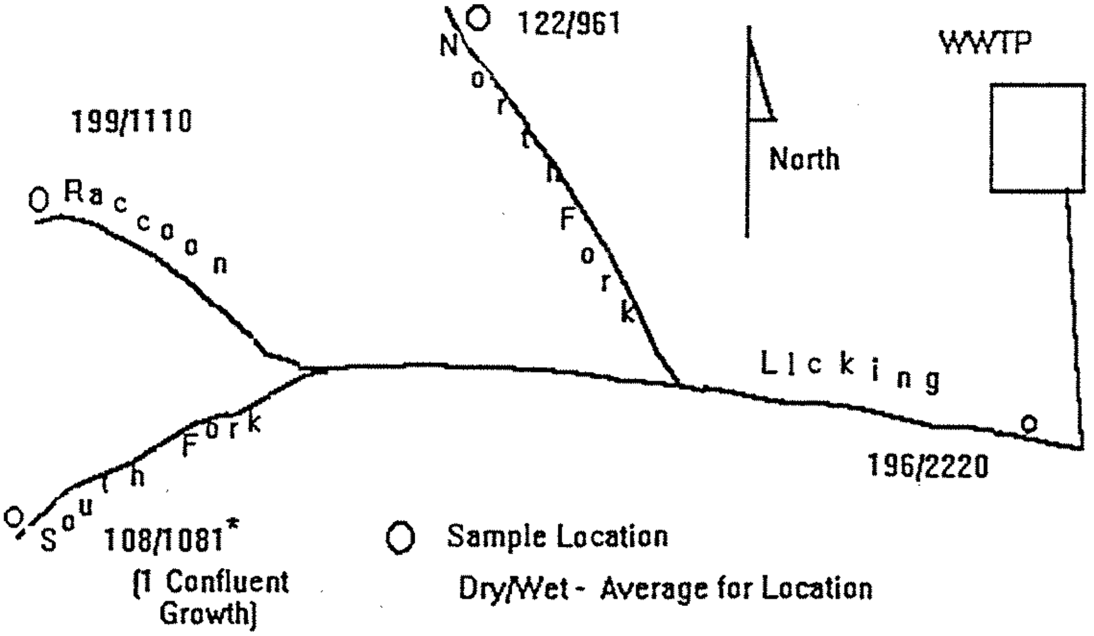
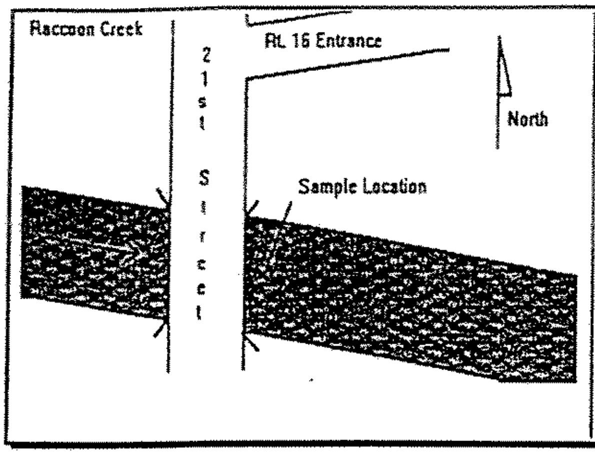


Figure 1, Geometric Means for each Location

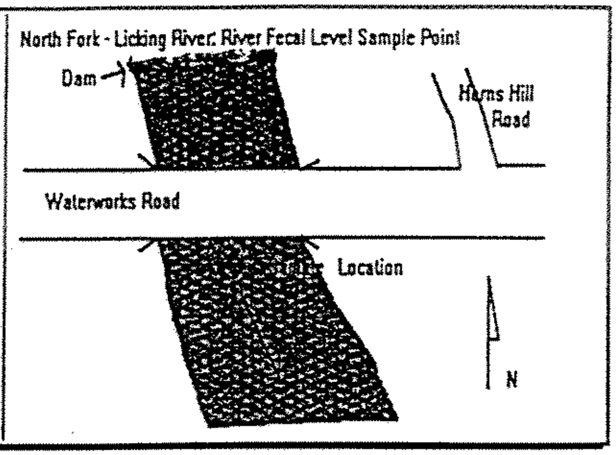
Sampling Procedure

Samples were collected from four locations, three above stream of the CSOs and one downstream of the CSOs and upstream of the City of Newark WWTP. All samples were collected within two hours of each other by trained city personnel. Samples were collected mid-stream using appropriately sterilized bottles. Sampling was completed according to methods approved in Standard Methods, Section 9060. A weighted sampling device was built by plant personnel that was attached to a rope so that a sample could be taken off a bridge. A detailed drawing of each sample location can be found below.

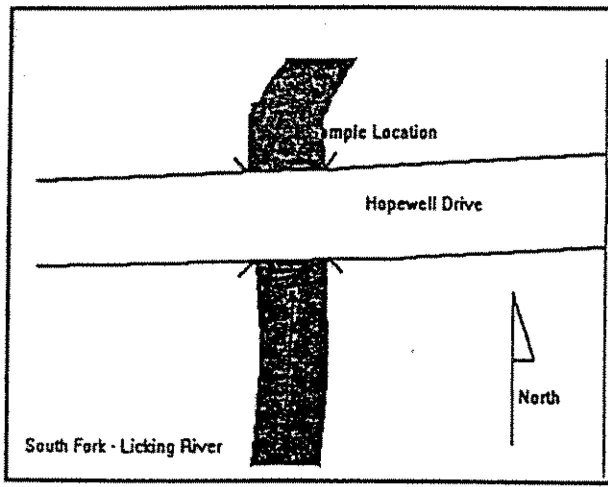
Sampling Locations



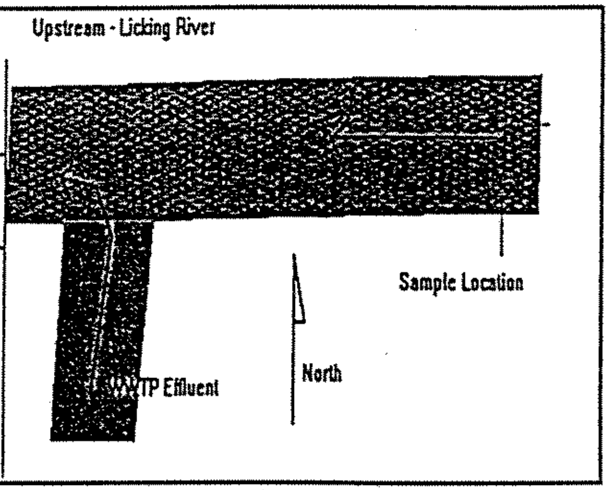
Raccoon Creek Sample Point



North Fork-Licking River Sample Point



South Fork-Licking River Sample Point



Upstream WWTP, Below CSO Sample Point

Analytical Method

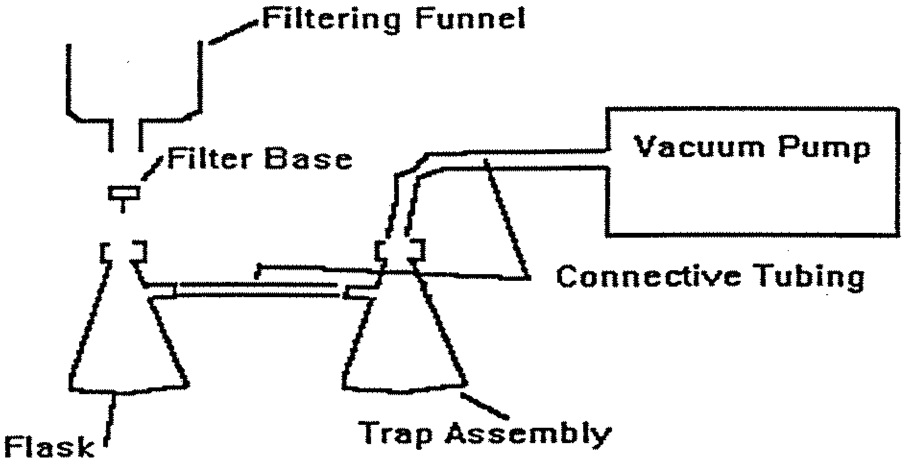
Determination of Fecal Coliform
Membrane Filter Method

Apparatus:

1. 1, 5, 10 and 25 ml graduated pipets
2. 25, 50 and 100 ml graduated cylinders
3. stainless steel parabolic funnel/filter assembly
4. 47 mm individually wrapped, pre-sterilized membrane filters (0.45 micron pore size)
5. forceps (flat tip, non-corrugated)
6. 50 ml beaker

7. large beaker, a precautionary measure to act as a snuffer
8. flame source (such as an alcohol lamp or butane torch)
9. vacuum pump
10. 2 sidearm vacuum flasks
11. connective tubing
12. pre-sterilized 47 mm plastic petri dishes
13. pre-sterilized 250 ml erlenmeyer flask
14. waterbath incubator maintained @ 44.5° C +/- 0.2° C.
15. thermometer, checked against an NBS certified thermometer, or one traceable to an NBS thermometer
16. 2 - 5x stereoscopic microscope
17. aluminum foil
18. hand tally or electronic counting device
19. pre-sterilized Whirlpak bags - 18 oz. puncture-proof

<u>Set up filtering apparatus as follows:</u>



<u>Reagents:</u>

1. sodium hydroxide solution, 0.2N - dissolve 8 g NaOH in water and dilute to 1 liter
2. reagent alcohol
3. dehydrated MFC broth
4. rosolic acid solution - dissolve 1 gram rosolic acid in 100 ml 0.2N NaOH
5. dehydrated agar

Plate Preparation:

1. Dissolve 7.4 gr. MFC broth and 3 grams agar in 200 ml water in a 250 erlenmeyer flask. Heat while stirring to boiling and remove from heat at first appearance of steam bubbles. Solution will be blue.
2. Remove from hot plate and allow to cool slightly while continuing to stir. Add 2 mls rosolic acid solution.
3. Pipet 2.5 ml solution into petri dishes.
4. Allow media to cool and gel.
5. Cover and store upside down in refrigerator. Prepared plates can be stored for up to 2 weeks as long as no colony growth occurs.

Procedure:

Sterilize all equipment before use (parabolic funnel/filter assembly, pipets, graduated cylinders, autoclaveable sample bottles). Cover each piece tightly with aluminum foil and autoclave @ 121° C for 15 minutes (15 pounds pressure).

Sterilize forceps between samples by dipping forceps into reagent alcohol and pass through open flame. When alcohol is evaporated, forceps are ready for use.

Assemble sterile parabolic funnel/filter assembly and flask. With sterile forceps, place a pre-sterilized filter membrane onto the assembly. Shake sample 25 times in 7 seconds to break up chain bacteria. With a sterile pipet, place an aliquot of sample onto filter membrane, apply vacuum and rinse sides of funnel 3 times with freshly distilled water. Sterilize forceps and remove filter.

Suggested volumes for river samples: 1, 5 and 10 mls.

A blank sample must be run before and after each sample series. Holding time on samples is 6 hours @ 4° C.

Completed filters are removed with sterile forceps and placed in a petri dish with the bottom of the filter in contact with the agar media. No air bubbles should be trapped between the media and the filter membrane. Do not drag forceps over the top of the filter, which could cause colonies to smear. Place the petri dishes with filters in Whirlpak bags so that all dishes are flat, not stacked (three per bag). Seal bags and incubate inverted in water bath @ 44.5 ° C +/- 0.2 ° C for 24 hours +/- 2 hours.

Remove dishes from water bath and count fecal colonies (blue shiny colonies only). Acceptable range is 20-60 colonies. Greater than 200 colonies is considered "too numerous to count" (TNTC).

Calculation:

Coliform colonies/100 mls = (colonies counted/mls of sample filtered) * 100.

Analytical Data

Dry Weather Sampling

Date	Time	NFLR	SFLR	Raccoon	Upstream	Rainfall
6/14/96						0
6/15/96						0
6/16/96						0
6/17/96	7:55 am	70	163	157	220	0
6/18/96	7:45 am	130	220	735	260	0
6/21/96						0
6/22/96						0
6/23/96						0
6/24/96	7:55 am	105	200	163	200	0.35*
6/25/96						0
6/26/96						0
6/27/96	2:15 pm	50	25	525	200	0
6/28/96	11:00 am	145	67	450	515	0
6/29/96	8:00 am	250	10	230	143	0
6/30/96	8:00 am	160	240	210	300	0
7/1/96	10:00 am	130	223	210	193	0
7/2/96	8:00 am	117	270	130	400	0
7/8/96						0
7/9/96						0
7/10/96	8:15 am	177	125	50	210	0
Average		133	140	286	264	
Geometric		122	108	199	191	

*rainfall was after sample collection

Wet Weather Sampling #1

Date	Time	NFLR	SFLR	Raccoon	Upstream	Rainfall	Duration*
6/3/96						0.77	1.75
6/4/96	8:20 am	3000	#	8600	13000	0.08	0.5
6/5/96	8:10 am	2300	1540	2000	2500	0.00	0.0
6/6/96	8:00 am	570	240	480	640	0.55	1.75
6/7/96	9:20 am	1317	17200	2800	10400	1.13	4.0
Average		1797	4745	3470	6635		
Geometric		1509	1853	2193	3835		

* in hours, # - Confluent growth

Wet Weather Sampling #2

Date	Time	NFLR	SFLR	Raccoon	Upstream	Rainfall	Duration*
6/10/96						0.77	1.75
6/11/96	2:40 pm	700	420	860	2300	0.27	2.20
6/12/96	8:15 am	560	310	420	700	0.03	0.25
6/13/96	10:10 am	780	6750	210	2800	0.0	0.0
6/14/96	7:55 am	1020	515	200	800	0.0	0.0
Average		765	1999	423	1650		
Geometric		747	820	350	1378		

* in hours

Wet Weather Sampling #3

Date	Time	NFLR	SFLR	Raccoon	Upstream	Rainfall	Duration*
7/14/96						0.01	0.1
7/15/96	10:15 pm	360	340	1260	4900	0.61	2.67
7/16/96	9:45 am	415	427	220	1307	0.03	0.17
7/17/96	11:20 am	213	330	515	700	0.43	1.25
7/18/96	10:15 am	4877	2200	2700	9800	1.2	5.0
Average		1466	824	1174	4177		
Geometric		628	569	788	1448		

* in hours

APPENDIX I

DIVISION OF WATER & WASTEWATER

Joseph E. Sawyer
Utilities Superintendent
740-349-6737

40 West Main Street
P. O. Box 4100
Newark, Ohio 43058-4100

Charles L. Frey
Asst. Utilities Superintendent
740-349-6735

MEMORANDUM

TO: Mayor
Members of Council

FROM: Joseph E. Sawyer J
Utilities Superintendent

SUBJECT: City of Newark's Combined Sewer System Update

DATE: April 29, 1998

COPIES: Service Director, Malcolm Pirnie, Supt. WWTP, file

The City's existing National Pollution Discharge Elimination System (NPDES) permit requires an analysis of the impacts of the combined sewer system on local area streams in accordance with the United States EPA National CSO Policy. It was these requirements in the City of Newark's NPDES permit that initiated the project presently being conducted by the City's consulting engineer, Malcolm Pirnie.

The National Policy requires public presentations and input regarding prioritizing any CSO projects that may be identified. This effort is to be summarized in a Long Term Control Plan to be submitted by the City on or before October 1, 1998 to the Ohio EPA. The preparation of the Long Term Control Plan is part of the scope of work of this project.

At the suggestion of the Ohio EPA, the public presentation should be held in conjunction with a local standing committee in charge of related matters or familiar with the issues involved. The Service Committee is proposed as the best available forum for the public presentation and Mr. Forgrave has agreed to place this on the May 11, 1998 Service Committee Agenda to update council and the public on the status of our combined sewer system study.

In order to attract interested members of the public, we have sent invitations to several groups and individuals that have stated an interest in the water quality of the streams and rivers in the Newark area. Below is the list of those receiving direct invitations by mail.

DIVISION OF WATER & WASTEWATER

Joseph E. Sawyer
Utilities Superintendent
740-349-6737

40 West Main Street
P. O. Box 4100
Newark, Ohio 43058-4100

Charles L. Frey
Asst. Utilities Superintendent
740-349-6735

MEMORANDUM

TO: David Forgrave, Chairman
Public Service Committee

FROM: Joseph E. Sawyer
Utilities Superintendent

SUBJECT: Service Committee

DATE: May 8, 1998

COPIES: Mayor, Service Director, Clerk of Council, Bill Rauch, Lori Resta, Brad Feightner, Julie Barrett, file

……

I would appreciate some time on your upcoming Service Committee agenda to discuss the following:

1. Submission of legislation authorizing the advertisement for bids for a vehicle and equipment for the Water and Wastewater Department (with emergency clause).

2. To provide the Service Committee, Council members and interested members of the public with an update on the status of Newark's Combined Sewer System Study presently being performed by Malcolm Pirnie. We will present the results to date of the Combined Sewer System Study and welcome any comments and/or feedback from Council and the public regarding the study. We will also discuss the next actions required to complete the project. No action from the Service Committee will be requested at this time.

Thank you.

JES/ek

List of Direct Mail Invitations

Ernie Grimm
Dillon Lake Water Sports
6275 Clay-Littick Drive
Nashport, OH 43830
Phone: 740/453-7964

Jim McCluskey
Licking Co. Soil & Water Conservation Dist.
771 East Main Street
Newark, OH 43055
Phone: 740/349-3920

Mike Sims
Muskingum Co. Soil & Water Conservation Dist.
225 Underwood Street
Suite 100
Zanesville, OH 43701
Phone: 740/454-2767

Gary Stuhlfauth
Ohio Environmental Protection Agency
Combined Sewer Overflow Coordinator
1800 WaterMark Drive
Columbus, OH 43216-1049
Phone: 614/644-2026

Dr. John Marks
Muskingum Technical College
1555 Newark Road
Zanesville, OH 43701
Phone: 740/454-2501

Todd Bickle
Dillon Area Advisory Council
2165 Creedmore Drive
Zanesville, OH 43701

Jan Rice
Ohio Environmental Protection Agency
Central District Office
3232 Alum Creek Drive
Columbus, OH 43207
Phone: 614/728-3850

* * END OF MEMORANDUM * *

JES/ek

Water and Wastewater Department

Roger Loomis
Plant Superintendent

Michael D. Fox
Assistant Plant Superintendent

WASTEWATER TREATMENT PLANT
1003 East Main Street, Newark, OH 43055

Plant (614) 349-6768
Lab (614) 349-6774

fice (614) 349-6769
ax (614) 349-6771

April 21, 1998

RECEIVED
APR 23 1998
MALCOLM PIRNIE, INC.
COLUMBUS, OHIO

Thomas Bulcher
Malcolm Pirnie Inc.
445 Hutchinson Avenue
Columbus, Ohio 43235

Re: City of Newark, Ohio
Combined Sewer System

Dear Thomas Bulcher:

The City of Newark is in the midst of studying its Combined Sanitary and Storm Sewer System. This study will address the impacts, if any, of wet weather overflows from the system on local streams and rivers. This effort will satisfy requirements of the Ohio Environmental Protection Agency's Combined Sewer Overflow Policy and the City of Newark's NPDES permit.

