SALT LAKE COUNTY
2014 STORMWATER QUALITY TECHNICAL REPORT

Participating Agencies:
Salt Lake County Engineering & Flood Control
Utah Department of Transportation, Region 2

Prepared for:
Salt Lake County

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Abbreviations

BMP	Best Management Practice
DWQ	Utah Division of Water Quality
EMC	Event Mean Concentration
TMDL	Total Maximum Daily Load
TSS	Total Suspended Solids
UDOT	Utah Department of Transportation
UDPES	Utah Pollutant Discharge Elimination System

Executive Summary

Salt Lake County was issued a permit to discharge municipal stormwater by the Utah Division of Water Quality (DWQ) in 1992 (UPDES Permit No. UTS000001). Stormwater quality monitoring has been conducted by the County on a routine basis since the issuance of the permit. The intent of the monitoring is to determine any trends in stormwater quality and to assist with the implementation of best management practices (BMPs). In accordance with Section 5.6.2.1 of the new permit (issued on Sept. 3, 2013), Salt Lake County is required to prepare a summary of five years of wet weather monitoring. Similar five-year reports were prepared and submitted to the DWQ in 2000, 2005 and 2008 (the previous permit required this report during the third year of the permit term).

Basis of Stormwater Sampling

This report provides a summary of the stormwater data collected for Salt Lake County and the Utah Department of Transportation (UDOT). Stormwater sampling for UDOT is conducted by Salt Lake County under agreement and therefore is included when referring to the County's sampling. In accordance with the UPDES permits, storms that are representative of typical storms in this area are defined by a permit or by a Representative Sampling Plan (see Chapter 3). Five sampling stations representing various landuses have been established to conduct this monitoring:

- DEL-01 Commercial Landuse - County
- DEL-05 Industrial Landuse - County
- JOR-03 Transportation Landuse - UDOT
- LIT-06 Residential Landuse - County
- MIL-07 Residential Landuse - County

Sampling is conducted two times per year, during the spring and fall seasons. Storms during these periods are more likely to be frontal storms, as necessary for this sampling, and runoff is not as likely to be affected by irrigation or snowmelt. Parameters for sampling are determined by the sampling plan; additional parameters have recently been added for purposes of the Jordan River Total Maximum Daily Load study. Sampling includes grab samples taken before and during a representative storm, and a flow-weighted composite sample collected throughout the duration of the storm. These are referred to as Base, Rise and Composite samples respectively.

Salt Lake County has sampled 41 storm events since 1992. The majority of the sampling events occurred in May and October. Not all stations are sampled each year due to either lack of precipitation or sampling equipment difficulties; not all parameters are

analyzed for each storm due to either laboratory holding times or lack of the necessary sample volume. However, over 6,000 sample results have been collected under the County's representative sampling program.

Data Review and Analysis

Landuse in Salt Lake Valley has been delineated for two reasons: 1) to understand what stormwater constituents may be associated with particular landuses and 2) to determine the appropriate runoff coefficient for use in other calculations. The amount of impervious area in a basin and the connectivity (storm drain system connections) within the basin directly affects the amount of runoff in that area.

Analyses were conducted on the event concentrations, event mean concentrations (EMCs) and annual loads. Event concentration analyses are conducted on the composite results, whereas, EMCs are calculated to take into account pollutant loads, precipitation, runoff coefficients and serviced area. With time, it is anticipated that EMCs will stabilize, allowing the use of these concentrations as predictive tools in other basins within Salt Lake Valley, and appropriate BMP implementation.

Significant observations are summarized below:

- **Landuse Pollutant Concentrations** were compared to evaluate differences in runoff concentrations due to different landuses. This comparison was conducted on the average composite sample results for each outfall. The following was noted:
  - The commercial landuse had the lowest runoff concentrations of TSS, Total Phosphorus, Total Copper, Total Lead and Total Zinc.
  - The industrial landuse had the highest runoff concentrations of BOD_5.
  - The transportation landuse had the highest runoff concentrations of TSS, Total Copper, Total Lead and Total Zinc.
  - The residential landuse had the highest runoff concentrations of Total Phosphorus and the lowest runoff concentrations of BOD_5.
- **Outfall Event Mean Concentration Trends** were analyzed to determine the effect of landuse within a basin on stormwater quality. This analysis was similar to the Landuse Pollutant Concentration comparison, however, in this case, a linear regression analysis was performed on all composite results to date, in order to ascertain if there is a historical trend in outfall event concentrations. The following was noted:
  - TSS showed a slight increase in commercial and residential landuses, however, the strength of the trend was poor (R^2 = 0.002 and 0.02 respectively). The TSS concentrations in the industrial and transportation landuses showed a general

decrease; the decrease for transportation had the strongest correlation (R^2 = 0.094).

- Total Phosphorus trends were downward with the exception of the commercial landuse, which showed a poor strength of trend (R^2 = 0.007).
- BOD_5 trends were generally upwards with the exception of the transportation landuse.
- Total Copper trended downwards with the exception of the residential landuse. Total Lead trended downwards in all landuses, particularly in the transportation, with a strong trend (R^2 = 0.5). Total Zinc also trended downwards, however, the strength of the trend was poor in commercial, residential and transportation landuses (R^2 between 0.01 and 0.002).

- **Event Mean Concentrations** (EMCs) for the past five years are presented below. There was a general decrease in the EMCs during this period. Some of the parameters show a stabilizing of the EMCs, indicating the potential use of these are predictive tools for use in the Salt Lake valley.

Unincorporated Salt Lake County Event Mean Concentration Summary

Constituent	2009 EMC (mg/L)	2010 EMC (mg/L)	2011 EMC (mg/L)	2012 EMC (mg/L)	2013 EMC (mg/L)
Total Suspended Solids	126	144	139	137	137
Total Phosphorus	0.6	0.61	0.59	0.56	0.53
BOD_5	14.5	14.5	14.6	14.7	14.7
Total Copper	0.0415	0.0443	0.0435	0.0427	0.0427
Total Lead	0.038	0.0405	0.0396	0.039	0.039
Total Zinc	0.1546	0.1678	0.1622	0.1596	0.1596

- **Receiving Water EMC Comparisons** were conducted to evaluate the discharge of pollutants to each receiving waterbody. The following was noted:

  - Big Cottonwood Creek had the lowest EMCs for Total Suspended Solids (TSS) and Total Copper in 2013, compared to the other receiving waters.
  - Parleys Creek had the highest TSS and Total Lead EMCs, and the lowest Total Phosphorus and BOD EMCs in 2013.
  - Mill Creek had the lowest Total Zinc EMC and the Riter Canal had the highest Total Zinc EMC in 2013.
  - In general, the Total Phosphorus EMC is lower in all receiving waters in 2013.

- BOD EMCs remained relatively stable through all receiving waters during this five-year period.

- **Municipal EMC Comparison** indicates that Salt Lake County's EMCs are within the range of results for other similar municipality EMCs.

Annual Stormwater Pollutant Loads indicate either an overall decrease or leveling of the pollutant loads within unincorporated County. The County will continue representative sampling, implementing the Stormwater Management Plan and evaluating stormwater BMPs.

Synopsis

Salt Lake County has a well-developed stormwater sampling program that has resulted in valuable stormwater data. It is difficult to make overall conclusions regarding trends in stormwater quality given the variable nature of stormwater, however, a general decrease in stormwater pollutants is noted in the outfall trend analysis, EMCs and Annual Loads. The extensive data obtained by the County may be used to evaluate other basins, modify the current sampling requirements, prioritize outfalls and implement BMPs.

1.0 INTRODUCTION

The 2014 Stormwater Quality Data Technical Report details storm event sampling analytical results associated with the Utah Pollutant Discharge Elimination System (UPDES) municipal stormwater permits of Salt Lake County and Utah Department of Transportation (UPDES Permit UTS000001 and UTS000003 respectively). In accordance Section 5.6.2.1 of the new permit (issued on Sept. 3, 2013), this report provides a summary of stormwater quality data in the County from 2009 through the fall of 2013. Water quality technical reports were developed for the previous five-year periods (with the exception of one report which was required during the third year of the permit): 1995 – 2000, 2000 – 2005 and 2005 - 2008 (Salt Lake County Engineering Division, 2000, Salt Lake County Engineering Division, 2005 and Salt Lake County Engineering Division, 2008). However, in some cases, the data collected from 1992 to 2013 was analyzed to provide a more comprehensive look at the Salt Lake County stormwater data.