The work has been in progress since 1996. A presentation discussing the combined sewer system study will be made to the City of Newark Service Committee meeting on Monday, May 11, 1998 at 6 p.m. in the Council Chambers, 40 West Main Street, Newark, Ohio.

The purpose of the meeting will be to present the status of the study to date and discuss the next steps to be taken to address the results of the study. This meeting is open to the public. Due to interest you have shown in the past relating to water quality issues in the Newark area, we are offering a specific invitation for your attendance.

If you have any questions or comments, please call Roger Loomis at (740) 349-6769 or Joe Sawyer at (740) 349-6737.

Thank you for your time and we look forward to seeing you on May 11th.

Sincerely yours,

Roger Loomis

Roger Loomis

c: file

May 8, 1998

PUBLIC SERVICE COMMITTEE
Monday, May 11, 1998
6:00 p.m., Council Chambers

AGENDA

1. Mayor Stare asking the committee to waive the $100 license fee for the Police Athletic League's circus coming to town in August.

2. Tim Matheny, Service Director, to discuss the Division of Engineering helping Miller Elementary School with their stormwater run off on the playground problem.

3. Joseph E. Sawyer, Utilities Superintendent, requesting authorization to bid a vehicle and equipment for the Water and Wastewater Department and the legislation is to contain the emergency clause.

4. Discussion of the Thornwood Drive Corridor.

5. Presentation of the status of the City of Newark's combined sewer system.

6. Other items at the discretion of the chairman.

cc: Mayor
Auditor
Service Director
Safety Director
Law Director
Engineer
Utilities Superintendent
Parks Superintendent
Council members
Tax Commissioner
WCLT
WHTH
Advocate

Route REH
JEH
MDW
~~JOB~~ TJB
proj 0821-194

RECEIVED
MAY 20 1998
MALCOLM PIRNIE, INC.
COLUMBUS, OHIO

Honorable Council
City of Newark, Ohio
May 12, 1998

The Public Service Committee, met Monday, May 11, 1998, in Council Chambers. The following were in attendance:

Julie Ketner Barrett, member
William J. Rauch, member
Tim Matheny, Service Director
Joseph Sawyer, Public Utilities Supt.
Brian Morehead, City Engineer

David S. Forgrave, chair
Brad B. Feightner, member
Lori J. Resta, member
Mayor Frank Stare
See Exhibit A for CSO Register Sheets

We wish to report as follows:

1. Mayor Stare asked the committee to waive the $100 license fee for the Police Athletic League's circus coming to town in August.

   Motion by Mr. Rauch, second by Mr. Feightner to send to council. Motion passed unanimously.

2. Tim Matheny, Service Director, discussed the Division of Engineering helping Miller Elementary School with their problem of stormwater run off on the playground.

   Motion by Ms. Resta, second by Mrs. Barrett to send to council. Motion passed unanimously.

3. Joseph Sawyer, Public Utilities Supt., requested authorization to bid a vehicle and equipment for the Water and Wastewater Department and declaring an emergency.

   Motion by Mr. Rauch, second by Mr. Feightner to send to council. Motion carried unanimously.

4. Joseph Sawyer, Public Utilities Supt., discussed the status of the City of Newark's combined sewer system. Representatives of the Ohio EPA and the engineering firm of Malcolm Pirnie were on hand to discuss this. **See Exhibit B**

5. Discussion of the Thornwood Drive Corridor took place in a combined meeting of the Public Service Committee and the Economic Development Committee chaired by Bruce Bain, councilman. All council members were present for this discussion as well as the Licking County Commissioners and Mike Smith, Clerk of the County Commissioners. Also attending were: Robert O'Neill, Steve Layman, Jerry Brems, and Herb Murphy.

   It was decided that the next step would be to appoint an advisory committee from all six entities involved plus the school systems: Licking County, Hebron, Heath, Newark, Granville, Union Township and Granville Township. Everyone is in favor of going ahead with this.

6. A late item was presented by Chief of Police, Paul Green, concerning moving the near west Community Policing Center from West Church Street to South Williams.

Motion by Mr. Feightner, second by Mrs. Barrett, to send to council. Motion passed unanimously.

Respectfully submitted,

David S. Forgrave
Chairman

cc:

- Mayor
- Service Director
- Law Director
- Public Utilities Supt.
- Council Members
- Auditor
- Safety Director
- Engineer
- Police Chief

"EXIBIT A"

CITY OF NEWARK, OHIO
WATER POLLUTION CONTROL DEPARTMENT

COMBINED SEWER OVERFLOW PROGRAM
LONG TERM CONTROL PLAN-PUBLIC PARTICIPATION PRESENTATION

May 11, 1998

ATTENDANCE SIGN-IN SHEET

	NAME	ASSOCIATION/PHONE
1.	RICK BAKER	NEWARK CITY COUNCIL
2.	Brian Miller	Advocate
3.	Glenda Carr	LCNRC/HEALTH
4.	TODD BICKLE	DILLON AREA ADVISORY COUNCIL
5.	Mike [illegible]	" " " "
6.	[illegible]	" "
7.	[illegible]	NEWARK CITY COUNCIL
8.	Paul A. Green	NEWARK POLICE DEPT.
9.	Roger Loomis	City of Newark WWTP
10.	Dan Markowitz	Malcolm Pirnie
11.	[illegible]	City of Newark Engineer
12.	Jim Kelly	City of Newark
13.	[illegible]	[illegible]
14.	Mike Wilson	Malcolm Pirnie (614) 888 4953
15.	Dick Merrell	Malcolm Pirnie (614) 888 4953
16.	Michael Fox	City-WWTP (740) 349-6769
17.	Gary Samuels	Newark Traffic
18.	Fred Stacy	City of Newark

EXHIBIT A

CITY OF NEWARK, OHIO
WATER POLLUTION CONTROL DEPARTMENT

COMBINED SEWER OVERFLOW PROGRAM
LONG TERM CONTROL PLAN-PUBLIC PARTICIPATION PRESENTATION

May 11, 1998

ATTENDANCE SIGN-IN SHEET

	NAME	ASSOCIATION/PHONE
19.	Tim Matheny	City of Newark
20.	Cheryl Lucas	WCLT Radio
21.	David Hesser	Licking County Commissioner
22.	Jerry Brems	Licking County Planning Comm
23.	Al Ashcraft	LC Comm
24.	Marvin J Phelps	L.C. Commissioner
25.	Robert Cowell	Southgate Corporation
26.	[illegible]	Commissioners Clerk
27.	Craig Baldwin	Newark City Council
28.	Bob Diebold	" " " 1 ward
29.	Jim Hays	Malcolm Pirnie
30.	Also Present	
31.	Dave [illegible]	Newark City Council
32.	Julie Barrett	Service Committee Members
33.	[illegible] Rauch	
34.	Len Kesta	
35.	Gary Stuhlfauth	Ohio EPA
36.		

EXHIBIT "B"

Tom Bulcher, P.E. representative of Malcolm Pirnie, opened his presentation with a brief statement relative to USEPA and OEPA's role in establishing policy which required cities throughout the United States to perform a comprehensive review and analysis of their combined sewer system and report their findings. This requirement is incorporated in Newark's National Pollutant Discharge Elimination System (N.P.D.E.S.) and requires Newark to characterize their combined sewer system and report the findings, along with a proposed Long Term Control Plan to OEPA by October 1, 1998. The purpose of this evening's meeting is to present the City of Newark's current program status and to permit an opportunity for Council and the public to ask questions and offer any suggestion.

Mr. Bulcher presented overhead visuals with an explanation of each as follows:

1. Separate Sewer System
2. Combined Sewer System
3. Dry Weather Flow (depicting a CSO structure)
4. Wet Weather Flow (depicting a CSO structure)
5. Project background
6. 1997 Ohio EPA Water Quality Study
7. Columbus Dispatch article – Licking River is clearly a success
8. Ohio EPA CSO Policy
9. CSO System Operational Plan (9 minimum controls)
10. Stream Bacteriological Monitoring
11. Bacteria Sampling Locations
12. Sewer System Characterization
13. Flow Meter Data for Typical Rain Event
14. Typical SWMM Graphical Output of a Combined Sewer Overflow
15. Long Term Control Plan (Goals)
16. 1997 Stream Survey
17. Biological Assessment Sampling Locations
18. 1997 Stream Survey Results
19. Long Term Control Plan (Previous Work)
20. Long Term Control Plan (Develop Alternatives)
21. Long Term Control Plan (Evaluate Alternatives) and Implement

Summary of questions and answers relative to Combined Sewer Overflow:

Q-1 (Council Member-Julie Barrett): There are homes in my area where the combined sewers backup and flood their basements. Does this project address homes with flooded basements in combined sewer areas?

A-1 (Malcolm Pirnie-Tom Bulcher): The problem should be addressed but other information is required before a solution can be developed. Is the home in a combined sewer area? Is the problem wide spread or localized to individual homes? What is the capacity of the sewer? What type of rain events cause the basement flooding? We will try to address basement flooding issues as best we can.

Q-2 (Dillon Area Advisory Council-Todd Bickle): Are samples taken upstream and downstream of the wastewater treatment plant? How far downstream of the plant is the sampling performed?

A-2 (Malcolm Pirnie-Tom Bulcher): The sampling done for this project did not sample downstream of the plant since we were only concerned with combined sewers. However, the City samples upstream and downstream of the plant outfall as part of their NPDES permit.

(City of Newark-Roger Loomis): The sampling location downstream of the plant is at Staddens Bridge.

(Council Member-Bill Rauch): Are you concerned?
(Dillon Area Advisory Council-Todd Bickle): Yes, we have had beach closings and complaints from swimmers of skin irritation.

(Malcolm Pirnie-Tom Bulcher): The sampling for this project indicated that during dry weather the fecal coliform levels were within EPA guidelines. During wet weather the fecal coliform concentrations increased upstream and downstream of all CSOs. The elevated levels were typically for short durations and did not adversely impact water quality.

Q-3 (Council Member-Dave Forgrave): What should the City be doing now since the results indicate that the rivers within the City are doing well?

A-3 (City of Newark-Joe Sawyer): A Long Term Control Plan will be developed based on the sampling results collected by the Engineer that will address the slight depression in the water quality in the North Fork. Once the plan has been developed, implementation of the LTCP will occur. Since the problem is small and localized, we don't anticipate any major capital costs will be required to implement the LTCP.

Q-4 (Dillon Advisory Committee-Todd Bickle): How will this project impact the water quality and beach closures at Dillon Reservoir?

A-4 (Malcolm Pirnie-Tom Bulcher): The purpose of this meeting is to discuss the project findings and to discuss what needs to be done to comply with Ohio EPA's October 1, 1998 deadline. A second meeting will be held later this summer to present alternatives for the Long Term Control Plan. During that meeting, public concerns and comments pertaining to the different alternatives will be addressed.

All individuals that received letters of invitation to this meeting should also receive letters to the second public meeting.

Q-5 (Council Member-Bill Rauch): Is Newark causing the problems associated with Dillon Reservoir?

A-5 (Malcolm Pirnie-Tom Bulcher): As seen by the newspaper article in the Columbus Dispatch, the City of Newark has been improving the water quality in the Licking River over the past 15 years. This improvement in water quality is largely due to the upgrades to the treatment plant which have decreased the quantity of overflow and increased the quality of the plant discharge. We don't believe that Newark CSOs typically impact Dillon Reservoir due to these improvements and the distance between the City of Newark and Dillon Reservoir. There are other possible sources of fecals in Dillon Reservoir such as runoff associated with septic systems and agricultural areas downstream of the City of Newark.

Q-6 (Council Member-Julie Barrett): Since the City has been investigating the development of a Stormwater Utility, are separate sewers better than combined sewers?

A-6 (Malcolm Pirnie-Tom Bulcher): Separate sewers may or may not be better for a community and needs to be evaluated on a case by case basis. In combined systems, the majority of the "first flush" of pollutants is contained within the system and treated at the wastewater treatment plant. With a separate system, the runoff from the streets is discharged directly to the river and could have more of an impact on the river than a combined system. In general, combined sewers should not be replaced just because they are combined sewers. If a problem in a receiving stream can be attributed to the combined sewer system, then improvements to the system should be addressed. Improvements may include system storage, off-line storage or sewer separation.

Q-7 (Ohio EPA-Gary Stuhfauth): Is the City alerting the public to a potential bacteriological problems in the river?

A-7 (Malcolm Pirnie-Tom Bulcher): As part of the City's Combined Sewer System Operational Plan, the City has installed signs at each combined sewer outfall advising people to avoid contact with discharge from the CSO

+ + END OF MEETING MINUTES + +

The above meeting minutes represents the writers summary of the questions and answers from the referenced meeting. This is only a summary and is not intended as verbatim description of the meeting. Please contact the writers with revisions or questions....Mike Wilson and Jim Hays of Malcolm Pirnie.

The Advocate
TUESDAY
MAY 12, 1998

NEWARK COUNCIL COMMITTEES

East Main bridge concerns to be aired

By BRIAN MILLER
Advocate Reporter

NEWARK — The question of whether to build a new East Main Street bridge or to repair the existing bridge may get its most thorough hearing yet on Thursday.

Newark City Council members and citizens will get to air their views on that question at 11 a.m. Thursday at City Hall, 40 W. Main St.

Mayor Frank Stare said he called the meeting after being contacted by residents who support restoring the current bridge, which is nearly 100 years old.

During a capital improvements committee meeting on Monday, Council President Craig Young said he wants to know why the cost estimate for replacing the structure jumped to $2.1 million from an original estimate of $967,000.

"My concern is spending that kind of money on a new bridge," Young said.

City Engineer Brian Morehead has said one study estimated the cost of repairing the bridge at $600,000 to $700,000, with a life expectancy of 25 years.

But engineer Jim Riddel says he thinks it can be done for less than that.

Thursday's meeting will be held either in the fourth-floor conference room, or in council chambers.

At its meeting Monday, the capital improvements committee approved the local financing for the bridge — a combination of a $1.1 million note, and $200,000 in license plate fees — and sent it to council.

The rest of the cost will be federal and state dollars.

One concern expressed during Monday's meeting is how much federal and state money will be available if the bridge is repaired rather than replaced.

In other business, council members heard about a study on how area streams are being affected by overflow from combined sanitary and storm sewers that serve downtown and older areas of the city.

The Combined Sewer Overflows study — required by the Ohio Environmental Protection Agency — was performed by consultant Malcolm Pirnie.

Combined sewer pipes are sufficiently large that in drier weather all the sewage goes to the treatment plant, according to Utilities Superintendent Joe Sawyer. But when a storm causes the volume of storm water to be greater than the pipe's capacity, the excess is diverted into streams.

However, Sawyer said even in those cases, 83 percent of the storm water is sent to the treatment plant.

"Everything within the Combined Sewer Overflows shows that it is not having a detrimental affect on the receiving water," said Sawyer.

APPENDIX J

Typical Letter of Invitation

July 31, 1998

Name
Address
City, OH Zip Code

Re: City of Newark, OH
Combined Sewer System

Dear ______________________:

The City of Newark has developed a Long Term Control Plan (LTCP) to prevent the degradation of water quality in Newark area streams from combined sewer overflows. The LTCP is based on a study of the City of Newark's Combined Sewer System, various sampling activities and a study of the health of aquatic life in streams receiving combined sewer overflow discharges. The development of the LTCP is a requirement of the City's National Pollutant Discharge Elimination System (NPDES) permit issued by the Ohio Environmental Protection Agency.

A presentation discussing the conclusions and recommendations of the Long Term Control Plan will be made to the public at the City of Newark Service Committee meeting on Monday, August 10, 1998 at 6 p.m. in the City Hall Council Chambers, 40 West Main Street, Newark, Ohio.

Due to interest you have shown in the past relating to water quality issues in the Newark area, we are offering a specific invitation for your attendance.

If you have any questions or comments, please call Roger Loomis (740) 349-6735 or Joe Sawyer at (740) 349-6737.

Thank you for your time and we look forward to seeing you on August 10th.

Sincerely yours,

____
City of Newark

c: ____________________
____

List of Direct Mail Invitations

Ernie Grimm
Dillon Lake Water Sports
6275 Clay-Littick Dr.
Nashport, OH 43830
PH: 740/453-7964

Jim McCluskey
Licking County Soil & Water Conservation District
771 E. Main St.
Newark, OH 43055
PH: 740/349-3920

Mike Sims
Muskingum County Soil & Water Conservation District
225 Underwood St.
Suite 100
Zanesville, OH 43701
PH: 740/454-2767

Todd Bickle
Dillon Area Advisory Council
2165 Creedmore Dr.
Zanesville, OH 43701

Dr. John Marks
Muskingum Technical College
1555 Newark Rd
Zanesville, OH 43701
PH: 740/454-2501

Jan Rice
Ohio Environmental Protection Agency
Central District Office
3232 Alum Creek Drive
Columbus, OH 43207
PH: 614/728-3850

Gary Stuhlfauth
Ohio Environmental Protection Agency
Combined Sewer Overflow Coordinator
1800 WaterMark Dr
Columbus, OH 43216-1049
PH: 614/644-2026

The Advocate
SUNDAY
AUGUST 9, 1998

Local

Study: Sewer overflow not hurting river

Water department to unveil results Monday

By BETSY RAY
Advocate Reporter

NEWARK — The Newark city water department will present results from an 18-month study on the effects of the city's combined sewer system at council's service committee meeting Monday.

The study determined how much waste goes into the river and streams, instead of the treatment plant, after a substantial rainfall occurs, overflowing the system.

Utilities Supervisor Jim Sawyer said the EPA approved the amount of waste emitted into the Licking River and streams by Newark's dated system, which combines storm water and sanitary sewer systems, deeming it not harmful to the public.

The city's long-term control plan was created to prevent harm to Newark's streams from combined sewer overflows, Sawyer said. "Basically we found no impact from the combined sewer overflows," he said.

Although the study results are good news for Newark, Ernest Grimm, owner of Dillon Lake Water Sports in Nashport, said he would like to see more being done.

"I'd like to see them do more to control the flows," said Grimm. "What I prefer to see is that they separate some of those sewers."

But Sawyer said separating the sew systems is not necessarily the rig move.

"The evaluation and recommend tion points out the fact that it isn't ne essarily good," he said. "In some case the storm water is as bad or worse the combined flow to the stream."

Sawyer said the department will con tinue to monitor the situation to mak sure nothing changes in the system.

The committee will meet at 6 p.m. i Newark City Hall, 40 W. Main St.

August 7, 1998

AUG 1998
RECEIVED

PUBLIC SERVICE COMMITTEE
Monday, August 10, 1998
5:45 p.m. (immediately
following Finance Committee)
Council Chambers

AGENDA

1. Chief Paul Green asking the committee to review a contract with the City of Columbus Police Crime Laboratory for forensic testing and one between the city and Ann Kennedy, Trustee, for leasing property at 42 South First Street. It would be used as an office by special projects community policing officers.

2. Joseph E. Sawyer, Utilities Superintendent, to discuss:

   Submission of legislation authorizing the advertisement for bids for construction of a new sanitary sewer force main for Pembroke Court and declaring an emergency.

   Presentation of the city's Combined Sewer Long Term Control Plan.

3. Other items at the discretion of the chairman.

cc: Mayor
Auditor
Service Director
Safety Director
Law Director
Engineer
Utilities Superintendent
Parks Superintendent
Council members
Police
Tax Commissioner
WCLT
WHTH
Advocate

Honorable Council
City of Newark, Ohio
August 13, 1998

The Public Service Committee with Mr. Baldwin substituting for Mr. Rauch met Monday, August 10, 1998 in Council Chambers.

We wish to report as follows:

1. Chief Paul Green asked for review of a contract with the City of Columbus Police Crime Laboratory for forensic testing.

   Motion by Mr. Feightner, second by Miss Resta to approve. All voted in favor.

   Chief Green discussed a contract between the city and Ann Kennedy, trustee, to lease the property at 42 South First Street. It will be used as an office by special projects community policing officers.

   Motion by Mrs. Barrett, second by Mr. Baldwin to forward to council. All voted in favor.

2. Joseph E. Sawyer, Utilities Superintendent, brought forth legislation authorizing the advertisement for bids for construction of a new sanitary sewer force main for Pembroke Court. The emergency clause is to be included in the resolution.

   Motion by Mr. Baldwin, second by Mr. Feightner to send to council. Motion carried unanimously.

   A presentation of the city's Combined Sewer Overflow Long Term Control Plan was made by representatives of Malcolm Pirnie, Inc.

   It was stated the NPDES permit does not specifically define what would be required. The goal of the Long Term Control Plan is to prevent impairment of water quality standards due to CSO discharges.

   The cost of the recommended plan is approximately $140,000 per year, but the city is already doing some of the items included in the recommended plan.

   Councilman Diebold asked how much of the work for the Combined Sewer Overflow Long Term Control Plan overlaps with the development of a Stormwater Utility.

   Mr. Bulcher replied the Best Management Practices recommended for the Long Term Control Plan could be combined with a Stormwater Utility. The city would have to decide which program they would fall under since it would be a duplication of effort to have them in both.

   Mr. Diebold questioned if the $140,000 would come from the Sewer Fund or the Stormwater Utility Fund.

   Mr. Sawyer stated the requirements of the Long Term Control Plan and CSO problems will have to come out of the Sewer Fund. The stormwater discharges will have to be separate and have separate charges. There is some overlap in the programs but to what degree it saves the Stormwater Utility money cannot be determined.

   Tim Matheny, Service Director, said the river sampling data collected so far can be used for both programs.

   Dr. Markowitz stated the existing river studies document the rivers have good quality water. This is good for both the Combined Sewer System as well as the Stormwater Utility because it indicates overall program management for both programs is pretty good. The continued monitoring of the rivers for the Combined Sewer Overflow Long Term Control Plan will to some extent be useful for the Stormwater Utility.

Mr. Diebold explained it is hoped the money spent on the studies will be spent out of the Sewer Fund and not the General Fund.

Dr. Markowitz replied you must recognize the CSO program is only concerned with stormwater from the CSO area while the Stormwater Utility will have to deal with stormwater from the separate areas and the entire city as well. The Stormwater Utility will likely be able to deal with its issues using the same sort of Best Management Practices used in the Long Term Control Plan.

3. There was discussion of creating an ad hoc committee to study property maintenance. It was merely a discussion and no action was taken.

Respectfully submitted,

David S. Forgrave
Chair

cc: Mayor
Auditor
Service Director
Safety Director
Law Director
Engineer
Utilities Superintendent
Parks Superintendent
Council members
Health Department

CITY OF NEWARK, OHIO
WATER POLLUTION CONTROL DEPARTMENT

COMBINED SEWER OVERFLOW PROGRAM
LONG TERM CONTROL PLAN-PUBLIC PARTICIPATION PRESENTATION

AUGUST 10, 1998

ATTENDANCE SIGN-IN SHEET

	NAME	ASSOCIATION/PHONE
1.	Joe Sanger	City W+S Dept. (740) 349-6737
2.	Eva Belick	City WWTP Lab (740) 349-6774
3.	Rick Baker	City Council (740) 366-7918
4.	Frank Stare	Mayor 740-349-6600
5.	Dennis R. Wisey	City of Newark WWTP, Asst Supt
6.	Tim Matthews	CITY OF NEWARK 349-6626
7.	Bob Diebold	City Council (740) 349-7106
8.	Roger Loomis	City W+B Dept (740) 349 6735
9.	Jan Rice	Ohio EPA/CDC (614) 728-3850
10.	John R. Marks	Muskingum Area Technical College (740) 454-2501 ext 249
11.	[illegible]	City Council (740) 345-8353
12.	Bren Miller	Advocate
13.	Tom Rollins	City of Newark
14.	Craig Baldwin	City Council (740) 345-9801
15.	Brad Feightner	City Council 349-6177
16.	Hart Fagin	City Council 740-345-0149
17.	Lori Resta	City Council 740 344-2546
18.	Julie L. Barrett	City Council 740-344-4862

CITY OF NEWARK, OHIO
WATER POLLUTION CONTROL DEPARTMENT

COMBINED SEWER OVERFLOW PROGRAM
LONG TERM CONTROL PLAN-PUBLIC PARTICIPATION PRESENTATION

AUGUST 10, 1998

ATTENDANCE SIGN-IN SHEET

	NAME	ASSOCIATION/PHONE
19.		Malcolm Pirnie Inc.
20.	Tom Butcher	Malcolm Pirnie Inc.
21.	Jim Hays	Malcolm Pirnie Inc.
22.	Dr. Dan Markowitz	" " "
23.		
24.		
25.		
26.		
27.		
28.		
29.		
30.		
31.		
32.		
33.		
34.		
35.		
36.		

1

Long Term Control Plan

City of Newark
August 10, 1998

2

3

4 Project Background

- 1995 Licking River Water Quality Study
- City of Newark NPDES Permit
- Combined Sewer System Long Term Control Plan

5 Long Term Control Plan Goal

- "The goal of the plan is that discharges from Combined Sewer Overflows shall not cause or significantly contribute to violations of water quality standards or impairment of designated uses."

  - City of Newark NPDES Permit

6 Long Term Control Plan

- Focus on North Fork Licking River
- Evaluate Existing Water Quality
- Develop Alternatives
- Make Recommendations

7 Water Quality Assessment

- Fish and Macroinvertebrate Sampling (All Rivers)
- Bacteriological Monitoring (All Rivers)
- Sediment Sampling and Analysis
- CSO, Storm Sewer and River Water Quality Analysis

8 North Fork Sampling Locations

9 Water Quality Assessment

- No water quality impacts due to Combined Sewer Overflows
- Partial attainment in the North Fork at RM 0.2 due to habitat modifications
- Combined Sewer Overflows are not a pervasive threat to primary contact recreation
- Combined Sewer Overflows and storm sewer discharges have similar pollutant concentrations
- Combined Sewer Overflows do not appear to be toxic to aquatic life

10 Long Term Control Plan Alternatives

- Continued Monitoring Activities

- Best Management Practices (BMPs)

- Collection System Controls

11 Continued Monitoring Activities

Continued Monitoring Activities enable the
City of Newark to:

- Increase knowledge of the operation of the Combined Sewer System

- Document maintenance of water quality
- Identify Future Problems

12 Continued Monitoring Activities

- Flow monitoring of the collection system. (All CSOs every 2 years, CSO 8 periodically)
- Aquatic sampling at five year intervals.
- Monitor floatables
- Sample bacteria downstream of the Combined Sewer Overflow area.

13 Best Management Practices (BMPs)

Reduce pollutants in Combined Sewer Overflows:

- Educational Programs
- Brochures/Pamphlets
- Storm Drain Stenciling

14 Collection System Controls

- Reduce the quantity of Combined Sewer Overflow that currently discharges to the river by providing flow storage or treatment

15 Collection System Controls -Alternatives

Reduced CSD Discharge

- In-System Storage
- Off-Line Basins

Total CSO Discharge Elimination

- Off-Line Basins
- Sewer Separation

16 Evaluation Criteria

- Cost
- Performance
- Public Input

17 Long Term Control Plan Alternatives Summary

- Continued Monitoring .... $14,000 - $86,000 / Year
- BMPs .... $11,000 - $26,000 / Year
- Collection System .... $2,000,000 - $20,000,000 Total

18 Long Term Control Plan - Recommendations

- Best Management Practices (BMPs)
- Continue flow monitoring of the collection system (All CSOs every 2 years, CSO 8 periodically)
- Aquatic sampling at five year intervals
- Monitor floatables
- Sample bacteria downstream of Newark

Newark CSO
Long Term Control Plan Public Meeting #2
August 10, 1998

Summary of the City of Newark Combined Sewer Overflow Long Term Control Plan Presentation to the City of Newark Ohio, Service Committee by Malcolm Pirnie Inc. on August 10, 1998 at Council Chamber, City of Newark City Hall.

Summary prepared by Mike Wilson and Jim Hays of Malcolm Pirnie Inc.

The City of Newark Service Committee chairman recognized Joe Sawyer, the City of Newark Utilities Superintendent.

Joe Sawyer stated that this item on the Service Committee agenda was a presentation of the Long Term Control Plan for the City of Newark Combined Sewer System. Joe Sawyer introduced Tom Bulcher of Malcolm Pirnie.

Tom Bulcher introduced Mike Wilson, Dr. Dan Markowitz and Jim Hays from Malcolm Pirnie. Mr. Bulcher explained that this was the second public meeting regarding the status of the City of Newark's Combined Sewer System Long Term Control Plan. The first meeting was held on May 11, 1998. This second meeting would summarize what had taken place since the previous meeting, alternatives reviewed as part of the Long Term Control Plan and the recommendations of the Long Term Control Plan.

For the text of Mr. Bulcher's presentation, see the attached slides which were used during the presentation. After the presentation, Mr. Bulcher asked if there were any questions or comments. The questions, answers and comments offered during this session are summarized below:

(Q-Question, A-Answer, C-Comment)

Q-1 (Audience- Council Member Bob Drebold): Are the recommendations you made based on what is required as a minimum by the NPDES permit or is this just your opinion?

A-1 (Malcolm Pirnie-Tom Bulcher): The NPDES permit does not specifically define what would be required thus the minimum requirement would be to do nothing. The goal of the Long Term Control Plan is to prevent impairment of water quality standards due to CSO discharges. Some of the Best Management Practices recommended are already in place so it makes sense to continue those efforts, such as education programs that teach people not to discharge harmful material to the sewer system. Continued monitoring for example, verifies that water quality is still being maintained and can identify new problems which may have occurred due to some change in the system such as a new industry. Also, continued monitoring of water quality protects the City. We know now that a certain level of CSO discharge does not hurt the streams, thus if something changes, it could be the result of some up or downstream influences in the watershed such as agricultural feed lots or fertilizer.

Q-2 (Audience- Council Member Bob Drebold): Is the cost of the recommended plan is between $0 and $140,000 per year?

A-2 (Malcolm Pirnie-Tom Bulcher): The cost of the recommended plan is approximately $140,000 per year, but the City is already doing some of the items included in the recommended plan. The Collection System Controls estimated between $2,000,000 and $20,000,000 are not in the recommended plan.

Q-3 (Audience- Council Member Bob Drebold): The City has investigated developing a stormwater utility. How much of the work for the Combined Sewer Overflow Long Term Control Plan overlaps with the development of a Stormwater Utility?

A-3 (Malcolm Pirnie-Tom Bulcher): The Best Management Practices recommended for the Long Term Control Plan could be combined with a Stormwater Utility. The City would have to decide which program they would fall under since it would be a duplication of effort to have them in both.

Q-4 (Audience- Council Member Bob Drebold): Will the $140,000 come from the Sewer Fund? How much money will the Stormwater Utility save from the money spent by the Sewer Fund? It sounds as if we are going to spend money on both programs to a certain extent.

A-4 (City of Newark-Joe Sawyer): The requirements of the Long Term Control Plan and CSO problems will have to come out of the Sewer Fund. The Stormwater discharges will have to be separate and have separate charges. There is some overlap in the programs but to what degree it saves the Stormwater Utility money cannot be determined.

Q-5 (Audience-Council Member Bob Drebold): Will the studies coming out of the CSO study save costs in the Stormwater Utility program?

A-5 (City of Newark-Joe Sawyer): It is likely that the EPA will require some very specific information for the Stormwater permit and the information collected for the Long Term Control Plan may not satisfy their needs since they are completely separate permits.

C-1 (Audience-Tim Matheny): The river sampling data collected so far can be used for both programs.

C-2 (Malcolm Pirnie-Dan Markowitz): Yes, and the existing river studies document that the rivers have good quality water. This is good for both the Combined Sewer System as well as the Stormwater Utility because it indicates overall program management for both programs is pretty good. The continued monitoring of the rivers for the Combined Sewer Overflow Long Term Control Plan will to some extent be useful for the Stormwater Utility.

C-3 (Audience-Bob Drebold): It is hoped that the money spent on the studies will be spent out of the Sewer Fund and not the General Fund.

C-4 (Malcolm Pirnie-Dan Markowitz): Recognize that CSO program is only concerned with stormwater from the CSO area while the Stormwater Utility will have to deal with stormwater from the separate areas and the entire City as well. The good news is that the Stormwater Utility will likely be able to deal with its issues using the same sort of Best Management Practices used in the Long Term Control Plan.

C-5 (Audience-Tim Matheny): The filing fee alone for the Stormwater Permit will be very expensive thus some significant costs cannot be avoided.

\+ + END OF MEETING MINUTES + +

The above meeting minutes represents the writers summary of the questions and answers from the referenced meeting. This is only a summary and is not intended as verbatim description of the meeting. Please contact the writers with revisions or questions.

APPENDIX K

MALCOLM PIRNIE

MALCOLM PIRNIE, INC.
ENVIRONMENTAL ENGINEERS, SCIENTISTS & PLANNERS

February 11, 1997

Joseph E. Sawyer
Utilities Superintendent
City of Newark, Ohio
40 West Main Street
Newark, Ohio 43055

Re: Water and Wastewater Department
Wastewater Collection System Evaluation
Project Meeting Minutes

Dear Mr. Sawyer:

Enclosed are meeting minutes for the Ohio EPA coordination meeting that was held at the Ohio EPA'S Central District office on January 16, 1997. If you have any questions regarding the enclosed information, please let us know.

Very truly yours,

MALCOLM PIRNIE, INC.

Thomas J. Bulcher

Thomas J. Bulcher, P.E.
Associate

LNMM.L1/jeh

Enclosure

c: Roger Loomis, WWTP Superintendent
Kenneth E. Beichler, Water Dist. & Sewer Maint. Dept. Superintendent
Jim Shaw, Water Dist. & Sewer Maint. Dept. Ass't. Superintendent
Jack Dixon, Water Dist. & Sewer Maint. Dept.
Don Hiltner P.E., Ass't. City Engineer
Gary Stuhlfauth, Ohio EPA Central Office
Jan Rice, Ohio EPA Central District Office
Dr. John Marks, Muskingum Technical College

0821-194

CITY OF NEWARK
WATER POLLUTION CONTROL DEPARTMENT
WASTEWATER COLLECTION SYSTEM EVALUATION

OHIO EPA COORDINATION MEETING MINUTES
JANUARY 16, 1997

A coordination meeting between the City of Newark and the Ohio EPA regarding Newark's Wastewater Collection System Evaluation was held on January 16, 1997 at the Ohio EPA's Central District Office. A copy of the meeting agenda and meeting attendance list is attached.

Subject: Status of Newark CSO Submittals and Review of Proposed Spring/ Summer of 1997 Fish and Macroinvertebrate Study of the Licking River

1. Introductions

2. Status of Newark CSO Submittals:

The City of Newark requested the status of several CSO-related submittals they have made. No comments have been received yet on any submittals.

Operational Plan
The Ohio EPA stated that they had only one comment. They suggested the proposed notification sign for combined sewer overflows contain a reference to avoid contact with the overflow and the receiving water, not just the overflow. The Ohio EPA added that the existing sign language is reasonable and the final decision was up to Newark.

Newark responded that changing the language was possible, but they would review it and make a decision later.

Fecal Coliform Characterization
Newark asked if the fecal results were satisfactory, especially the wet-weather related results.

The Ohio EPA apologized for not responding sooner and stated they would respond to all submittals within the next few weeks.

3. Licking River CSO Sampling:

Fish Survey
Malcolm Pirnie asked how many fish surveys at each location would be necessary. They noted that only one had been done during the Ohio EPA's most recent Licking River work.

The Ohio EPA staff present at the meeting included some that had participated in the most recent EPA study of the Licking River. They indicated that a minimum of two fish surveys would be preferable for a river such as the Licking. The reason only one was performed during the past survey was likely due to high flow in the stream.

Log Pond Run & Cedar Run

There was much discussion regarding Log Pond Run and Cedar Run and whether they should be sampled during this study.

The City of Newark stated that at times Log Pond Run does carry high flows, however it can be dry in the summer. There is an upstream diversion channel on Log Pond Run that is intended to divert flow to the Raccoon Creek during periods of high flows. Log Pond Run flows through primarily residential areas.

Newark noted that Cedar Run does not dry up in the summer and runs through primarily agricultural areas.

It was concluded that previous sampling for fecal coliforms and chemical water quality was sufficient to determine impact of these tributaries on the North Fork and they did not require separate fish and macroinvertebrate studies.

The Ohio EPA questioned if the coliform samples were "strep" or "fecal". Newark stated that they had sampled for "fecals" since that was what the NPDES permit required.