This report is composed of the following chapters:

Chapter 2 – Salt Lake County Landuse Analysis
Landuse designations are delineated for use in determining sampling locations, and affiliated pollutant loads. A weighted average runoff coefficient based upon landuse is part of the Event Mean Concentration (EMC) calculation. This chapter provides detailed information regarding landuse in Salt Lake County.

Chapter 3 – Representative Sampling Methodology
This chapter explains the purpose and procedures associated with the representative stormwater sampling program for Salt Lake County and the Utah Department of Transportation (UDOT). The storm criteria and constituents sampled are outlined and sampling locations described, as well as Quality Assurance/Quality Control procedures. This chapter also summarizes parameter analyses and sampled storms.

Chapter 4 – Stormwater Data Analysis
This chapter summarizes the data analysis including outfall event concentrations and Event Mean Concentrations (EMCs). Outfall pollutant concentrations were analyzed for trends and landuse influences. EMCs were calculated to provide a method for examining the representative storm event concentration for an outfall in the storm drain system. EMCs have been used by numerous municipalities and therefore can provide an indication of how Salt Lake County stormwater quality compares with other municipalities.

2.0 SALT LAKE COUNTY LANDUSE ANALYSIS

Landuse in Salt Lake County was first delineated for stormwater analyses in 1992 from 1991 aerial photographs for the UPDES stormwater permit application. This information was initially utilized in locating the stormwater sampling sites. Landuse information is also critical for use in determining pollutant load and Event Mean Concentration (EMC) calculations, as discussed in Chapter 4.

The Salt Lake County Landuse Map was updated in 2002 utilizing 2000 census data (Figure 2-1); subsequent loads and EMCs were calculated with the new landuse data. Table 2-1 provides information regarding landuse in Salt Lake County in 1990 and 2002. The landuse data is for serviced areas, representing the portion of the catchment directly connected to stormwater collection and conveyance systems.

Landuses were not adjusted for serviced area in 2002; the pecent serviced area for each of the 231 basins was estimated based on landuse in 1990. Table 2-2 identifies landuse for the sample location drainage basins. Figure 2-2 identifies the sampling locations and associated landuse.

TABLE 2-1
Unincorporated Salt Lake County Landuse

Land Use	1990		2002	
	Serviced Area (acres)	Percent of Total	Serviced Area (acres)	Percent of Total
Low Density Residential	35,201	57	28,681	47
Medium Density Residential	2,750	4	2,464	4
High Density Residential	814	1	1,700	3
Commercial	4,545	7	5,189	9
Light Industrial	2,721	4	1,610	3
Heavy Industrial	974	2	3,359	6
Transportation	1,342	2	1,141	2
Open	5,039	8	11,485	19
Agriculture	2,584	4		
Public	5,499	9	4,907	8
Total Serviced Area	61,469		60,536	
Total Area	128,238		127,135	
Population*	212,293		233,677	

*Population data was compiled from data from the Census Bureau and GIS maps

FIGURE 2-1
Salt Lake County Landuse

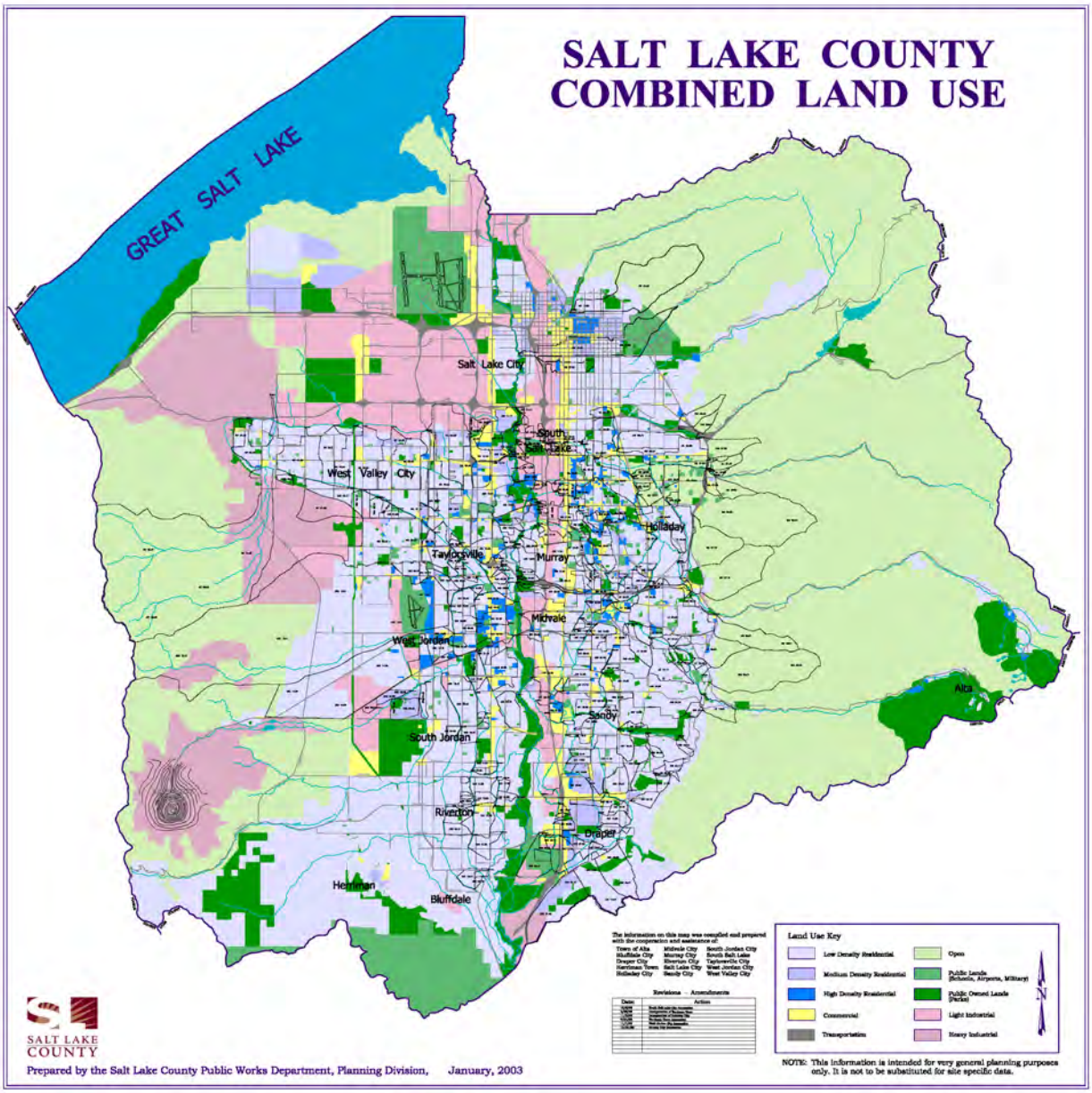
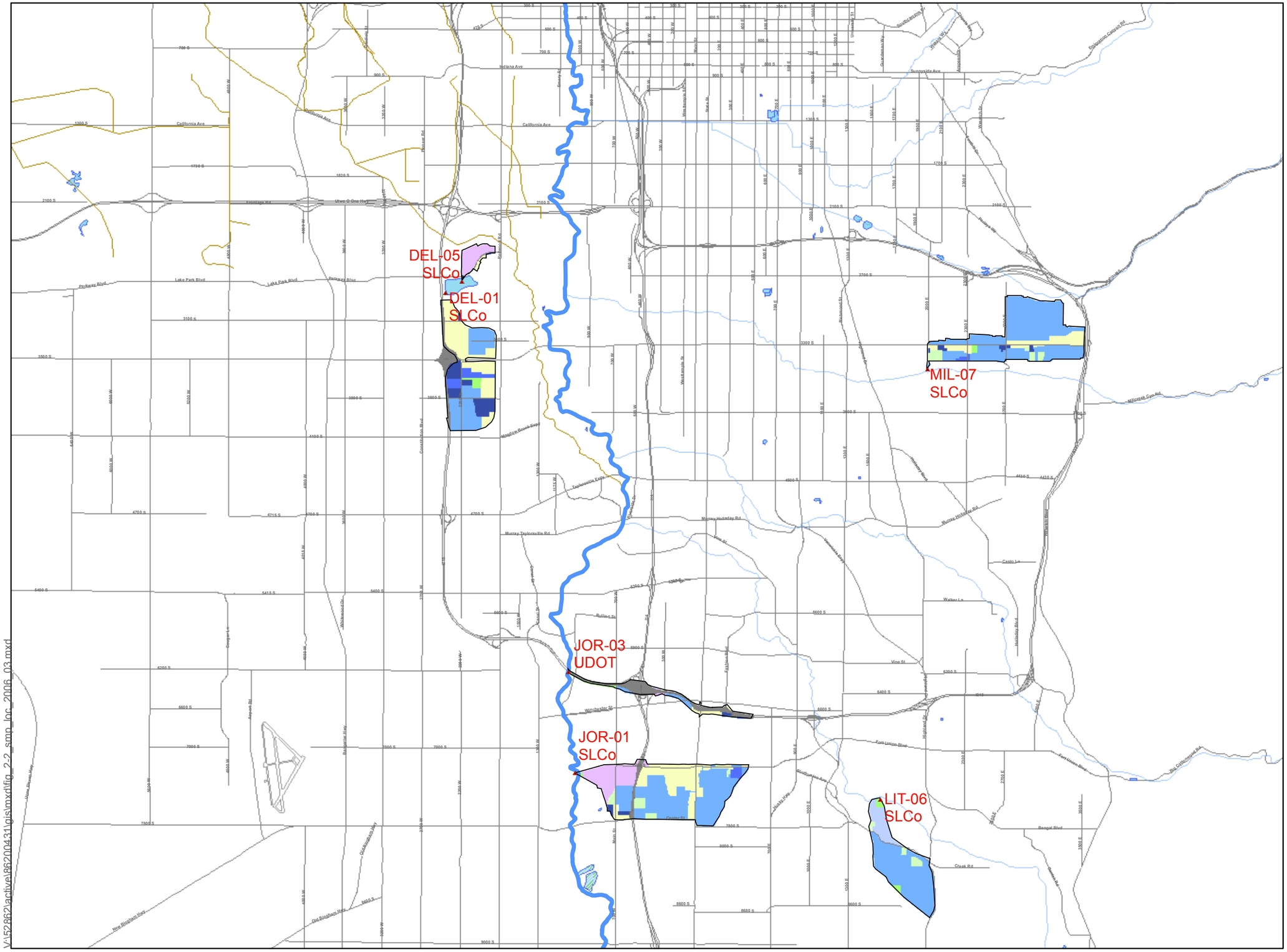