Scope

The Ohio EPA asked why the scope of the study included the South Fork and Raccoon Creek when the NPDES permit focussed the effort on the North Fork.

Malcolm Pirnie stated that the original study was already five years old. The requirements of the Long Term Control Plan require a thorough knowledge of CSO impacts. Also, since a study of the North Fork Licking River was required, the cost to study the additional areas was incrementally small.

The City of Newark added that they wish to be proactive regarding CSOs and go further than just immediate compliance.

Fish and Macroinvertebrate Plan

Malcolm Pirnie reviewed each site to be sampled and solicited questions or comments.

The Ohio EPA questioned why a sampling site was not selected immediately upstream of the confluence of Raccoon Creek on the South Fork. Malcolm

Pirnie responded that site had been originally selected, however it was moved further upstream due to the close proximity of the City of Heath WWTP discharge. Should impacts be detected, sampling can be added at this site if necessary.

Datasondes

The Ohio EPA asked if continuous data recording of pH, conductance, dissolved oxygen using "datasondes" had been considered. The EPA stated these devices are standard in EPA surveys. The minimum time for the installation of these devices is considered between 5 days to 2 weeks. Use of these devices is superior to random grab sampling since grab samples can miss a short-duration dissolved oxygen sag.

Malcolm Pirnie stated that they had not included this level of sampling in the study since previous studies had not indicated a problem. Malcolm Pirnie added that they would consider adding these devices since some may become available due to work on unrelated studies. The City of Newark also added that some of this data can be taken by automatic samplers they own. It was concluded that Malcolm Pirnie would look at each site to determine if continuous monitoring would be warranted.

Site Visits

Malcolm Pirnie asked if the Ohio EPA thought a field visit to the sample sites was necessary. The Ohio EPA stated that they were very familiar with the Licking River in this area and a site visit was not necessary.

4. Sewer System CSO Characterization Report

Malcolm Pirnie asked if their was any guidance available from the Ohio EPA regarding what they wanted in a System Characterization Report.

The Ohio EPA stated that no specific guidance exists other than what is already published, however they offered the following examples:

- Other reports have estimated number of annual occurrences, annual volumes, maximum discharge volumes, minimum discharge volumes, size of storm event that causes overflows, etc.
- In Toledo and Akron, at each CSO site the dry weather flow to wet weather flow ratio was calculated and the ability of the system to handle wet weather flows was addressed.
- A discussion of sewer surcharging, including how often and how quickly they surcharge.
- Summary tables of rainfall data
- A discussion of separate system flows and whether they pass through combined areas.

Newark stated that their separate systems do not typically flow through the combined areas.

Stream Modeling
Malcolm Pirnie informed the Ohio EPA that modeling of the streams itself was not necessary and was not part of this CSO plan. The Ohio EPA agreed this was not necessary.

5. Long Term Control Plan

Malcolm Pirnie asked if there was any additional guidance regarding the Long Term Control Plan.

The Ohio EPA stated that three plans had been submitted: NEORSD, Cincinnati MSD and Sandusky. These plans were due first because of the timing of their permit renewals. The Ohio EPA stated that Cincinnati MSD submitted a good plan. Malcolm Pirnie asked for a copy of the Ohio EPA review comments when available.

The Ohio EPA encouraged future meetings to this type and requested to be kept up to date on progress of this project as well as any other developments.

+ + End of Meeting Minutes + +

CITY OF NEWARK, OHIO
WATER POLLUTION CONTROL DEPARTMENT

OHIO EPA MEETING AGENDA

January 16, 1997

1. **Introductions**

2. **CSO Submittal Status**

    - Operational Plan
    - Fecal Sampling Results
    - Wet Weather Stress Testing
    - CSO Monitoring Plan (North Fork Licking River)

3. **Licking River Stream Survey**

    - Sampling Firm: EnviroScience, Cuyahoga Falls, OH
      Subcontract with Malcolm Pirnie
    - Number of Fish Surveys
    - Proposed Sites (see Attachment 1)
    - Crews and Tentative Dates (see Attachment 1)

4. **Sewer System and CSO Characterization Report (Due October 1, 1997)**

    - Current Work (North and South Licking River Sampling Plan)
    - Suggested guidelines

5. **Long Term Control Plan (Due October 1, 1998)**

\+ + END OF AGENDA + +

ATTACHMENT 1

CITY OF NEWARK, OHIO
WATER POLLUTION CONTROL DEPARTMENT
OHIO EPA MEETING JANUARY 16, 1997

STREAM SAMPLING SUMMARY

Fish Sample Crews

(2) EnviroScience Employees, including crew leader
(2) Muskingum Tech personnel, including Dr. Marks and one intern
(1) City of Newark employee for observation and assistance as necessary
(1) Malcolm Pirnie employee, Dr. Dan Markowitz for quality control/quality assurance and assistance when necessary

Fish Survey Dates

1st Survey Week of June 9th, including the setting of Hester-Dendys
2nd Survey Week of July 21st, including the removal of Hester-Dendys (Six weeks after installation)

Sampling Locations

See Attachment 2 (Figure 2-2) for Map of Sites
See Attachment 3 (Table 3) for Summary of Ohio EPA 1993 Sampling Sites

North Fork Licking River:

① • Rivermile 0.2- Access North Fork at Fleek Avenue: Steep embankment, but possible to carry a small boat and equipment to access stream. A boat is required to sample this site.

② • Rivermile 2.5- Access North Fork at Manning Street ramp, easy access for boat. Wading upstream to sample site should be possible, but boat would likely be better for sampling. EPA surveyed immediately below low head dam just south of Cedar Run Road.

Raccoon Creek:

③ • Rivermile 0.3- Raccoon Drive- Access stream at Calburn St. Will require key to unlock gate behind Tectum factory site. Newark has key.

④ • Rivermile 5.6- Cherry Valley Rd.- Access @ S. 40th St behind WHTH radio towers. Requires permission of owner, Charlie Franks. Work upstream to site. Will require boat since stream is fast and deep in this area.

South Fork:

⑤ • Rivermile 4.5 (Hobak Park-Heath Ohio): This survey site was picked to establish upstream unimpacted conditions. Due to the close proximity of the Heath WWTP discharge to Newark, we selected an upstream site in Heath (Hobak Park). The site should provide easy access since the EPA has used it in the past for fish-shocking demonstrations.

⑥ • Rivermile 0.4-This site can be accessed off Nathaniel St, downtown Newark. The Gas Company has a booster station located off Nathaniel that has an access road to the river.

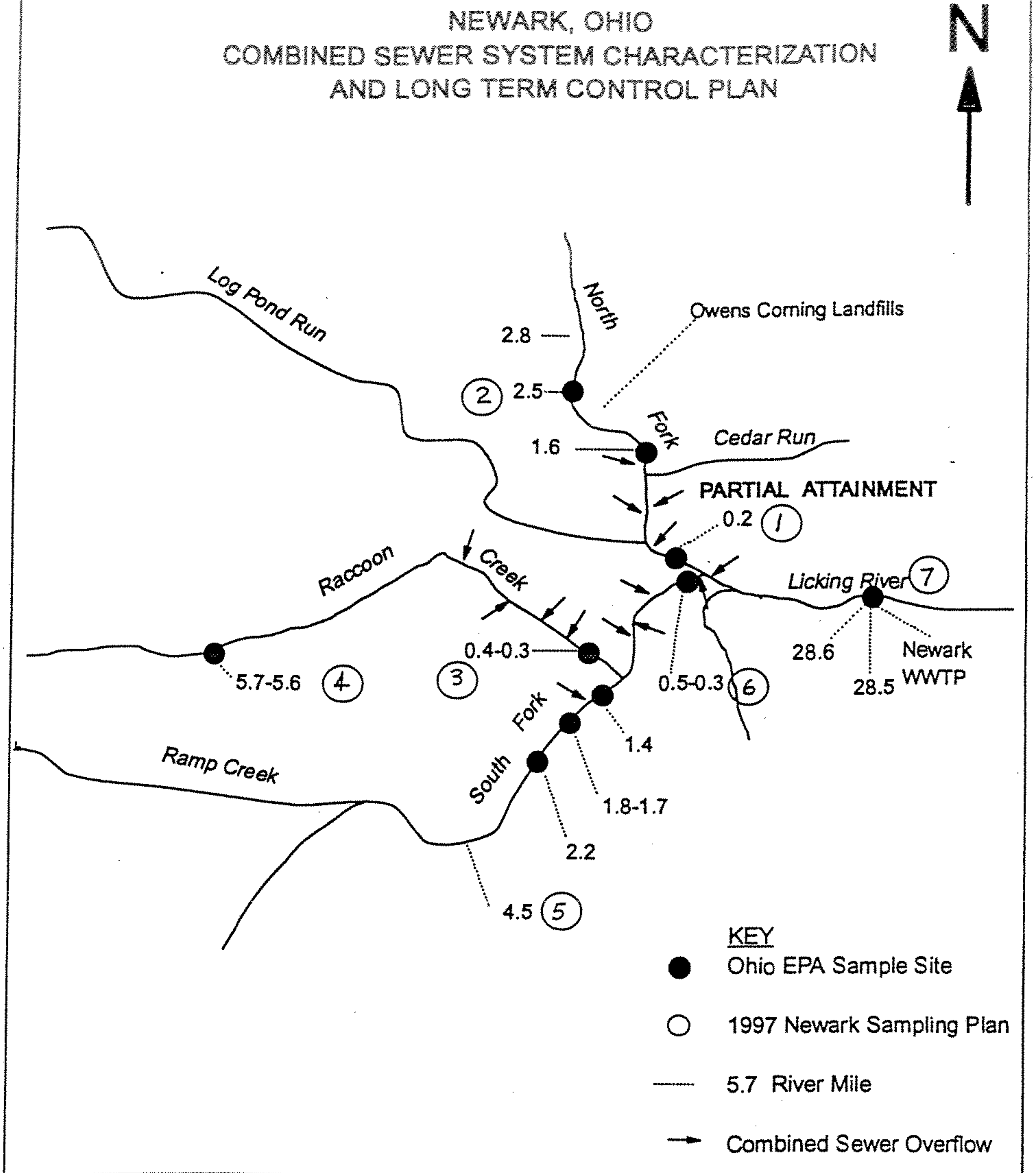
Licking River-Mainstem:

⑦ • Rivermile 28.6-This site was added since there did not appear to be any way to sample the South Fork Licking River for the impacts of its CSOs and include the impacts of CSO #8 which discharges at the confluence of the North and South Forks. CSO #8 is thought to discharge a significant volume and apparently contains industrial flow.

\+ + END OF ATTACHMENT + +

ATTACHMENT 2

NEWARK, OHIO
COMBINED SEWER SYSTEM CHARACTERIZATION
AND LONG TERM CONTROL PLAN



MALCOLM PIRNIE	CSO STUDY AREA LOCATION MAP	FIGURE 2-2

ATTACHMENT NO.

Table 3. Sampling locations (water chemistry-C, sediment metal-SM, sediment organic-SO, macroinvertebrate sample-M, fish community-F, continuous monitors-D, effluent-E) within the 1993 Licking River study area.

River/Stream River Mile	Sample Type	Latitude/Longitude	Landmark	USGS 7.5' Quad.
Licking River				
28.6	(F,B,C,SM,SO, D)	40°03'08"/82°22'52"	Ust. Newark WWTP	Hanover
28.5	(F,B,C)	40°03'09"/82°21'42"	Newark WWTP (Mix Zone)	Hanover
26.8	(B,D)	40°03'33"/82°20'16"	Stadden Rd.	Hanover
26.7	(C,SM)	40°03'33"/82°20'23"	Stadden Rd.	Hanover
26.6	(F)	40°03'39"/82°20'08"	Stadden Rd.	Hanover
18.9	(B,D)	40°03'27"/82°13'12"	Toboso Rd.	Toboso
18.7	(F,C)	40°03'30"/82°13'11"	Toboso Rd.	Toboso
14.8	(B)	40°03'44"/82°10'34"	Dst. Hanby trib.	Toboso
13.3	(F)	40°03'30"/82°09'20"	Adj. Hill Rd.	Toboso
13.0	(C)	40°02'52"/82°09'20"	Adj. Hill Rd.	Toboso
5.7	(B)	39°59'22"/82°04'30"	Dst. Dillon Reservoir	Zanesville West
5.5	(F,C,D)	40°59'20"/82°04'14"	Dst. Dillon Reservoir	Zanesville West
3.7	(C)	39°58'14"/82°05'24"	Dillon Falls Rd.	Zanesville West
3.6	(B)	39°58'14"/82°03'24"	Dillon Falls Rd.	Zanesville West
3.4	(F)	40°58'08"/82°03'22"	Dillon Falls Rd.	Zanesville West
Big Run				
5.1	(B)	40°03'40"/82°04'42"	Prior Rd.	Dresden
5.0	(F)	40°03'35"/82°04'47"	Prior Rd.	Dresden
North Fork Licking River				
23.9	(C)	40°15'14"/82°30'29"	TR 70	Homer
17.1	(C)	40°13'38"/82°26'45"	Dst. Utica WWTP	Utica
11.1	(C)	40°10'44"/82°25'14"	SR 13	Utica
2.8	(B,C,SM,SO)	40°05'13"/82°24'38"	Ust. OC/Newark Landfills	Newark
2.5	(F)	40°05'00"/82°24'23"	Ust. OC/Newark Landfills	Newark
1.6	(C,SM,SO)	40°04'22"/82°24'06"	Manning St.	Newark
0.2	(F,B,C,SO)	40°15'58"/82°29'57"	Adj. Fleek Ave.	Newark
Vance Creek				
0.7	(F,B)	40°15'58"/82°29'57"	Beger Rd.	Hunt
Sycamore Creek				
0.1	(F,B)	40°15'46"/82°27'27"	near mouth	Hunt

Table 3. continued.

River/Stream River Mile	Sample Type	Latitude/Longitude	Landmark	USGS 7.5' Quad
South Fork Licking River				
31.6	(B)	40°01'28"/82°41'20"	Cable Rd.	Jersey
31.5	(F,C,SM,SO)	40°01'26"/82°41'19"	Cable Rd.	Jersey
28.4	(B)	39°59'21"/82°40'17"	Ust. Pataskala WWTP.	Pataskala
28.3	(F)	39°59'20"/82°40'15"	Ust. Pataskala WWTP	Pataskala
27.6	(F,B,C)	39°39'40"/82°39'40"	Dst. Pataskala WWTP	Pataskala
24.6	(F,C)	39°58'04"/82°37'34"	York Rd.	Pataskala
24.1	(B)	39°58'08"/82°37'19"	York Rd.	Pataskala
21.3	(F)	39°57'45"/82°34'53"	Gale Rd.	Millersport
21.2	(C)	39°57'45"/82°34'48"	Gale Rd.	Millersport
21.1	(B)	39°57'45"/82°34'43"	Gale Rd.	Millersport
15.7	(C)	39°55'38"/82°31'19"	SR 79	Millersport
15.4	(B)	39°55'33"/82°30'44"	SR 79	Millersport
15.3	(F)	39°55'34"/82°30'35"	SR 79	Millersport
14.2	(E)	39°56'11"/82°29'40"	Buckeye Lake WWTP Effluent	Millersport
13.1	(F)	39°56'54"/82°28'48"	SR 79	Thornville
13.0	(B)	39°56'52"/82°28'55"	SR 79	Thornville
12.9	(C,SM,SO)	39°56'24"/82°28'51"	SR 79	Thornville
11.6	(C)	39°57'40"/82°28'09"	US 40	Thornville
9.9	(B)	39°59'18"/82°28'31"	Ust. Beaver Run (Hebron)	Thornville
9.4	(F)	39°59'11"/82°08'25"	Ust. Beaver Run (Hebron)	Thornville
8.9	(B)	39°58'46"/82°28'46"	Dst. Beaver Run (Hebron)	Thornville
8.8.	(F)	39°59'24"/82°28'27"	Dst. Beaver Run (Hebron)	Thornville
5.7	(SM,SO)	40°04'01"/82°26'59"	Ust. Ramp Creek	Newark
5.6	(C)	40°00'58"/82°26'58"	Ust. Ramp Creek	Newark
4.7	(C,SM,SO)	40°00'57"/82°26'20"	Irving Wick Rd.	Newark
2.2	(F,B,C)	40°02'05"/82°24'45"	Heath WWTP (Mix Zone)	Newark
1.8	(C)	40°02'15"/82°24'43"	Dst. Heath WWTP	Newark
1.7	(F,B)	40°02'23"/82°24'51"	Dst. Heath WWTP	Newark
1.4	(C)	40°02'34"/82°24'43"	Orchard St.	Newark
0.5	(F)	40°03'01"/82°23'25"	Second St.	Newark
0.4	(B)	40°03'03"/82°23'47"	Second St.	Newark
0.3	(C)	40°02'33"/82°23'49"	Second St.	Newark
Ramp Creek				
2.0	(F,B,SM,SO)	40°01'35"/82°28'51"	Thornwood Rd.	Newark
1.9	(C)	40°01'34"/82°28'49"	Thornwood Rd.	Newark
1.4	(F,B,C)	40°01'23"/82°28'20"	Dst. Kopper Co.	Newark
1.3	(SM,SO)	40°01'18"/82°28'11"	Dst. Kopper Co.	Newark
0.8	(C,SM,SO)	40°01'11"/82°27'37"	Dst. Kaiser Aluminum	Newark
0.7	(F,B)	40°01'10"/82°27'36"	Dst. Kaiser Aluminum	Newark

CSO Meeting OEPA & NEWARK

Name	Affiliation/phone no.	
Jan Rice	OEPA/CDO	728-3890
PAUL PAINTER	OEPA/CDO	728-3851
John Maakes	Muskingum Area Tech. Coll.	454-2501 ext 24
GARY STUHLFAUTH	OEPA-CO	614-644-2026
JEFF BOHNE	OEPA - CDO	728-3841
Joe [illegible]	Newark	(614) 349-6797
DON HELTNER	NEWARK	349-6646
Roger Loomis	Newark	349-6769
Tom Butcher	Malcolm Pirnie	614-888-4953
Dan M[illegible]	Malcolm Pirnie	330 867-0053
Jim Hays	" "	614-888-4953

Table 3. continued.

River/Stream River Mile	Sample Type	Latitude/Longitude	Landmark	USGS 7.5' Quad.
Ramp Creek				
0.3	(C)	40°01'08"/82°27'05"	SR 79	Newark
0.1	(F,B,SM,SO)	40°01'01"/82°26'53"	Liberty St.	Newark
Raccoon Creek				
11.7	(C)	40°04'08"/82°33'07"	SR 161	
5.7	(C,SM, SO)	40°02'52"/82°28'30"	Cherry Valley Rd.	Newark
5.6	(F)	40°02'57"/82°28'27"	Cherry Valley Rd.	Newark
0.4	(C,SM,SO)	40°03'02"/82°24'41"	Adj. Raccoon Drive	Newark
0.3	(F,SM)	40°03'02"/82°23'11"	Adj. Raccoon Drive	Newark
Lobdell Creek				
1.6	(F)	40°06'10"/82°35'53"	Upstream Landfill	Granville
0.2	(F)	40°05'13"/82°35'32"	Raccoon Valley Rd.	Granville

METHODS

All chemical, physical, and biological field, laboratory, data processing, and data analysis methodologies and procedures adhere to those specified in the Manual of Ohio EPA Surveillance Methods and Quality Assurance Practices (Ohio Environmental Protection Agency 1989a) and Biological Criteria for the Protection of Aquatic Life, Volumes I-III (Ohio Environmental Protection Agency 1987a, 1987b, 1989b, 1989c), and The Qualitative Habitat Evaluation Index (QHEI): Rationale, Methods, and Application (Rankin 1989) for aquatic habitat assessment. Chemical, physical and biological sampling locations are listed in Table 4.

Determining Use Attainment Status

The attainment status of aquatic life uses (*i.e.*, FULL, PARTIAL, and NON) is determined by using the biological criteria codified in the Ohio Water Quality Standards (WQS; Ohio Administrative Code [OAC] 3745-1-07, Table 7-17). The biological community performance measures which are used include the Index of Biotic Integrity (IBI) and Modified Index of Well-Being (MIwb), based on fish community characteristics, and the Invertebrate Community Index (ICI) which is based on macroinvertebrate community characteristics. The IBI and 1C1 are multimetric indices patterned after an original IB1 described by Karr (1981) and Fausch *et al.* (1984). The 1C1 was developed by Ohio EPA (1987b) and further described by DeShon (1994). The MIwb is a measure of fish community abundance and diversity using numbers and weight information and is a modification of the original Index of Well-Being originally applied to fish community information from the Wabash River (Gammon 1976; Gammon *et al.* 1981).

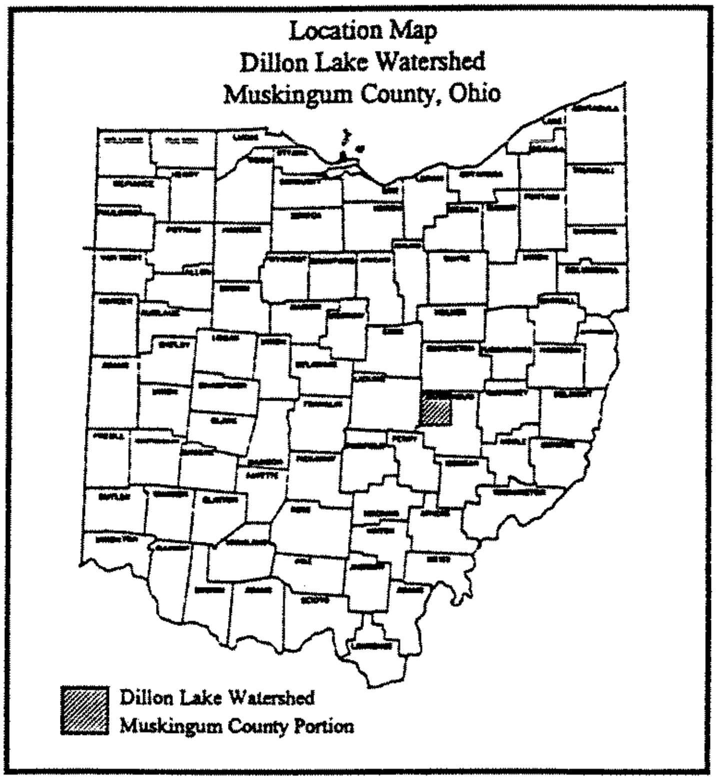
Performance expectations for the principal aquatic life uses in the Ohio WQS (Warmwater Habitat [WWH], Exceptional Warmwater Habitat [EWH], and Modified Warmwater Habitat [MWH]) were developed using the regional reference site approach (Hughes *et al.* 1986; Omernik 1988).

APPENDIX L

DILLON LAKE

MUSKINGUM COUNTY PORTION

WATERSHED PROTECTION PROJECT



Location Map
Dillon Lake Watershed
Muskingum County, Ohio

▨ Dillon Lake Watershed
Muskingum County Portion

MUSKINGUM COUNTY, OHIO

MAY 1994

PLATE 1

Location Map
Dillon Lake Watershed
Muskingum County, Ohio

▨ Dillon Lake Watershed
Muskingum County Portion

DILLON LAKE

WATERSHED PROTECTION PROJECT

MUSKINGUM COUNTY, OHIO

MAY 1994

THIS DOCUMENT HAS BEEN PREPARED BY:

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IN COOPERATION WITH:

Ohio Environmental Protection Agency

USDA, Soil Conservation Service

Ohio Department of Natural Resources

Division of Soil & Water Conservation
Division of Wildlife
Division of Parks & Recreation

Muskingum Conservancy District

Muskingum County Health Department

USDA Agricultural Stabilization and Conservation Service

U.S. Army Corps of Engineers

Ohio State University Extension

U.S. Forest Service

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EXECUTIVE SUMMARY
DILLON LAKE WATERSHED

The Dillon Lake Watershed encompasses a considerable area of approximately 480,000 acres in Muskingum, Licking, Knox, Delaware and Perry Counties.

The Muskingum County portion, encompassing 36,730 acres, is comprised of 28% woodland, 41% cropland, 25% pastureland, and 6% urban and other land.

The basis of the watershed plan development is to eliminate non-point source pollution problems associated with Dillon Lake and the surrounding tributaries. For ease of understanding and writing the watershed plan, it shall include only the portion of Dillon Watershed that lies within the boundaries of Muskingum County and all reference made and data presented pertain to the same geographical area.

The watershed is divided into several subwatersheds, of which concentrated efforts shall be focused on: The Big Run subwatershed - 14,504 acres; The Stump Run subwatershed - 4,631 acres; The Poverty Run subwatershed - 5,793 acres; and The Licking River watershed - 11,802 acres.

The major concerns associated with all the subwatersheds of the Dillon Lake watershed are as follows:

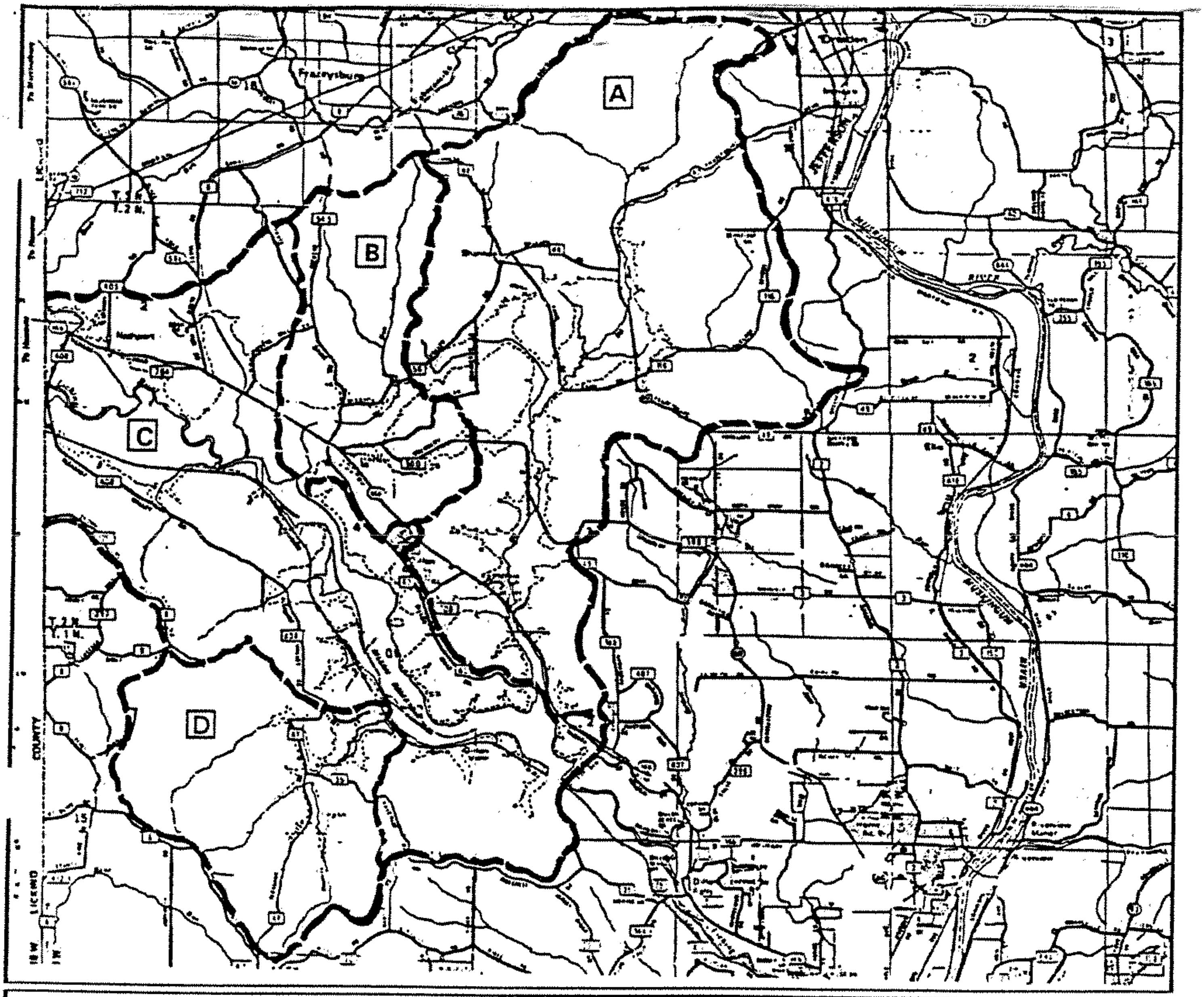
1. High sediment discharges from cropland, pastureland, grazed woodland, oil & gas lease roads, and to a lesser degree, unreclaimed county and township ditch banks, and urban development sites.

2. Severe streambank erosion due to fragile stream corridors and miles of overlain silt and gravel deposits. Accelerated run-off in the upper watershed (out of county) associated with extensive urban development which creates high velocities in the upper Licking River tributaries.

3. High nitrate loading due to fertilizer runoff, failed leach fields, animal waste runoff, and out of county contributions from municipalities (i.e. Newark sewage treatment plant).

4. Limited sources of high phosphorus discharge, animal waste runoff, fertilizer producers and silo discharges.

Overall, the main objective of the watershed management plan is to reduce sediment loading within the four subtributaries through land management practices on agricultural lands by utilizing conservation tillage and other BMP's associated with agriculture.



LEGEND

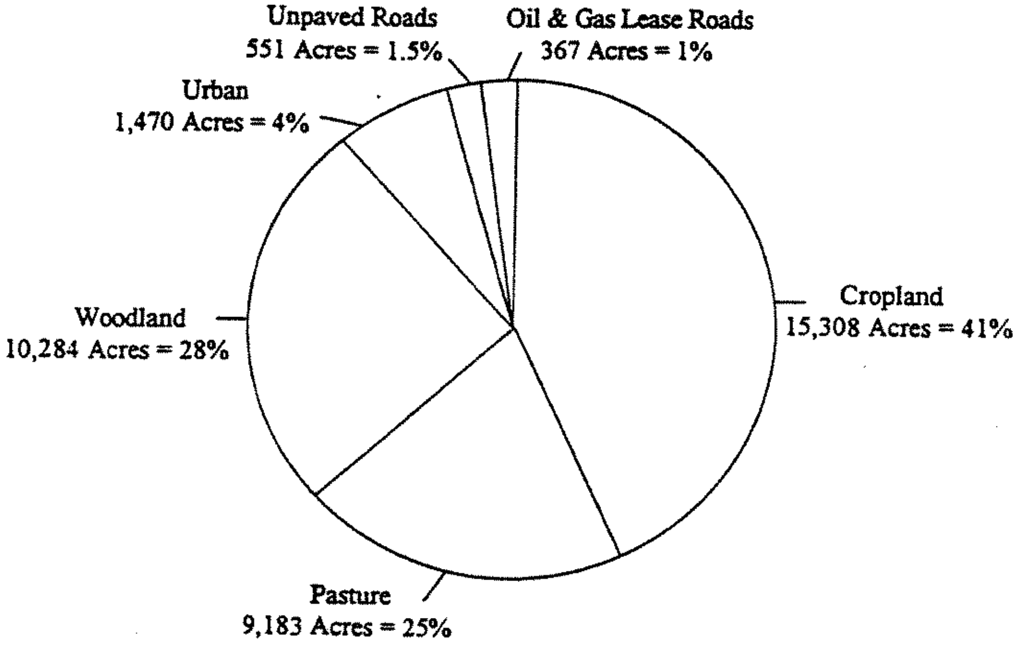
WATERSHED BOUNDRY	▬ ▬ ▬	BIG RUN SUBWATERSHED (14,504 Acres)	A
TOWNSHIP ROADS	408	STUMP RUN SUBWATERSHED (4,631 Acres)	B
STATE ROUTE	(60)	LICKING RIVER/MAIN LAKE SUBWATERSHED (11,802 Acres)	C
100 YEAR FLOOD ELEVATION	⋯	POVERTY RUN SUBWATERSHED (5,793 Acres)	D
TRIBUTARY STREAM	~		
COUNTY LINE	— · —		

FIGURE 1

DILLON LAKE WATERSHED

MUSKINGUM COUNTY PORTION

LAND USE



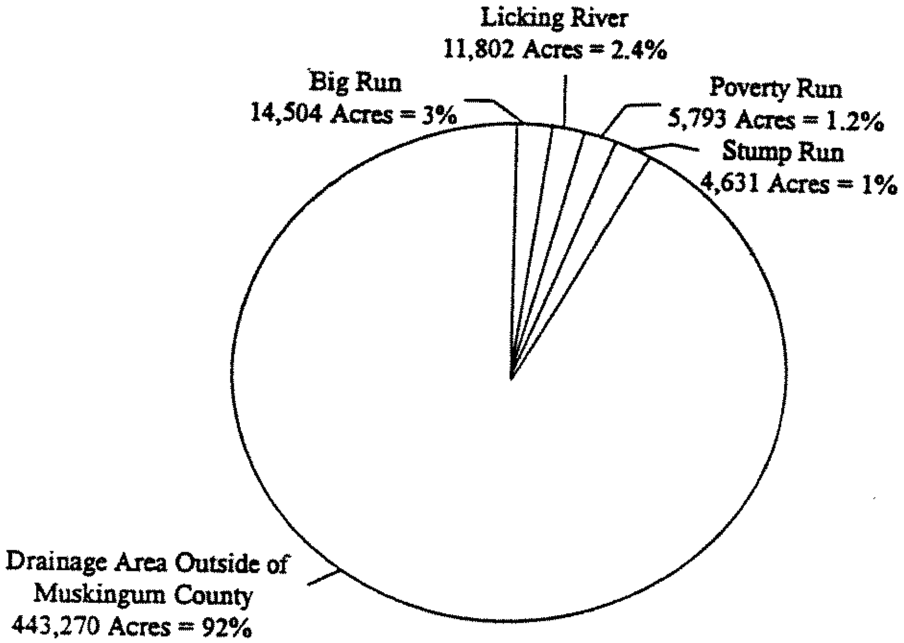
DILLON LAKE WATERSHED LAND USE & SLOPES

	Poverty Run	Stump Run	Big Run	Licking River
Total Acres	5793.0	4631.0	14504.0	11802.0
Acres Crops	2352.0	1938.0	7746.0	3272.0
Acres/Slope Range				
0-4%	381.0	439.0	2125.0	1970.0
5-9%	1030.0	1055.0	4231.0	2531.0
10-20%	2562.0	1724.0	7389.0	3199.0
21 + %	1987.0	1242.0	829.0	3927.0
Average Slope Length Per Slope Range				
0-4%	250'	225'	293'	290'
5-9%	157'	165'	167'	147'
10-20%	137'	178'	159'	135'
20 + %	100'	100'	100'	100'
Percent of Watershed Based on the Following Slopes				
0-4%	7%	9%	15%	17%
5-9%	18%	23%	29%	21%
10-20%	44%	37%	51%	27%
20 + %	34%	27%	6%	33%

FIGURE 2

DILLON LAKE WATERSHED

Drainage Area of Major Tributaries Within Muskingum County



Total Watershed Drainage Area	480,000 Acres
Total Drainage in Muskingum County	36,730 Acres
% of Watershed in Muskingum County	.075%

DILLON LAKE WATERSHED (MUSKINGUM COUNTY)
ENVIRONMENTAL SETTING

The Muskingum County portion of the Dillon Lake watershed consists of three major subtributaries; Big Run, Stump Run and Poverty Run. The headwaters of the lake consist of the Licking River with tributaries which extend some 40 miles into Licking County. Other smaller drainages extending into Knox, Perry and Delaware Counties, along with drainage from Buckeye Lake, all converge into Dillon Lake.

Total stream miles are estimated at 44 miles, with the subtributaries and main stem of Big Run totaling 21 miles; Stump Run and it's subtributaries equaling 6.5 miles; and Poverty Run totaling 7 miles. The Licking River and subtributaries is approximately 9 miles in length.

The above mentioned tributaries have OEPA priority class designations as follows: Big Run, unclassified with suspected NPS impact from agricultural crop production, urban, and oil and gas production; Poverty Run also unclassified with NPS concerns on agricultural crop production and livestock waste. Stump Run is designated as class 7 with point source and non-point source impact related to agricultural crop production, storm sewer discharges, sanitary sewer discharge and oil and gas production. The Licking River is designated as , and is impared by point source pollution caused from storm sewers, sanitary sewers, construction sites, and oil and gas production, non-point source problems are associated with agricultural crop production and livestock waste. All the above streams have aquatic life designated uses of warmwater habitats.

Land use within the watershed would consist of: 28% woodland, 41% cropland, 25% pastureland, 6% comprising of urban land and other land uses.

In the agricultural sector, approximately 5,855 acres of highly erodible cropland exists with 2,872 acres in the Big Run subwatershed, 542 acres in Stump Run, and 1,369 acres in Poverty Run. The Licking River drainage in the Muskingum County portion of the watershed is comprised of 1,074 acres of highily erodible cropland.