TABLE 2-2
Representative Storm Drainage Basin 2002 Landuse

SAMPLING STATION ID	TOTAL CATCHMENT AREA	SERVICED CATCHMENT AREA	SERVICED AREA (acres)									
			LOW DENSITY RESIDENTIAL	MEDIUM DENSITY RESIDENTIAL	HIGH DENSITY RESIDENTIAL	LIGHT INDUSTRIAL	HEAVY INDUSTRIAL	COMMERCIAL	TRANSPORTATION	PUBLIC LANDS	PUBLICLY OWNED (e.g. parks)	OPEN
DEL-01	556	328	112	22	50	0	0	126	11	0	8	0
DEL-05	67	60	0	1	0	0	50	7	0	2	0	0
JOR-01	804	225	115	4	3	0	35	53	5	1	9	1
JOR-03	356	313	54	6	12	0	6	63	73	67	4	27
LIT-06	376	309	286	0	0	0	0	0	0	14	9	0
MIL-07	648	370	283	4	9	0	0	54	0	17	3	0
Total Urban Area	**2807**	**1605**	**850**	**37**	**74**	**0**	**91**	**303**	**89**	**101**	**33**	**28**

It is noted that the 2002 serviced area for the unincorporated Salt Lake County has decreased since 1990. This is due to annexations and incorporations throughout the County, thus removing areas from the jurisdiction of Salt Lake County. In addition, due to recent changes (e.g. incorporation of Cottonwood Heights), the County is in the process of updating the landuse map. An updated map will assist in the assessment of the basins and will be utilized during the current effort to relocating some of the sample stations.



N

0 0.5 1 2 Miles

LEGEND

Landuse

- RES-RURAL
- RES-LOW
- RES-MED
- RES-HIGH
- COMMERCIAL
- PUBLIC
- PARKS
- INDUSTRIAL
- UTILITY
- TRANSPORTATION

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Figure 2-2
Sampling Location and Land Use Map

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3.0 REPRESENTATIVE SAMPLING METHODOLOGY

This chapter describes the methodology associated with the representative stormwater sampling program. As part of the UPDES requirements, Salt Lake County and the Utah Department of Transportation Region 2 (UDOT) have conducted representative storm sampling since 1992. UDOT stormwater sampling is conducted in conjunction with the Salt Lake County sampling program through a cooperative agreement.

DEL-01

Stormwater quality sampling is conducted in accordance with the *Sampling Plan for Representative Storm Monitoring* (Salt Lake County, 2006). Representative storms are identified in this plan, as well as sample stations, sample types and sample parameters.

DEL-05

3.1 SAMPLING LOCATIONS

Representative sampling was conducted at six locations throughout Salt Lake County (including one UDOT station) until 2013. The JOR-01 station was discontinued in 2013 with approval from DWQ. Results from these locations have been combined in the analysis for this report. A rain gauge is located near each sampling station to determine the amount and duration of precipitation for the storm events. The sampling locations and primary landuse designations are identified below:

JOR-03

- DEL-01 Commercial Landuse - County (DEL 01.00)
- DEL-05 Industrial Landuse - County (DEL 05.00)
- JOR-03 Transportation Landuse - UDOT (JOR 20.20)
- LIT-06 Residential Landuse - County (LIT 06.29)

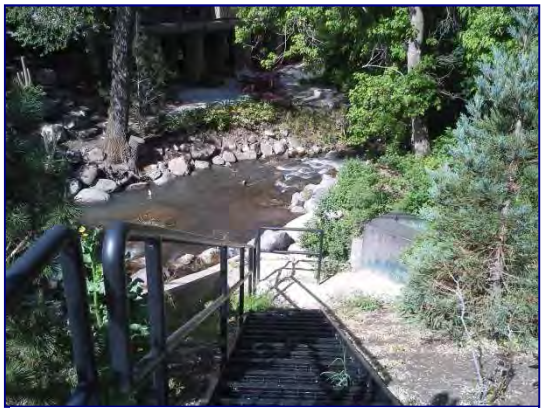
- MIL-07 Residential Landuse - County (MIL 05.56)

LIT-06

3.2 REPRESENTATIVE STORMS

Average storm characteristics for Salt Lake County were determined in Part 2 of the UPDES Stormwater Permit Application (1991). A study showed that a representative storm event in Salt Lake County has an average rainfall volume of 0.62 inches over an average 6.4 hour period accumulating at an average of 0.1 inches/hour.

A representative storm is the target storm for stormwater monitoring because at least 50% of the storms in Salt Lake County meet or exceed the criteria identified above. A monitoring frequency of twice a year (spring and fall, subject to weather conditions) was targeted.



MIL-07

The minimum allowable rainfall for monitoring a representative storm is determined from average storm data and observed storm patterns. The specific storm guidelines used are as follows:

- Minimum of 0.20 inches of precipitation
- 30-day separation period between storm monitoring events
- Event must occur at least 72 hours from previously measurable precipitation (0.1")
- Inter-event time of six hours

3.3 MONITORING

Weather forecasts are monitored daily during the spring and fall to determine when a representative frontal storm event is expected. Approximately 24 hours prior to the prediction of a representative storm, preparations for sampling begin. Four hours prior to the event, the automatic sampling units and area velocity flow meters are activated and programmed to take samples at specified intervals, based on the predicted length and intensity of the storm. Base flow grab samples are taken prior to the beginning of stormwater runoff. Storm grab samples are taken at each station on the rising limb of the storm hydrograph. Flow-weighted composite samples are collected by an automatic sampler at specified intervals, and are subsequently composited based on continuous flow measurements in order to derive a flow-weighted composite sample.

At various intervals throughout the storm event, general observations such as rain gauge reading, flow level and rate readings and equipment status are recorded on field data sheets. As runoff ceases, flow returns to approximately 1.2 times the base flow, or six hours has passed, the sample bottles and station flow data are retrieved. Flow-weighted compositing is performed based on flow data compiled by the area velocity meters.

In summary, three types of samples are collected when possible:

1. Base grab samples are taken before the beginning of runoff for each event;
2. Rise grab samples are collected within the first 30 minutes of runoff; and
3. Discrete samples are collected at a specified interval over a six-hour period. These samples are composited for submittal to the laboratory for analysis.

The following constituents are analyzed at each sampling location for the storm events as sample volumes permit:

TABLE 3-1
Salt Lake County Stormwater Sampling Parameters

SALT LAKE COUNTY STORMWATER SAMPLING PARAMETERS	
General	**Oxygen**
◆ pH	◆ BOD_5
Solids	◆ COD
◆ Total Suspended Solids	**Metals**
◆ Total Dissolved Solids	◆ Cadmium (total, dissolved)
◆ Hardness, as $CaCO_3$	◆ Copper (total, dissolved)
Nutrients	◆ Lead (total, dissolved)
◆ Total Phosphorus	◆ Zinc (total, dissolved)
◆ Ortho-Phosphate	**Hydrocarbons**
◆ Total Nitrogen	◆ Oil and Grease*
◆ Total Kjeldahl Nitrogen	**Bacteria**
◆ Total Ammonia	◆ E. Coli*

*Only collected for Base and Rise grab samples

Additional parameters analyzed in association with the Jordan River TMDL have been conducted during the past five years. This includes the following:

- Volatile Suspended Solids (VSS)
- Suspended Sediment Concentration (SSC)

- Carbonaceous BOD (CBOD)
- Carbonaceous BOD, Soluble (SCBOD)

The County continues to sample for VSS and CBOD as suggested by DWQ.

3.4 SUMMARY OF SAMPLED STORMS

A total of 41 storm events for the County/UDOT have been sampled to date. However, not all stations and not all constituents were analyzed during each sampling event. The storm seasons sampled for each basin/landuse are listed in Table 3-2. Table 3-3 provides a summary of stormwater sampling by month. A hydrologic summary describing the antecedent dry period, rainfall intensity and duration is provided in Appendix A.

Although 18-29 storms were sampled at each outfall, the analyses did not yield results for every constituent at each sampling location due to several factors, including: insufficient sample volume, sampling equipment malfunction, lack of adequate precipitation, etc. Raw analytical results for the base flow grab, rise grab and composite samples are provided in Appendix B.

TABLE 3-2
Summary of Storms Sampled per Outfall

Year	DEL-02/01 Commer-cial	DEL-05 Industrial	JOR-01 Mixed	JOR-04/03 Transpor-tation	LIT-06 Residen-tial	MIL-07 Residen-tial
Fall 92	1	—	1	1	1	1
Spring 93	2	2	2	2	2	1
Fall 94	1	1	1	1	1	1
Fall 95	1	1	1	1	1	1
Spring 96	—	1	1	1	1	1
Fall 97	2	2	2	2	—	1
Spring 98	1	1	1	1	—	—
Fall 98	—	—	1	1	1	1
Spring 99	2	2	1	1	1	1
Fall 99	—	—	—	—	—	1
Spring 00	—	1	1	1	1	1
Fall 00	1	1	—	—	1	1
Spring 01	1	1	1	1	1	1
Fall 01	1	1	—	—	1	1
Spring 02	1	1	1	1	1	1
Spring 03	1	1	—	1	—	1
Fall 03	—	—	—	—	—	1
Spring 04	1	—	—	1	1	1
Spring 05	1	—	1	—	1	1
Fall 05	1	1	1	1	1	1
Fall 06	—	—	1	—	—	1

Spring 07	1	1	—	—	—	2
Fall 07	—	1	1	1	1	—
Spring 08	1	1	Discontinued sampling due to station problems	1	1	1
Fall 08	1	1		1	1	1
Spring 09	—	1		1	1	1
Fall 09	—	—		—	—	—
Spring 10	1	1		1	—	1
Fall 10	1	1		1	1	1
Spring 11	—	—		—	—	—
Fall 11	1	—		1	1	—
Spring 12	1	1		1	1	1
Fall 12	1	1		1	1	1
Spring 2013	1	1		1	1	—
Total	**27**	**27**	**18**	**27**	**25**	**29**

TABLE 3-3
Salt Lake County/UDOT Sampled Storm Events Summary by Month

Year	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.
1992							●		
1993		●		●					
1994								●	
1995							●		
1996			●						
1997							●	●	
1998				●				●	
1999		●	●	●					●
2000			●					●	
2001			●					●	
2002		●							
2003			●						●
2004	●								
2005		●	●					●	
2006							●		
2007			●	●			●		
2008			●					●	
2009			●						
2010		●						●	
2011								●	
2012		●						●	
2013			●						

3.5 QUALITY ASSURANCE / QUALITY CONTROL

Both laboratory and field Quality Assurance/Quality Control (QA/QC) procedures are conducted. Samples are submitted to a State certified lab for analysis. The field QA/QC program consists of obtaining duplicate and split samples for the base and rise grab samples and composite samples to the lab for analysis. The split and duplicate samples serve to validate the original results.

4.0 STORMWATER DATA ANALYSIS

Data collected during storm events is analyzed in various ways to identify trends and make conclusions with regards to stormwater quality in Salt Lake County. Several methodologies are utilized and are presented in this chapter.

4.1 EVENT CONCENTRATION RESULTS

Analyses were conducted on pollutant concentrations of the composite results during a storm event. This analysis was only conducted on six parameters - those considered to be the most prevalent stormwater pollutants. Additional analyses are provided in Appendix C.

4.1.1 Outfall Event Concentrations

An analysis of the average composite pollutant concentrations during this five-year period for each outfall was conducted in order to evaluate differences due to landuse. The results are provided in Table 4-1 and Figure 4-1. Figure 4-1 also presents the cumulative average of all sample results from 1992 - 2013.

TABLE 4-1
Average Outfall Event Concentrations (2009 – 2013)

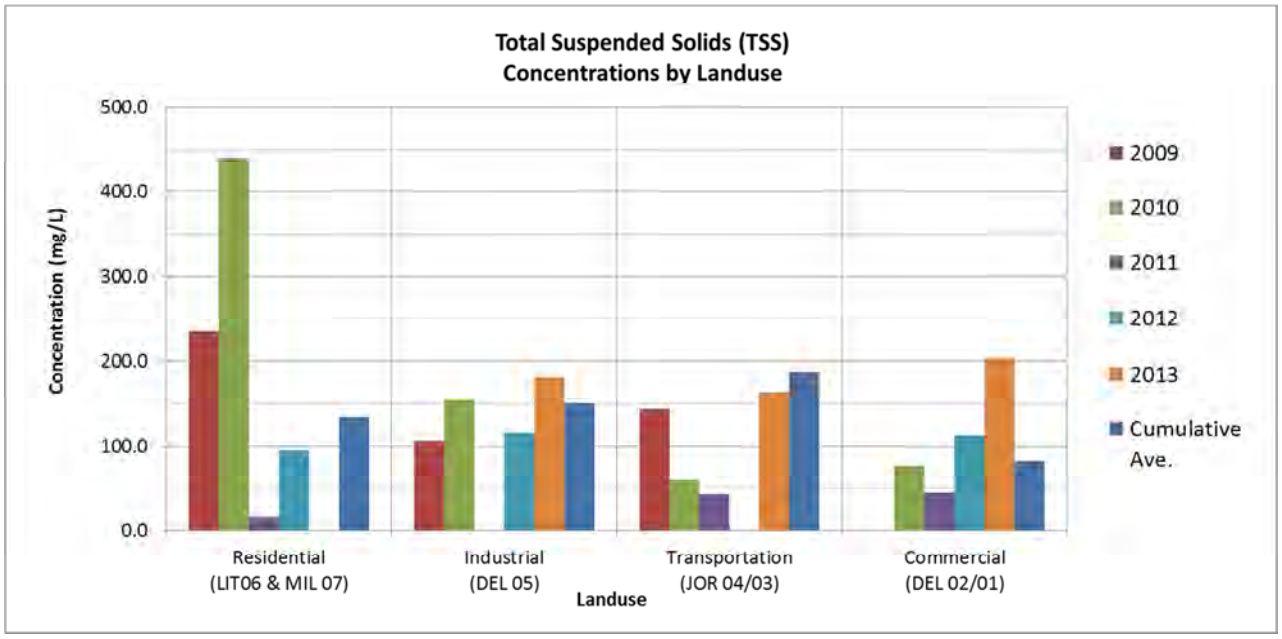
Station	Predominant Landuse	Receiving Water	5-Year Cumulative Average Concentration (mg/L)					
			TSS	T. Phos.	BOD_5	T. Cu	T. Pb	T. Zn
DEL-02/01	Commercial	Decker Lake	82.1	0.30	13.0	0.037	0.026	0.097
DEL-05	Industrial	Decker Lake	150.6	0.41	16.8	0.038	0.029	0.200
JOR-04/03	Transportation	Jordan River	187.6	0.38	11.0	0.058	0.052	0.315
LIT-06 & MIL-7	Residential	Little Cottonwood Creek & Mill Creek	133.3	0.55	05.9	0.044	0.032	0.155