Total non-highly erodible cropland throughout the watershed is 9,453 acres. The Big Run subwatershed totals 4,874 acres. There are 1,396 acres within the Stump Run subwatershed, and 985 acres within the Poverty Run subwatershed. The Licking River subwatershed contains 2,198 acres of non-highly erodible cropland.

Livestock operations within the watershed are comprised of beef, dairy, swine, and sheep operations; with beef making up the majority of the livestock facilities. Totals include: 27 beef operations, 7 swine, 2 dairy, and 1 sheep. Three of the seven swine facilities have potential to cause pollution problems, due to runoff and the number of animal units on feed lots.

The number of residents in the watershed is estimated at 2,700. Most of the residences utilize on-site septic systems, with less than 10% of residents living in subdivisions that utilize package plant facilities. The potential for NPS from these septic systems is significant, with approximately 75 systems that have the potential for failure.

FIGURE 3

NUMBER OF FARMS BY SUBWATERSHED

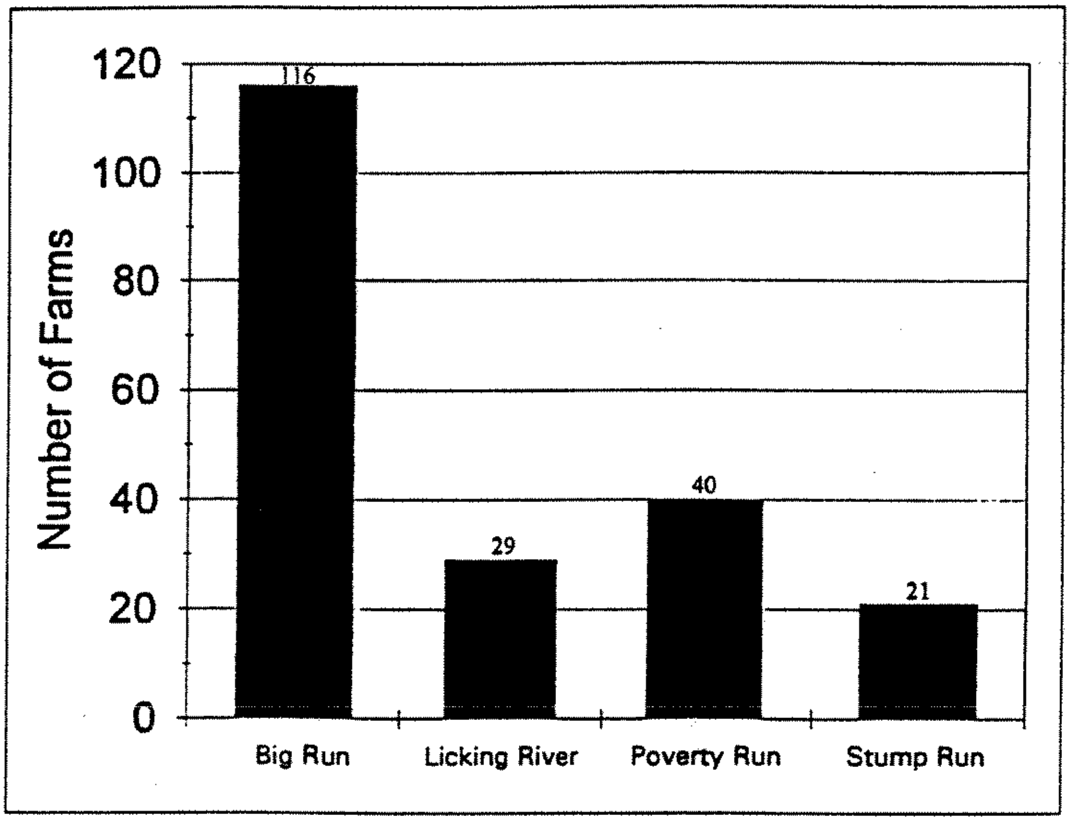
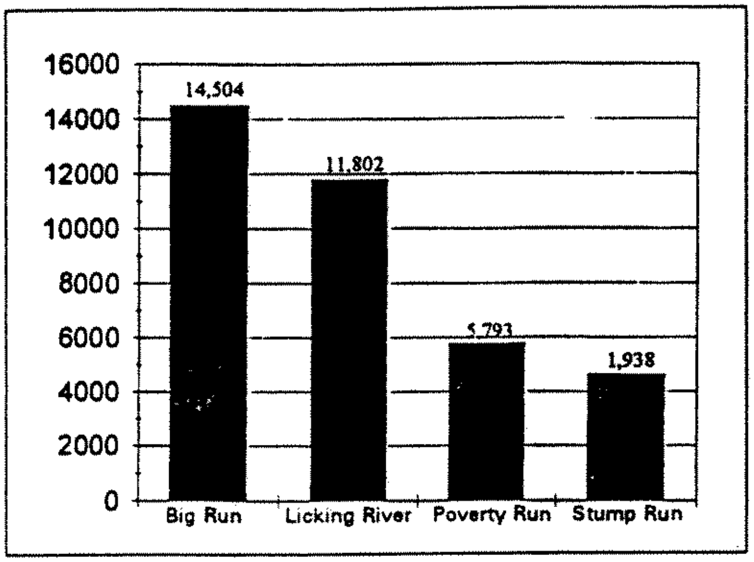


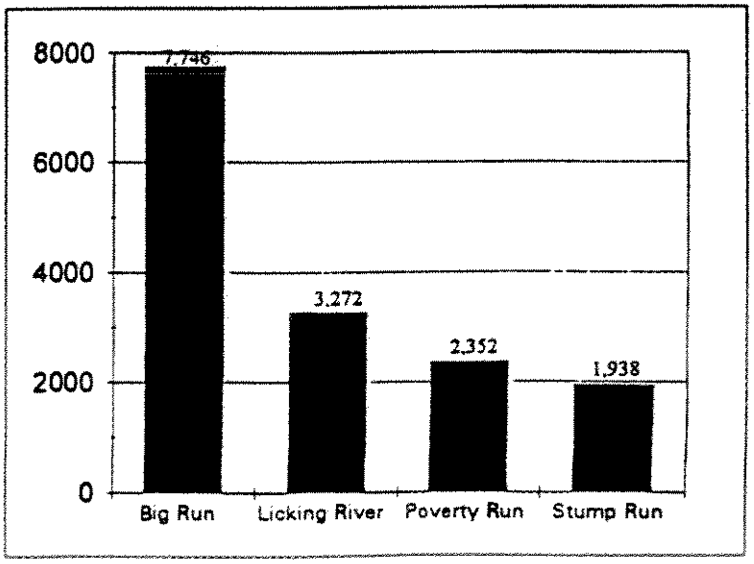
FIGURE 4

DILLON LAKE WATERSHED
MUSKINGUM COUNTY PORTION

Total Acres by Subwatershed

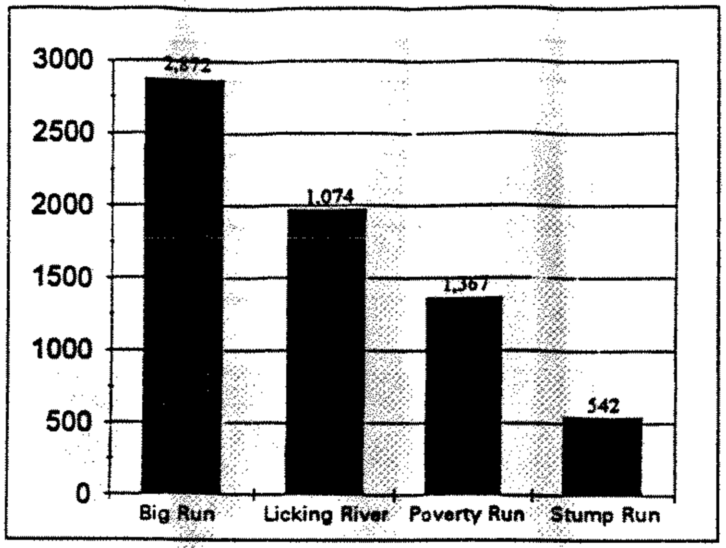


Cropland Acres by Subwatershed

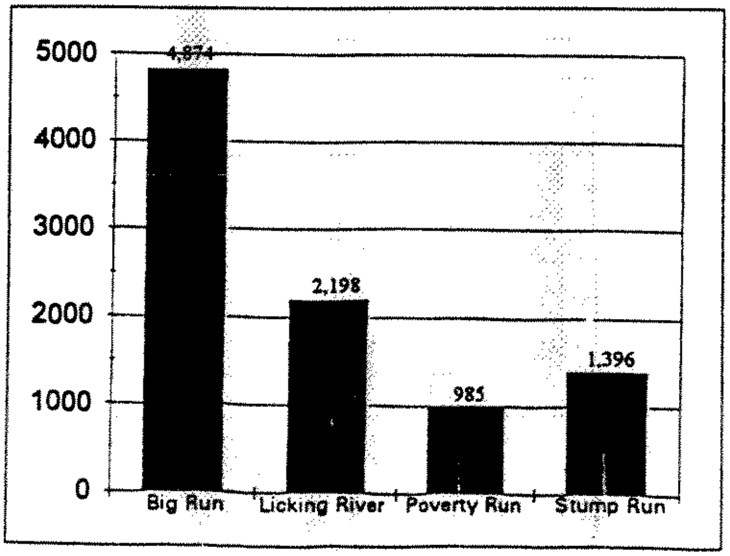


(Figure 4 Continued)

Hel Cropland

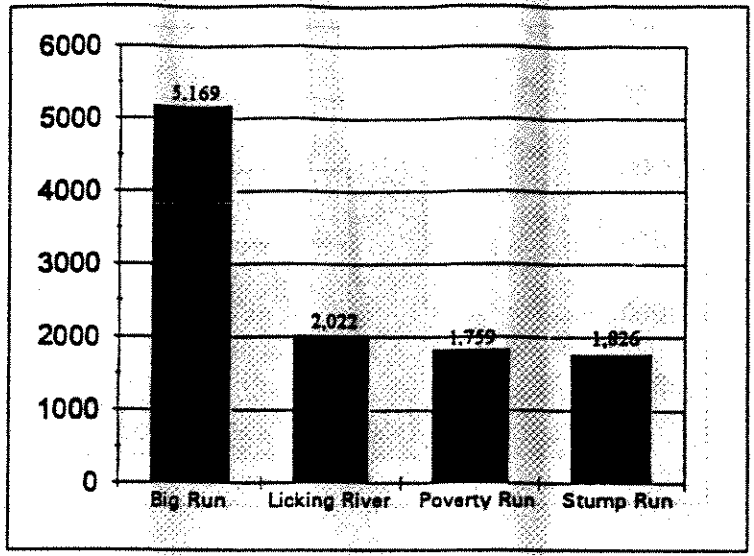


Non-HEL Cropland



(Figure 4 Continued)

Planned Cropland



Unplanned Cropland

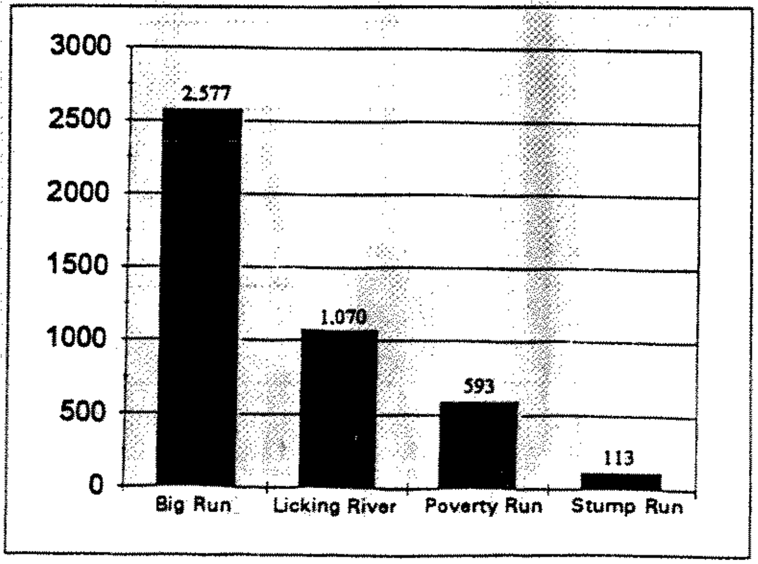
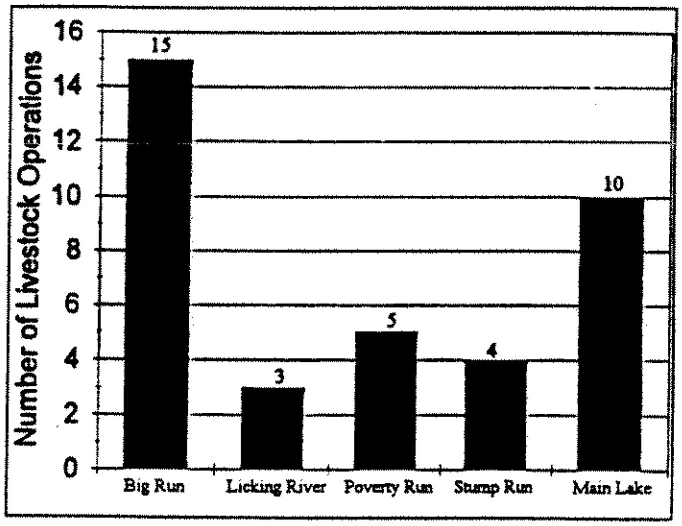


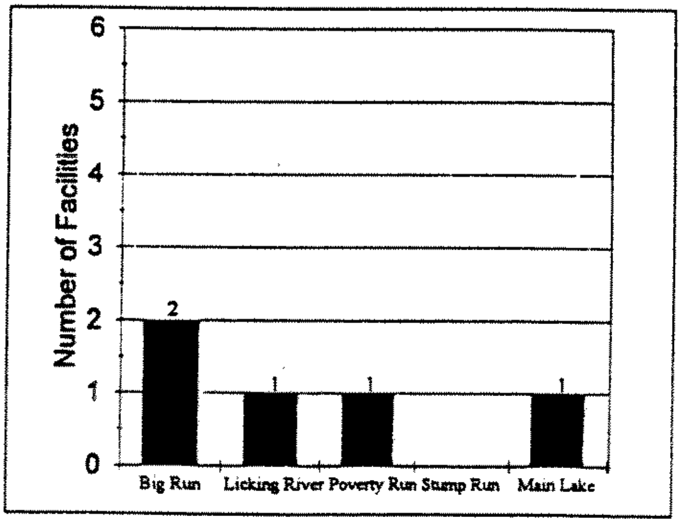
FIGURE 5

DILLON LAKE WATERSHED
MUSKINGUM COUNTY PORTION

Livestock Operations by Subwatershed

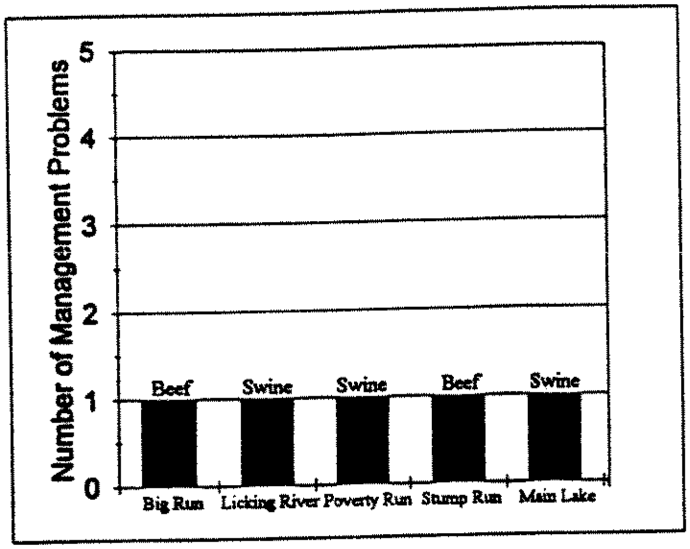


Livestock Operations with Waste Handling Facilities



(Figure 5 Continued)

Livestock Operations with Potential Waste Management Problems



There are an estimated 3,500 dug, driven, or drilled water wells in the watershed, and based on survey results, the number of abandoned water wells may exceed 564. The number of abandoned water wells is relatively high, due to several urban areas which have been converted to a public water supply.

Approximately 261 oil and gas wells exist within the watershed, consisting of nearly 50 miles of access roads. The average erosion from such roadways contribute at a minimum of 1,800 - 2,000 tons per year of sediment to the tributaries, subtributaries and road ditches.

Mining activities within Muskingum County are very limited. The northeast portion of the Big Run subwatershed was mined for coal by a surface strip technique in the late 1940's. Although most of this area has healed, minimal reclamation was done to remedy the earlier erosion problems. Approximately two to three square miles have been mined. At this time, the impact is moderate to low.

A relatively new sand and gravel operation is working in the western portion of the Poverty Run subwatershed. Pertinent permits, BMP's and other needed sediment control appurtenances have been addressed.

GEOLOGIC CONDITIONS

The geology of the watershed is comprised of several soil associations; and topography varies from flat, seasonally flooded, to steep. Approximately sixty-three (63) percent of the watershed is a Westmoreland, Coshocton, and Keene soils association, which is comprised of well drained, moderately to strongly sloping soils formed from eroded upland hillsides of siltstone, shale, sandstone, or colluvium from these rock formations. Underlying layers consist of coarse fragments and weathered porous bedrock.

Twenty-one (21) percent of the watershed is a Glenford-Newark Fitchville association, comprised of level or seasonally flooded to gently sloping soils varying from poorly drained to moderately well drained, formed from lake deposited alluvium within old valleys and stream beds. Some areas are flooded by stream overflows during spring or after intense local storms. Subsoils are generally more clayey with some intruding sandy layers. Brown and gray mottling is common.

Approximately eight (8) percent is made up of a Nolin-Tioga-Newark association with characteristics ranging from somewhat poorly drained, to well drained, nearly level soils formed from alluvial deposits along streams and floodplain areas. Flooding may occur and some limitation may result for crop production and building sites. Surface characteristics vary from dark grayish brown to dark brown and friable. Subsoils vary from gray mottles to loose stratified deposits.

Four (4) percent of the watershed consists of a Wellston-Zanesville-Alford association with variations from moderately well drained to well drained conditions, with slopes ranging from gently sloping to strongly sloping, and soils formed in loess or lake bed deposits weathered from siltstone or sandstone. In some cases, the top soil is lain on broad ridgetops with a mixture of topsoil and subsoil due to past erosion. Fragipans occur in underlying layers within the Zanesville silt loams, although the Alford and Wellston silt loams usually have friable to firm subsoil layers. The Alfords are considered prime farmland.