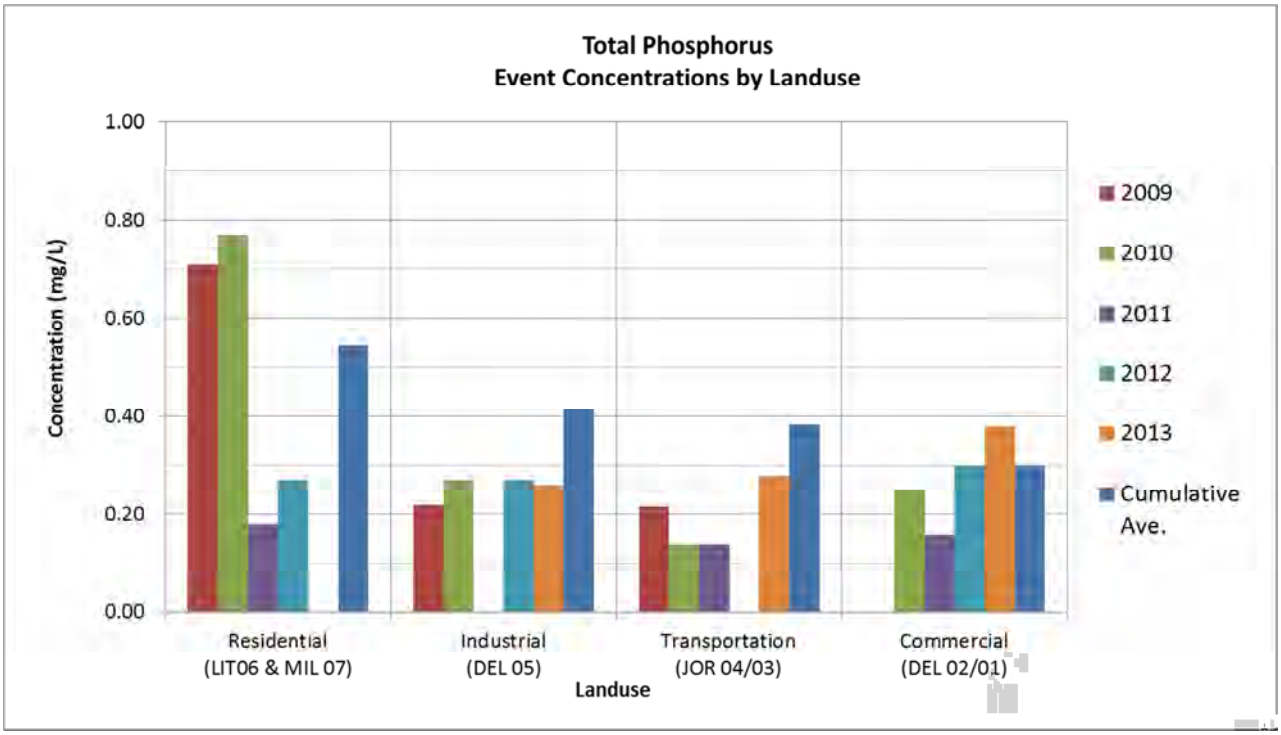
The following is noted in Table 4-1:

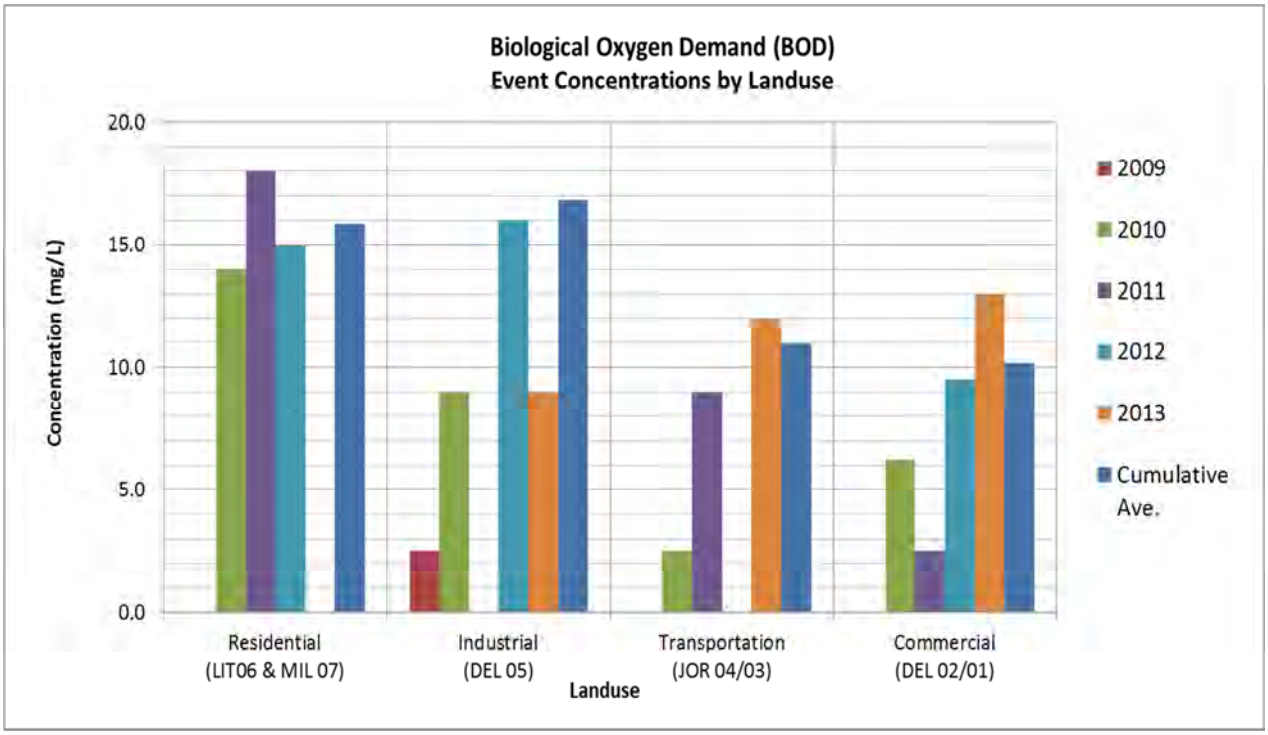
- The commercial landuse had the lowest runoff concentrations of TSS, Total Phosphorus, Total Copper, Total Lead and Total Zinc.
- The industrial landuse had the highest runoff concentrations of BOD_5.
- The transportation landuse had the highest runoff concentrations of TSS, Total Copper, Total Lead and Total Zinc.