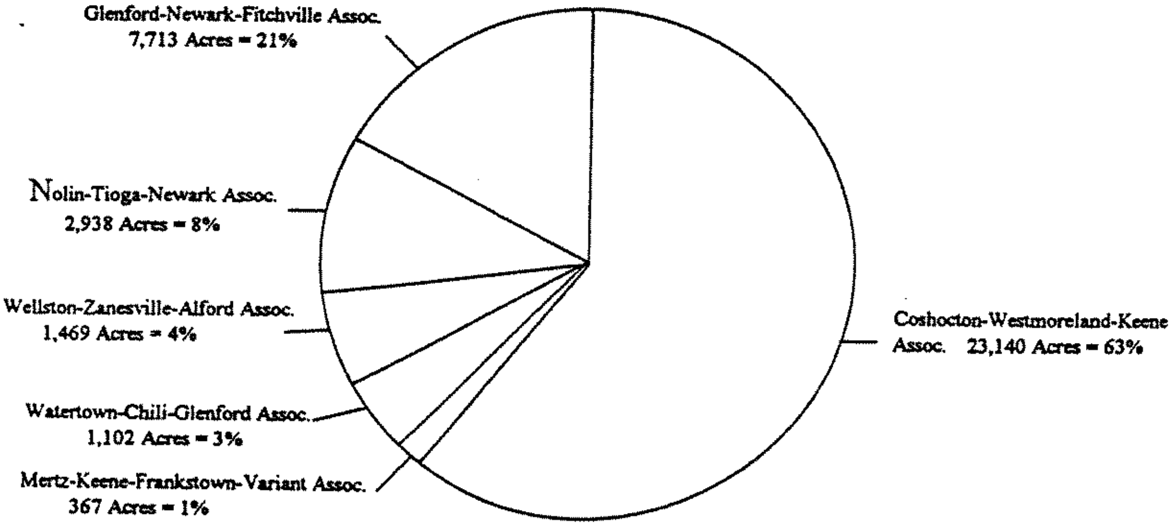
Three (3) percent is made up of a Watertown-Chili-Glenford association. These loamy soils vary from gravelly to sandy and are moderately to well drained. Slopes vary from nearly level to gently sloping, which occur on terraces, benches, and along long valleys. In many cases, these soils are a result of glacial outwash areas. Subsoils range from dark brown to yellowish and sand and gravel content increases with depth.

Less than one percent is related to a Mertz-Keene-Frankstown variant association. These soils range from gently sloping to strongly sloping silt loams and cherty silt loams formed on chert ridges and localized areas of Flint Ridge. Drainage is from moderately well drained to well drained. Surface soils range from brown to black and friable. Subsurface layers may be yellowish brown and firm with substraturm showing slight mottling. Underlying layers are eroded from clay shale, siltstone, or flinty limestone. Coarse fragments may exist in the Mertz and Frankstown variance.

FIGURE 6

DILLON LAKE WATERSHED MUSKINGUM COUNTY PORTION

Soils Association



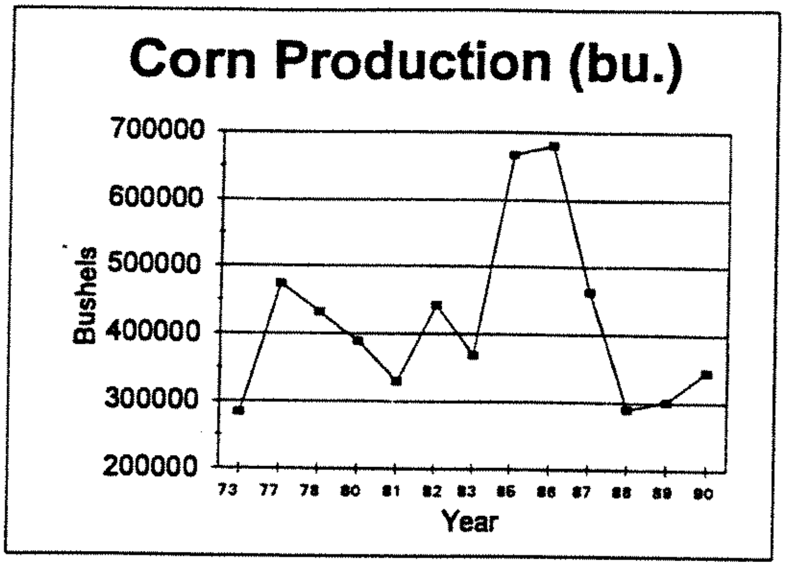
AVERAGE FARM SIZE, CROP HISTORY & PRODUCTION

Accorind to inventories completed for the Ohio Cooperative Extension Service, by the Ohio Crop Reporting Service on Ohio agricultural statistics, the following table reflects averages on watershed activities.

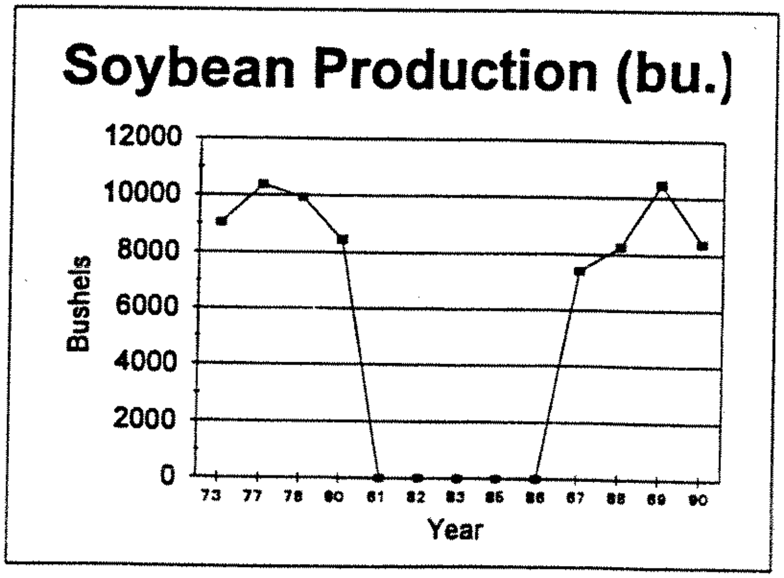
Table 1

Dillon Lake Watershed Muskingum County	Year												
	73	77	78	80	81	82	83	85	86	87	88	89	90
Number of Farms	220	188	186	220	221	220	220	215	215	204	206	211	206
Average Size of Farm	175	193	196	178	178	178	174	179	179	186	170	167	169
Corn Acre Harvested	3379	4463	4194	3907	4367	3749	4611	5357	5428	3851	3257	2849	3169
Corn Yield (bu/ac)	84	106	103	100	76	118	80	125	125	120	89	106	109
Corn Production (bu)	283,871	473,939	431,543	388,764	329,542	441,608	368,704	666,876	680,773	462,577	290,119	301,484	344,787
Soybeans Ac. Harvested	317	334	333	282	—	—	—	—	—	229	247	264	229
Soybean Yield (bu/ac)	29	31	30	30	—	—	—	—	—	32	34	40	38
Soybean Production	9029	10,366	9932	8448	—	—	—	—	—	7404	8258	10,462	8733
Wheat Ac. Harvested	352	580	456	493	667	387	494	494	634	475	317	352	405
Wheat Yield (bu/ac)	30	34	32	39	33	39	38	51	37	50	55	40	43
Wheat Production (bu)	10,560	19,837	14,722	19,184	21,915	14,907	18,656	25,254	23,298	23,583	17,395	14,049	17,554
Oat Ac. Harvested	511	474	439	563	526	475	370	441	247	440	317	317	370
Oat Yield (bu)	41	47	46	44	55	52	56	74	56	64	53	47	55
Oat Production (bu)	20,944	22,490	20,179	24,992	28,940	24,640	20,768	32,391	13,816	28,191	16,762	14,928	20,201
Hay Ac. Harvested	6477	6396	6791	5702	5718	6565	6389	7208	7173	7439	8539	8510	7641
Hay Yield (Tons/Yr)	2	2	3	2	2	3	2	3	2	3	2	3	3
Hay Production (Tons)	14,890	13,142	17,530	13,358	13,102	17,072	15,312	20,795	17,764	20,330	19,224	21,258	19,808
All Cattle & Calves	—	6940	6791	6178	5806	6178	5808	6168	6697	6683	7043	6506	5898
Hogs & Pigs	2851	2003	2106	3907	3613	3186	3168	3260	3525	4221	4226	3956	3838

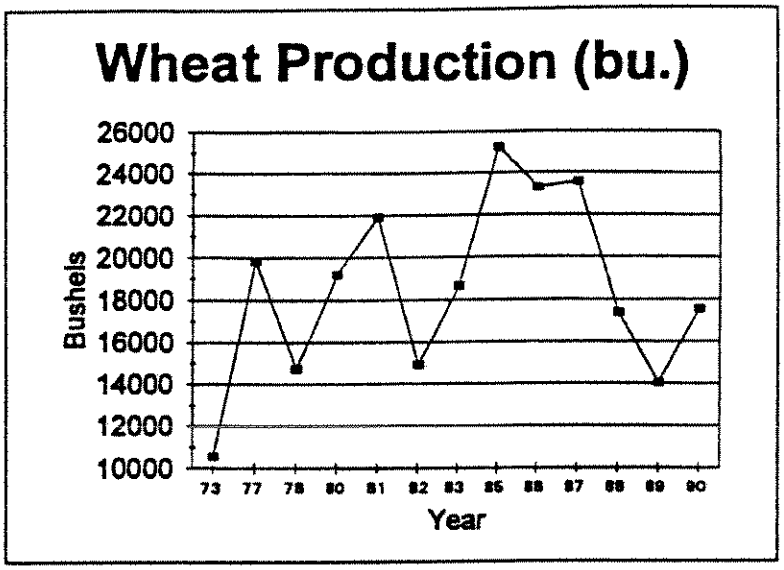
Corn Production (bu)



Soybean Production (bu)



Wheat Production (bu)



Oat Production (bu)

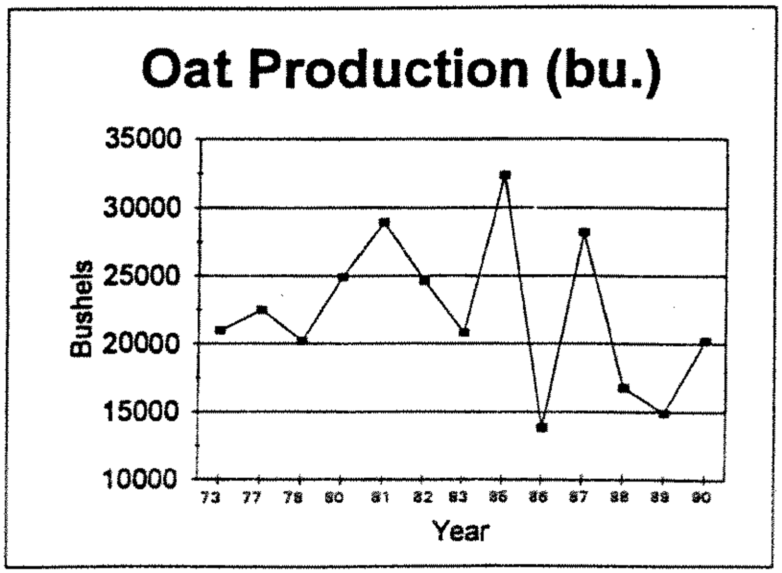


Table 2

DILLON LAKE WATERSHED
MUSKINGUM COUNTY PORTION

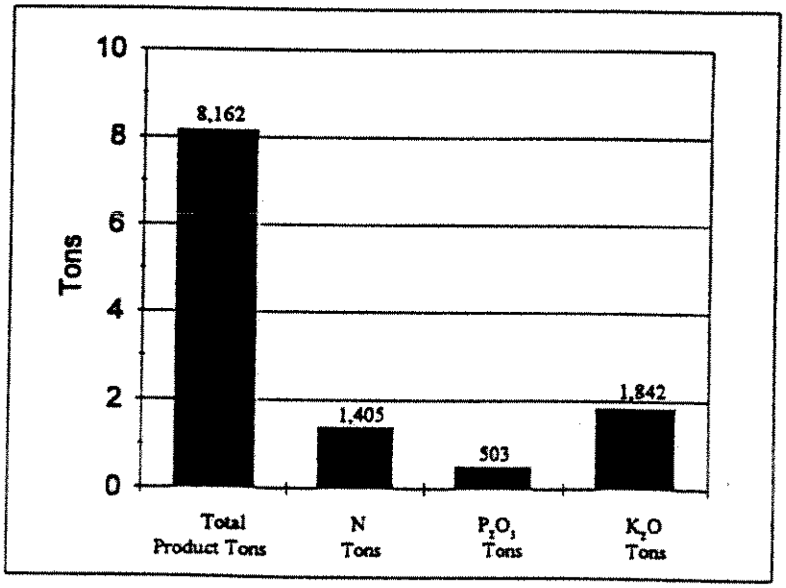
Manure and Nutrient Production Averages

Animal Type	Animal Count	Total Tons Manure/Yr	Solids Tons/Yr	Nitrogen Tons/Yr	P2O5 Tons/Yr	K20 Tons/Yr
Beef & Dairy*	6,391	70,301	8,155	6,219	8,366	7,399
Hogs*	3,374	53,672	4,937	3,780	5,016	4,835
Chickens	-----	-----	-----	-----	-----	-----
Sheep	-----	-----	-----	-----	-----	-----
Totals	9,765	123,973	13,092	9,999	13,382	12,234

Total Nutrient Value * $711,996.12

*Based on County Averages

Chemical Fertilizer Product and Nutrient Tons Delivered



NATURAL RESOURCE CONCERNS

WATER QUALITY

One major concern with Dillon Lake is the extreme high sediment loading. According to studies done by the OEPA and SCS, at least 50% of the sediment load is directly attributed to streambank erosion. Streambank instability and stream gradient throughout the Licking River system is such that large amounts of soil are sheared off of outside turns on the stream and flushed downstream. Due to the nature of Dillon Dam and the short retention time, most of the sediment does not settle out until it reaches the headwater areas of the lake. Even at this point, more than half the sediment load is carried through the lake and discharged from the spillway. By 19~~4~~2, over an estimated 425,000 cubic yards of sediment had collected in the lake basin. 1992?

High phosphorus loading in the past has caused algae blooms in summer. Since the completion of the Newark sewage treatment facility renovation, phosphorus has been reduced significantly. About 59% of the phosphorus input to Dillon is from non-point source problems with nearly 56.4% carried by the Licking River. All other tributaries, gauged and ungauged, contribute approximately 2.8 percent.

park manager has not closed beach due to high bacteria

Bacterial levels, at times of low flow, have caused problems with the water quality within the lake? Periodic closing of the beach has caused a reduction of park and lake use during the peak summer ? season. These high fecal coliform and E. Coli bacteria levels are directly attributed to the release of untreated sewage and feedlot discharges from public and private sewage systems, and inadequate livestock waste storage and/or handling facilities.

FLOODING

Dillon Dam was constructed by the U.S. Army Corp of Engineers to control flood waters in the lower Licking River and adjoining Muskingum River system. Easements restricting permanent structures, cutting and filling operations and dumping of wastes and sludge, were required to allow a floodplain to cover an area as determined by the 100 year flood pool elevation of 790 feet. Average yearly pool fluctuations from elevations of 734 to 737 feet are common.

Within Muskingum County, flooding of the tributaries is not a serious problem. However, in the Licking River headwaters and tributaries, flooding has caused problems, such as bridge abutment collapse, bank shearing and failure, which compounds the problem with debris and log jams. Some log jams have been quite large, up to 1 acre, blocking bridge abutments and causing a siltation problem upstream of the blockage. Several times this debris has built up in the lake causing problems for boaters, park maintenance crews, and blocking flood gates. Debris from the subtributaries within Muskingum County rarely enters the lake, although in some instances with the Big Run, fallen trees have created a meandering of the stream corridor resulting in excessive erosion and the creation of small oxbows. Damage to cropland or urban lands, however, is minimal.

SOLID WASTE

Illegal dumping is a problem in some parts of the watershed. At least one tire dump of approximately 2 acres has been identified in the Stump Run subwatershed. Smaller farm dumps occur throughout the watershed. The park roads throughout the state park grounds are often used for convenient dump grounds.

Sludge does not pose a significant problem, due to regulations prohibiting sludge application within the 100 year flood elevation.

RECREATION AND TOURISM

According to park statistics, nearly 1.8 million people visited Dillon State Park in 1991. This, in comparison to the revenues generated by visitation, which totalled nearly 9 million dollars, reveals the need to renovate the watershed to keep park utilization at its highest possible level. At times of poor water quality, i.e. low flow during mid summer, and beach closings drastically reduce the number of people using that part of the facilities. Other water sports are also affected which in turn reduces revenues to the county.

During spring flooding, log jams and floating debris cause potential hazards for fishermen and boaters. This condition, along with extremely turbid water conditions, have a tendency to reduce the number of lake users.

The Licking River, from the headwaters upstream to the confluence of the north and south fork provides excellent canoeing opportunities during favorable conditions, although the debris causes difficulty in navigation at times.

Access to the various lake and river segments is excellent within Muskingum County due to the large expanse of public land associated with the State Park. ODNR controls approximately 6,676 acres of wildlife grounds, providing hunting for upland species, as well as migratory waterfowl. Popular species for the outdoorsman include grouse, squirrel, deer, turkey, pheasant, rabbit and several species of migratory waterfowl.

With activities available through ODNR Div. of Wildlife, such as youth hunts and pheasant releases, and with permits available for waterfowl hunting, excellent opportunities for the local sportsmen exist.

Fishing for Largemouth Bass is popular with local fishermen, and weekend tournaments are held routinely throughout the open water season.

Camping within the park is quite popular, with over 245 units available. There are also 29 cottages available for rent throughout the season.

Several hiking trails exist within the park providing sight-seeing and exercise opportunities to the park guests.

DILLON LAKE WATER INVENTORY AND ANALYSIS OF NPS CONCERNS

Non-point source problems associated with the Muskingum County portion of the watershed and possible BMP's pertinent to the problems are listed below. Only realistic activities are noted.