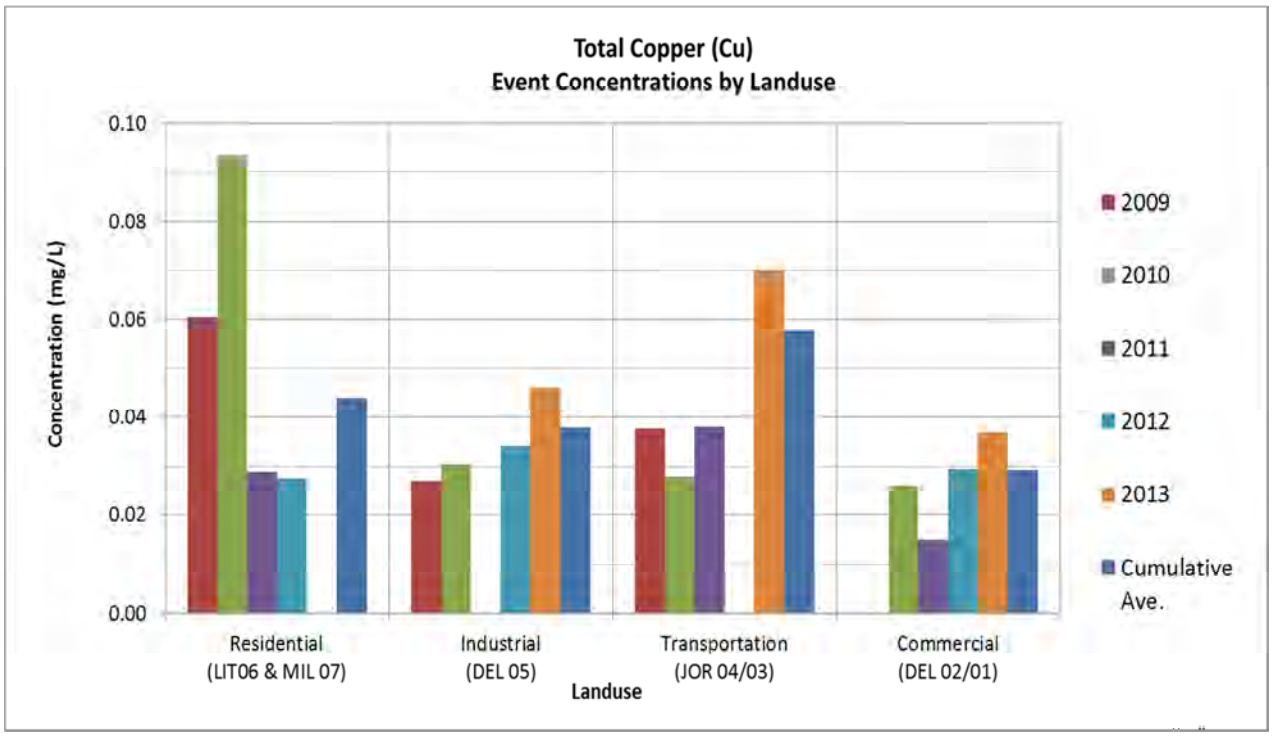
- The residential landuse had the highest runoff concentrations of Total Phosphorus and the lowest runoff concentrations of BOD_5.

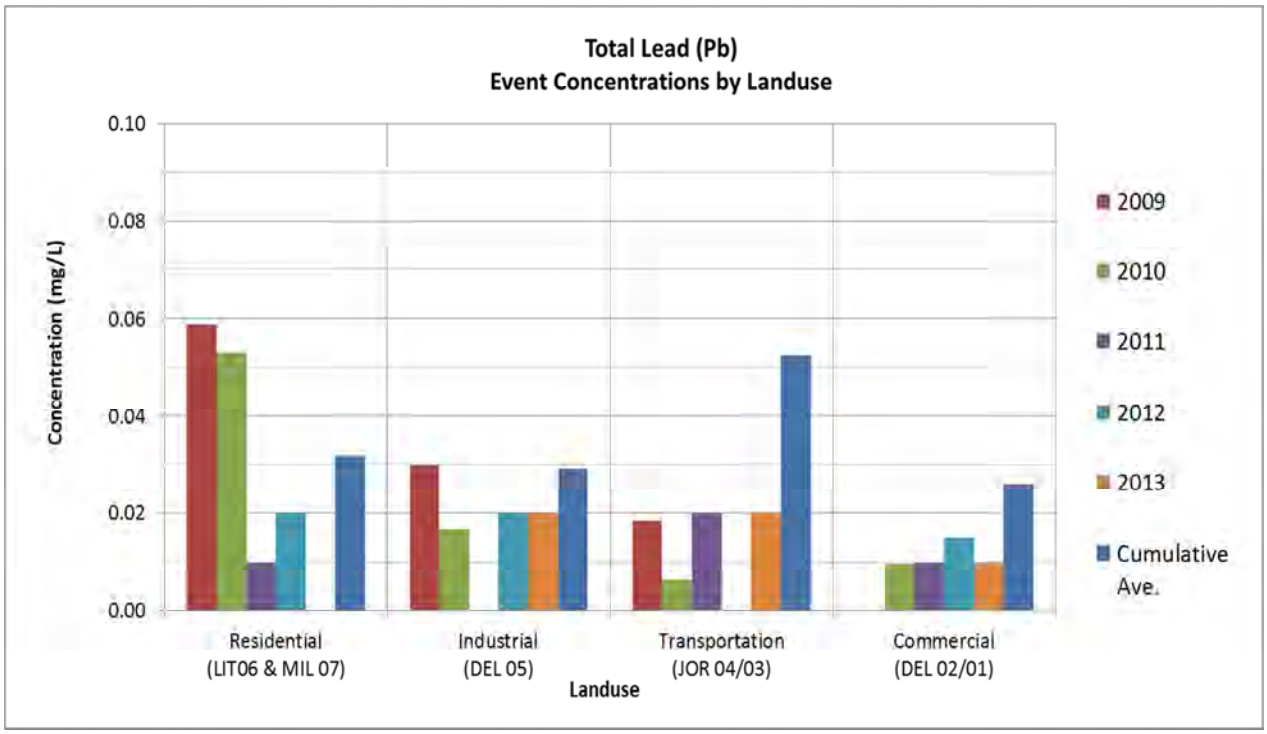
FIGURE 4-1
Outfall Event Concentrations (Average composite sample results/outfall; Cumulative average from 1992 - 2013)

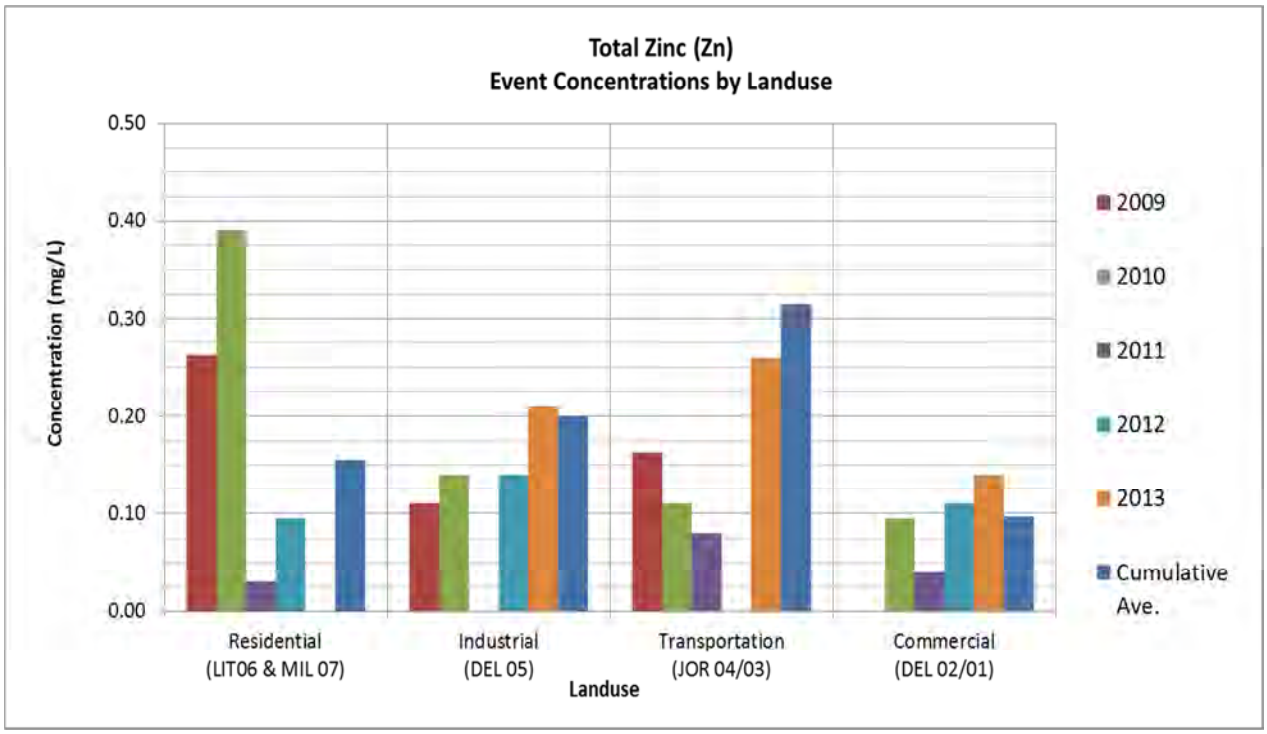





Biological Oxygen Demand (BOD)
Event Concentrations by Landuse
Concentration (mg/L)
20.0
15.0
10.0
5.0
0.0
Residential (LIT06 & MIL 07)
Industrial (DEL 05)
Transportation (JOR 04/03)
Commercial (DEL 02/01)
Landuse
2009
2010
2011
2012
2013
Cumulative Ave.


Total Copper (Cu)
Event Concentrations by Landuse
Concentration (mg/L)
0.10
0.08
0.06
0.04
0.02
0.00
Residential (LIT06 & MIL 07)
Industrial (DEL 05)
Transportation (JOR 04/03)
Commercial (DEL 02/01)
Landuse
2009
2010
2011
2012
2013
Cumulative Ave.

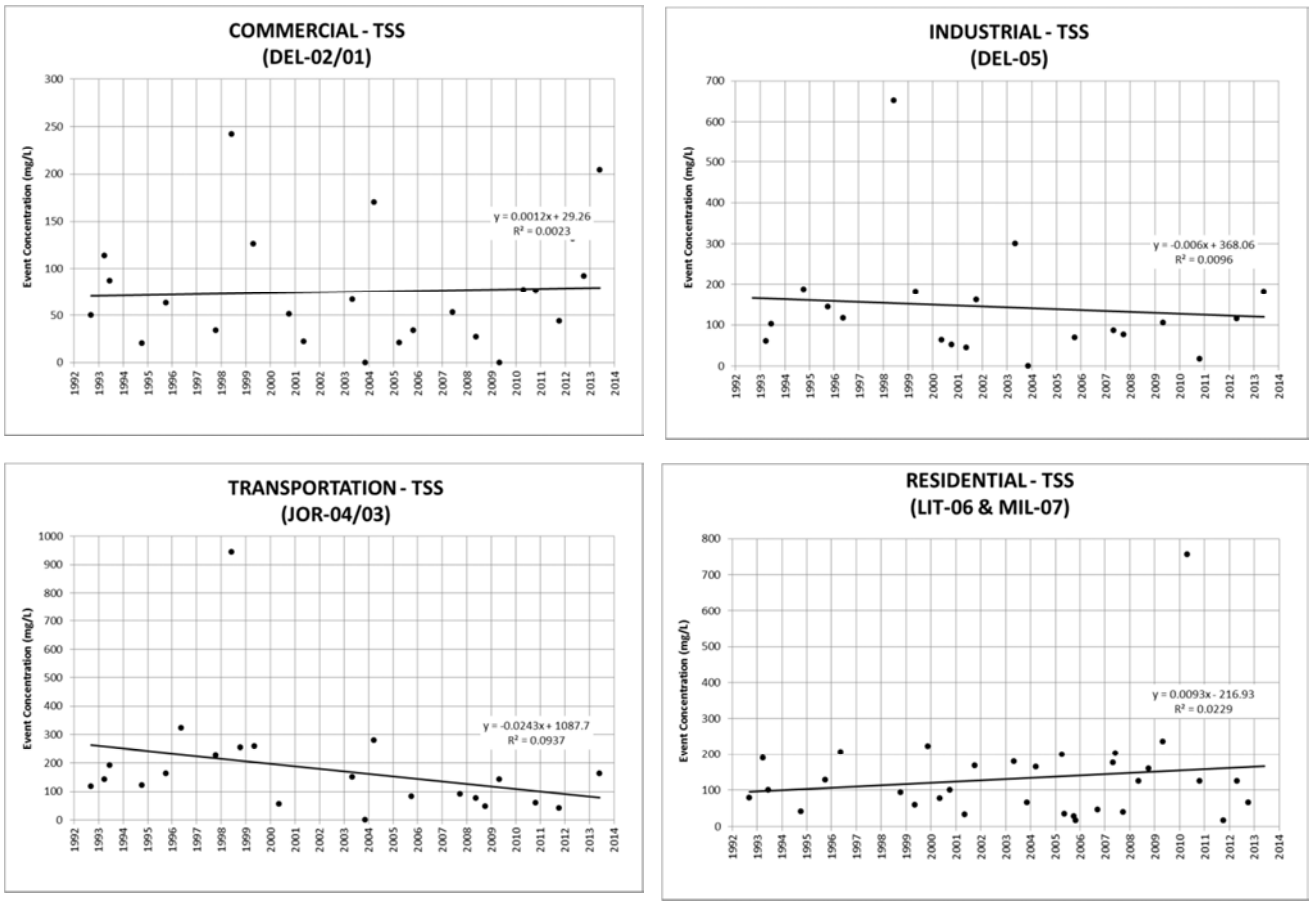

Total Lead (Pb)
Event Concentrations by Landuse
Concentration (mg/L)
0.10
0.08
0.06
0.04
0.02
0.00
Residential (LIT06 & MIL 07)
Industrial (DEL 05)
Transportation (JOR 04/03)
Commercial (DEL 02/01)
Landuse
2009
2010
2011
2012
2013
Cumulative Ave.

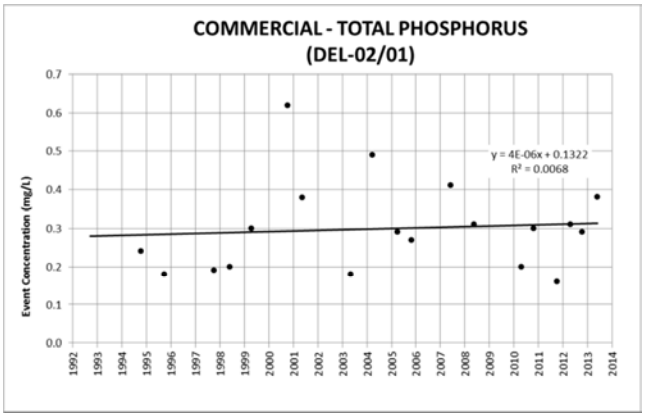

Total Zinc (Zn)
Event Concentrations by Landuse
Concentration (mg/L)
0.50
0.40
0.30
0.20
0.10
0.00
Residential (LIT06 & MIL 07)
Industrial (DEL 05)
Transportation (JOR 04/03)
Commercial (DEL 02/01)
Landuse
2009
2010
2011
2012
2013
Cumulative Ave.