Listing	Significance	Remarks	BMP Possibilities
1. Sedimentation	High	Most serious of water quality concerns	Streambank stabilization land treatment BMP's (See below)
2. Erosion - Agricultural - Urban	 High Medium	50% of erosion is due to streambank failure, 50% cropland erosion, urban erosion, and oil and gas well access road erosion	Bioengineering techniques for stream stabilization conservation tillage, residue management, filter strips for cropland protection. Cover crops, permits to control construction site erosion and regulate storm water runoff. Remove exemption status of Township and County Engineer on road ditch maintenance, requiring seeding and mulching after ditch maintenance.
3. Livestock Waste	Medium	32 livestock operations in watershed. Swine operations prove to have the most potential for problems.	Control animal waste runoff through construction of holding and handling facilities. Streambank and woodland fencing where applicable. Development of waste utilization plans.
4. Solid Waste	Low	Restricted to Licking County portion of watershed (sewage treatment plants).	Stringent restrictions on sludge application near flood prone areas.

5. Cropland	High	22% of watershed is conventional tillage with erosion rates up to 12 tons/acre/year	Conservation tillage. Resource Management System level conservation plans Filter/buffer strips, crop rotation, cover crops. Integrated crop management.
6. Pastureland	High	Overgrazing is a major concern, with overgrazed pastures eroding at >5-10 tons/ac/yr	Livestock exclusion fencing, rotational grazing, pasture renovation.
7. Forest Land	Low	Other than pastured woods, woodland erosion is minimal usually less than 1 ton/ac/yr	Woodland exclusion fencing, selective harvest, proper logging BMP's.
8. Recreation	Medium	1.8 million people/yr utilizing the park and associated wildlife areas	All of the above BMP's will increase water quality, with possible increase in park use as a result
9. Endangered Species	Low	No listed endangered species in watershed	N/A

WATER QUALITY (Benthic Macroinvertebrate Diversity)

Throughout the duration of the Watershed Project, a benthic macroinvertebrate assessment was compiled for the major tributaries and the Licking River in Muskingum County. Big, Stump, and Poverty Run tributaries, along with the Licking River, have been monitored twice monthly from March through November for three years. The assessments were done utilizing the kick seine techniques, as in the scenic rivers program, developed by the state of Michigan, and utilized by the ODNR, Natural Areas & Preserves, as well as the OEPA.

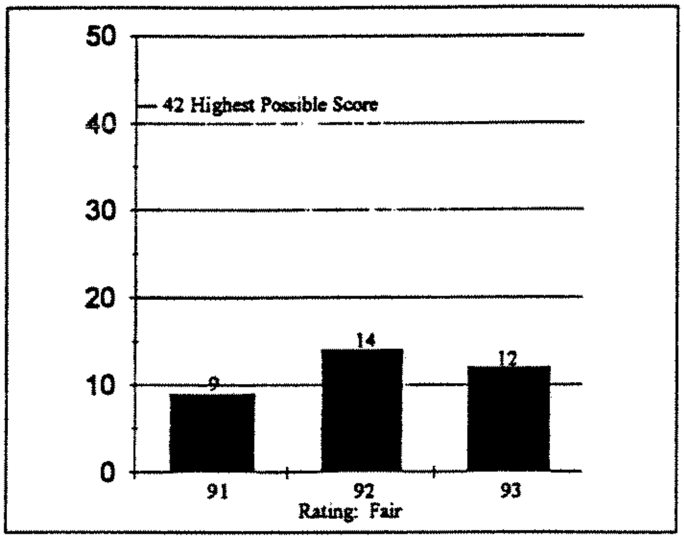
The following results show the variations between tributaries, and the rating given in accordance with the scenic rivers program. The Big Run tributary had a high rating of 14 out of a possible 42. The low was 9, with the cumulative average of 12. Ratings between 11 and 16 rate as fair for overall stream quality. The Stump Run assessments showed a high of 16, a low of 5, with an average of 13 which is also a fair rating. The studies on Poverty Run revealed a high rating of 20, a low of 6, and an average of 13. This also reflects a fair overall average rating. The Licking River was monitored below the dam of Dillon Lake in order to evaluate the combination of influxes from all the various tributaries. The highest count on the Licking River was 23, the low was 13, and the three year average was 18. A rating of 18 would be considered good. This ranges from 17-22 on the scale. Any score over 22 would be considered excellent, and any score under 11 would be considered poor.

FIGURE 7

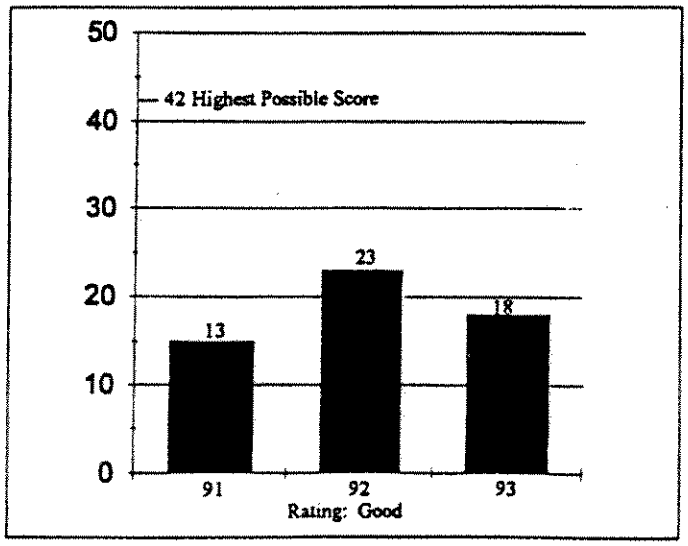
Macroinvertebrate Assessment of Tributaries Within Muskingum County

Highs, Lows & Averages 1991 - 1993

Big Run

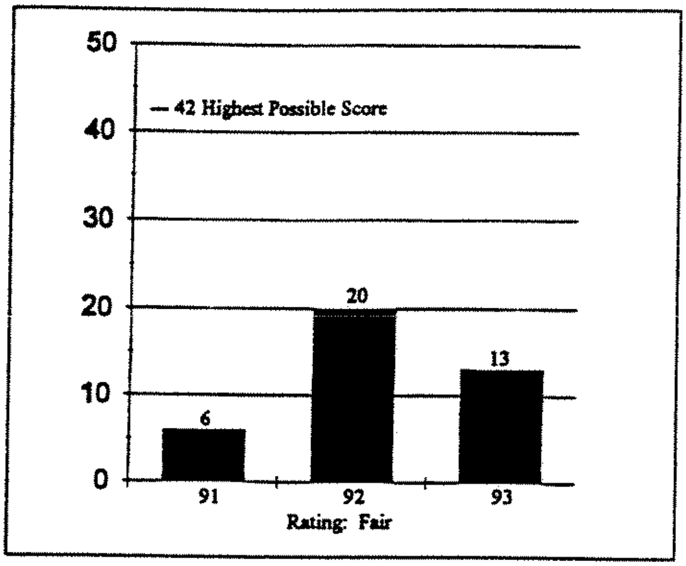


Licking River

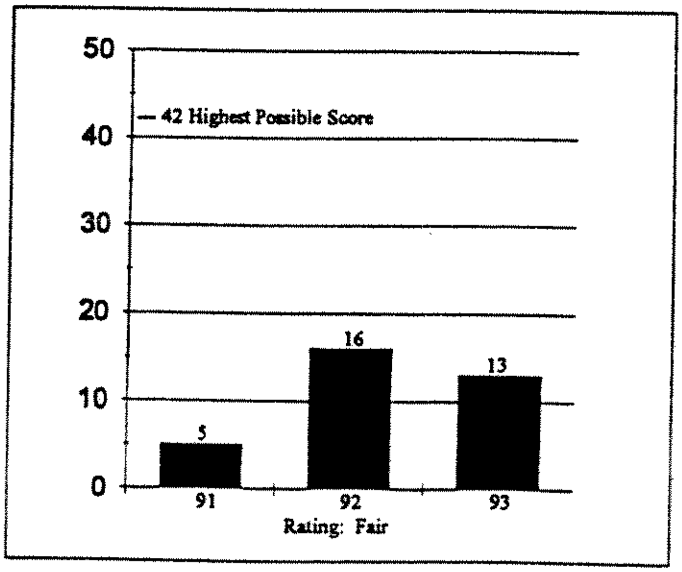


(Figure 7 Continued)

Poverty Run



Stump Run



One possible explanation for the relatively low ratings could be the overall stream gradient verses the carrying capacity of the stream. Extreme amounts of sediment in the tributaries are held in suspension until the stream is loaded. At this point, sediment drop-out occurs in meanders and areas of low gradient, which in turn buries the bottom substrata with fine sand and silts. This condition is not conducive to the development of the Group 1 invertebrate communities. Lack of suitable habitat and bottom substrata force the more tolerant species to relocate or disappear altogether. They are generally replaced by more tolerant species that do not require a clean substrata or high oxygen content. These conditions are similar among the three smaller tributaries throughout their flow length. Very limited areas show exposed or numbered substratums. Most areas in these three tributaries show moderate sinuosity, little to no channelization and moderate bank stability. Riparian widths are generally rated as moderate (10-50 meters), although many field ditches and subtributaries have a very narrow <5 meter riparian zone.

The assessment site on the Licking River, however, was approximately 2.2 miles below Dillon Dam. This river segment shows an increase in gradient directly below Dillon Falls which creates higher velocities that keep bottom substrates clean, with moderate to low amounts of embeddedness. Turbulence helps to oxygenate the water and a more suitable habitat exists for the more sensitive or pollution intolerant species in this segment.

Obviously, the conditions within the Licking River are more apt to hold more of a variety of invertebrate life forms, due in part to overall stream size and diversity, as compared to small tributaries that are heavily silted and have a relatively small drainage area: Whereas the Licking River retains somewhat stable flows throughout the summer period, the smaller tribuatries sometimes lose depth, resulting in a lack of suitable habitat for some species. During drought years a lack of certain species requiring fast flows, good riffle depth, and clean substrate is evident fromJune through September. Several of these species include Dobson Fly Larvae, Mayfly, Stonefly, Water Penny and Riffle Beetles. Also, during this period, more Group 2 and Group 3 invertebrates are collected, such as Crayfish, Crane Fly Larvae, Scuds, Leeches, Midge Larvae, and Black Fly Larvae. Ratings are generally high in early to mid-spring and quite low during low flow periods. This is pointed out so as not to confuse the issues of nonpoint source problems, verses a loss of habitat due to lack of flow.

WATER QUALITY (CHEMICAL PARAMETERS)

Chemical testing was an integral part of the analysis of N.P.S. associated problems in the watershed. Ten (10) sites were selected with one site in Licking County above the headwaters of the lake to serve as a control site. One in lake site was chosen for comparison purposes, and the other sites were specifically chosen to intercept any agricultural run-off and/or effluent with an alternate site on each stream that was upstream of any agricultural activity. The compiled baseline data should reveal any NPS associated problems and directly relate to the areas of discharge or impaction.

In all cases, on all stream segment test sites, a slightly higher nitrate-nitrogen level was apparent during the spring flush. Levels averaged 4.4 mg/l or less, except for an unnamed tributary to the Licking River. In this case, $N\text{-}NO_3$ levels exceeded 30.0 mg/l during low flow periods. This is attributed to observed animal waste runoff and silage drainge.

Total phosphorous levels at times exceeded 1.0 mg/l, far above recommended health standards of .05 mg/l for recreational waters. The total phosphorous levels averaged .17mg/l throughout the test sites.

Dissolved oxygen levels were consistent in most test sites. Samples ranged from 7.0 mg/l to 11.0 mg/l. The average for the combined sites was 9.25 mg/l. Only one site proved to hold less oxygen than needed to support life. This was also the site testing high levels of P and NO_3-N.

The pH levels were also fairly consistent throughout the test sites. The pH ranged from 7.58 to 8.03 with an overall average of 7.77. This is quite conducive to aquatic life needs.

Turbidity levels varied greatly from one site to the next; again, the unnamed tributary to the Licking River revealed the highest turbidity levels, at times reaching 86.3 FTU (based on a formzine standard, set up for the Hach DR2000 Spectrophotometer). The Licking River had the next highest turbidity level, most notably during peak flows. This is obviously due to the extensive drainage area and unstable Riparian zones. (See Figure 8 for yearly averages.)

Chemical parameters for heavy metals, VOC's and other minerals were studied intensively by the OEPA and average sediment loading was configured.

The following illustrates the sediment load contributed as of the 1988 study:

Acre-Ft. of sediment in lake	30977.9
Acre-Ft. of water in lake	14333.1
Acre-Ft. of original volume in lake	17431.0
Percent loss of volume in lake	17.8%
Percent loss of volume per year	.7%
Cubic yards of sediment in lake	4,997,949.8
Cubic yards of sediment into lake per year	185,109.3
Tons of sediment in lake	5,472,005.3
Tons of sediment in lake per year	202,666.9
Tons/acre/year delivered from watershed	.7
Tons/sq. mi./year delivered from watershed	419.6
Lake trap efficiency	.70%

Listed below are physical and chemical data for sediment samples tested by the Ohio EPA in 1988:

	SAMPLE 1	SAMPLE 2
Density lb./cu. ft.	81	79
% Moisture	42	32
% Silt/Sand	88/12	41/49
% Organic Matter	2.2	1.9
pH	7.1	7.8
CEC (meg/100g)	10	15
P - PPM 1/	16	31
K - PPM 1/	52	57
Ca - PPM 1/	1810	1795
Mg - PPM 1/	186	107
Ca - % 2/	88	90
Mg - % 2/	11	9
K - % 2/	1.3	1.5
P - PPM Total	449	493
Zn - PPM Total	52	71
Cu - PPM Total	42	64
Cr - PPM Total	15	13
Pb - PPM Total	23	20
Ni - PPM Total	18	18
CD - PPM Total	0.33	0.33

1/ Exchangeable
2/ Base Saturation

FIGURE 8

CHEMICAL PARAMETERS

Yearly Averages for Major Tributaries mg/l, FTU (1)

Nitrogen	3.9	.85
Total Phos.	.01	.04
DO.	8.5	10.1
pH	7.5	7.9
Turbidity	19.3	21.9
	1992	1993

Poverty Run

Nitrogen	3.9	1.5
Total Phos.	.05	.06
DO.	8.6	10.1
pH	7.7	7.7
Turbidity	39.4	26.7
	1992	1993

Big Run

(Figure 8 Continued)

Nitrogen	4.0	1.1
Total Phos.	.03	.03
DO.	9.2	11.0
pH	7.8	7.79
Turbidity	17.9	20
	1992	1993

Stump Run

Nitrogen	8.2	2.3
Total Phos.	.27	.17
DO.	9.09	10.70
pH	8.03	8.03
Turbidity	13.4	31.7
	1992	1993

Licking River

(Figure 8 Continued)

Nitrogen	12.5	6.1
Total Phos.	.33	.75
DO.	7.03	8.2
pH	7.7	7.58
Turbidity	63.8	86.3
	1992	1993

Unnamed Tributary of the Licking River

(1) Values shown in mg/l, Turbidity expressed as FTU's as utlized by Hach Chemical, standards for DR2000.

OBJECTIVES & ACTIONS

Listed below are the major goals for which this management plan was compiled, and the necessary objectives that must be implemented in order to improve the resources of the Dillon Lake Watershed within Muskingum County.

GOAL A: Reduce the rate of sedimentation in the Stump Run, Big Run, Poverty Run, and the Licking River subwatersheds.

1. Persuade the agricultural sector to reduce on-farm sediment discharges through "Resource Management System" conservation plans, including installation of Best Management Practices, such as no-till farming, contour farming, strip cropping, filter strip establishment, cover cropping, woodland and stream exclusion fencing, and construction of necessary structures for erosion control and animal waste runoff.

2. Coordinate with all necessary local entities, such as County Commissioners, Township Trustees, and County Engineer to minimize erosion of county and township road ditches. Submit a resolution to the Ohio Federation of Soil & Water Conservation Districts requesting that Trustees and County Engineers provide any necessary reclamation needs following ditch maintenance, or any construction causing soil disturbance or creating an erosion potential.

3. Promote NPDES permitting to help eliminate urban erosion during construction of subdivisions, access roads, or commercial building sites.

4. Develop a comprehensive watershed management plan by coordinating with all county, state and federal agencies -- SCS, ODNR, Muskingum Conservancy District, RC&D, OEPA, OCES, and other entities necessary to reduce erosion from a total watershed standpoint.

GOAL B: Improve and maintain surface and groundwater supplies within the watershed.

1. Provide technical assistance to agricultural landowners to minimize herbicide/pesticide runoff and promote the use of programs, such as integrated crop management, use of soil tests for fertilizer application, and provide the necessary education through OCES regarding herbicide/pesticide application rates and restrictions.

2. Assist livestock operators with the development of waste holding/handling facilities, construction of necessary fencing, buffer strips, and applicable surface water diversion and/or structures for water control.

3. Provide a comprehensive water testing program for private wells within the watershed, available to all landowners.

4. Promote the plugging of contaminated or abandoned water wells, through media, District newsletters, and educational programs for schools and other applicable groups.

GOAL C: Control and reduce illegal dump sites and litter in the watershed.

1. Promote recycling and litter control through news, media, District Field Days, and District newsletters.

2. Encourage enforcement of dumping regulations. Promote an increase in penalties for dumping within the State Park perimeters.

3. Work with local agencies, such as County Litter Prevention, Boy Scouts, Girl Scouts, Fisherman's Association, and Bass Clubs to hold cleanup days to pick up litter from highways, county and township roads, and in lake litter.

4. Encourage landowners to eliminate on-farm dump sites, and utilize proper refuse disposal areas, instead of creating many small localized dump sites county-wide.

GOAL D: Increase recreation and tourism for Dillon State Park.

1. By incorporating and implementing Goals A-C, the lessened sedimentation and improved water quality will utlimately improve recreation conditions as far as lake use is concerned.

2. Continue in lake dredging to increase lake capacity allowing use of the upper1/3 of the reservoir by boaters, fishermen, and ultimately revitalize fish habitat in this area.

3. Seek further State Park funding for necessary appurtenances, such as boat docks on the Big Run Boat Ramp, proper lighting throughout the park, provide clean safe drinking water at all boat ramps and swimming areas. Create fishermen access areas for shoreline fishing opportunities for the able and handicapped. Provide an open concession area at the beach and provide needed lifeguards for safe swimming. Provide enough maintenance personnel to keep park grounds litter free, trimmed, and maintain restroom facilities. Renovate any cabins, shelter houses or campsites that are deteriorating or in need of repair. Repair or replace blacktop, playground facilities, and ODNR access roads. Plugging off all abandoned water wells within the park would help eliminate groundwater contamination potential.

4. ODNR and the U.S. Army Corp of Engineers should work closely together to organize periodic lake clean-ups by seeking funding to help offset costs for log jam removal, both in the headwaters and at the spillway entrance gates.