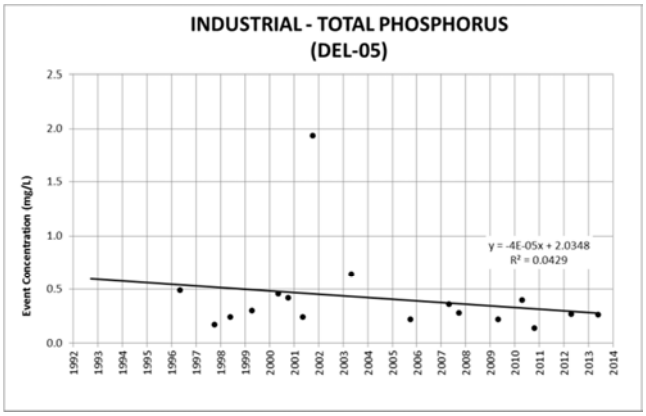
4.1.2 Outfall Event Concentration Trends (Average composite sample results)

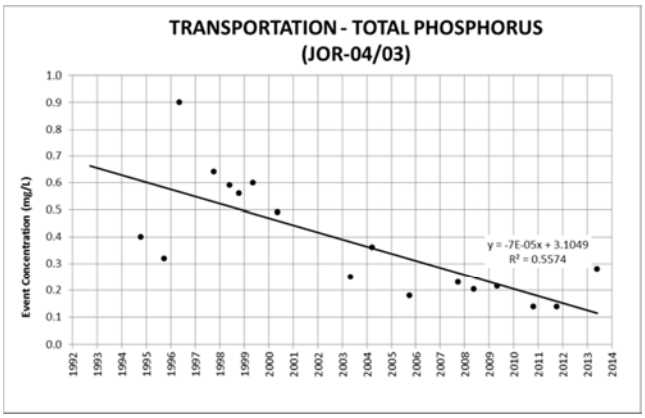
A linear regression analysis was performed on the outfall composite sample results to ascertain if there is an historical trend in landuse (outfall) event concentrations. All composite results to date were utilized (1992 – 2013). In the linear regression analysis, the outfall event concentration was plotted against date of the sampling event and the best-fit line was determined using the least-squares error method. The trend is shown by the slope of the best-fit line (negative slope indicates decreasing concentration and positive slope indicates increasing concentration) and the strength of the trend is measured by the correlation coefficient [R^2] (the closer the value is to 1, the greater the strength of the correlation). A trend analysis for each constituent for each outfall event concentration is presented in Figure 4-2.

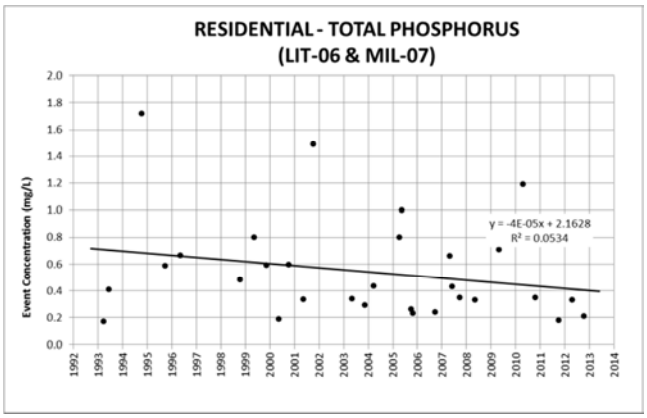
FIGURE 4-2
Outfall Event Concentration Trends (Composite Sampling Results/outfall)

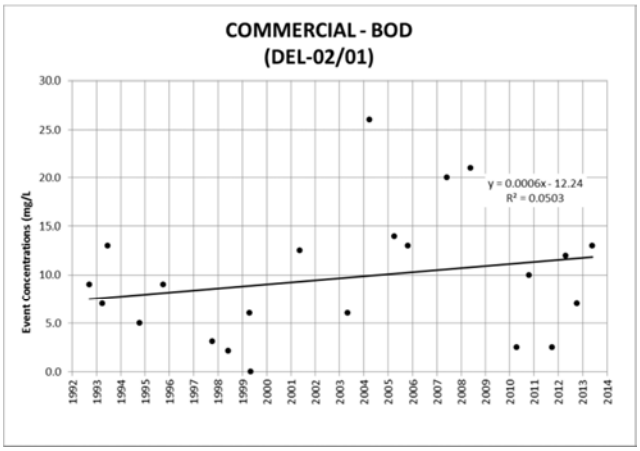


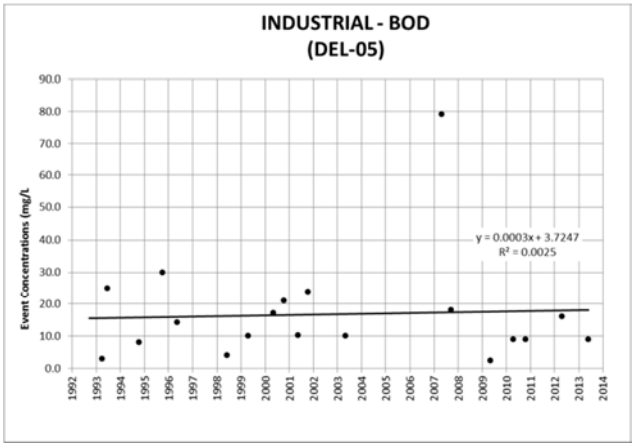

COMMERCIAL - TOTAL PHOSPHORUS
(DEL-02/01)
Event Concentration (mg/L)
y = 4E-06x + 0.1322
R² = 0.0068

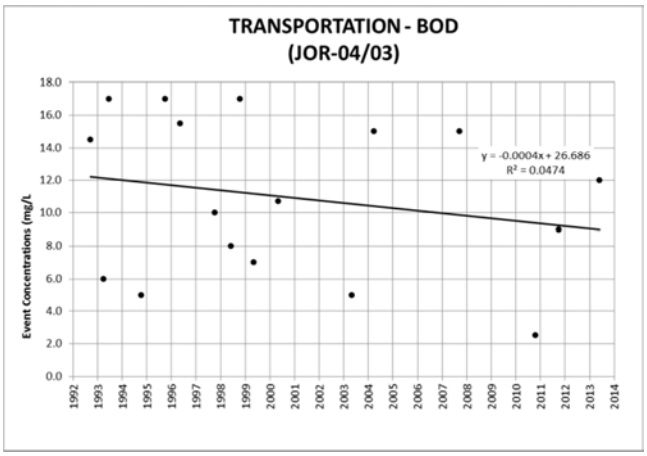

INDUSTRIAL - TOTAL PHOSPHORUS
(DEL-05)
Event Concentration (mg/L)
y = -4E-05x + 2.0348
R² = 0.0429

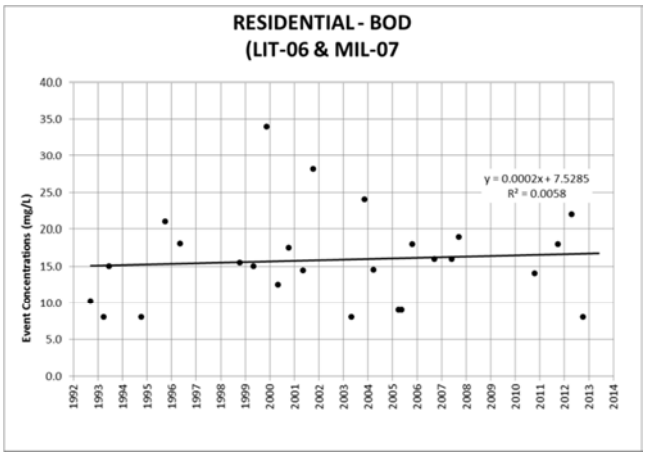

TRANSPORTATION - TOTAL PHOSPHORUS
(JOR-04/03)
Event Concentration (mg/L)
y = -7E-05x + 3.1049
R² = 0.5574

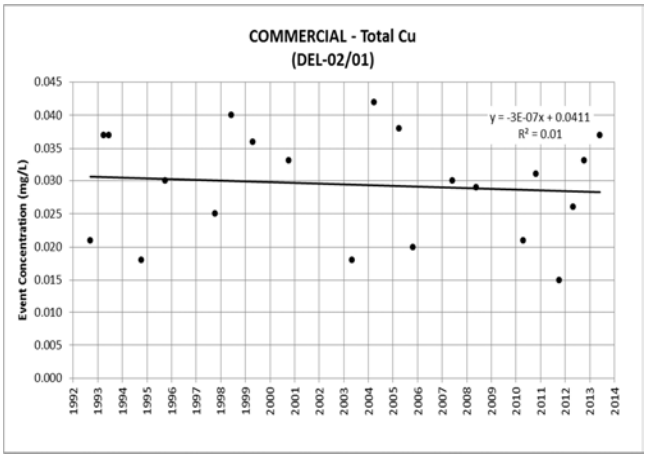

RESIDENTIAL - TOTAL PHOSPHORUS
(LIT-06 & MIL-07)
Event Concentration (mg/L)
y = -4E-05x + 2.1628
R² = 0.0534

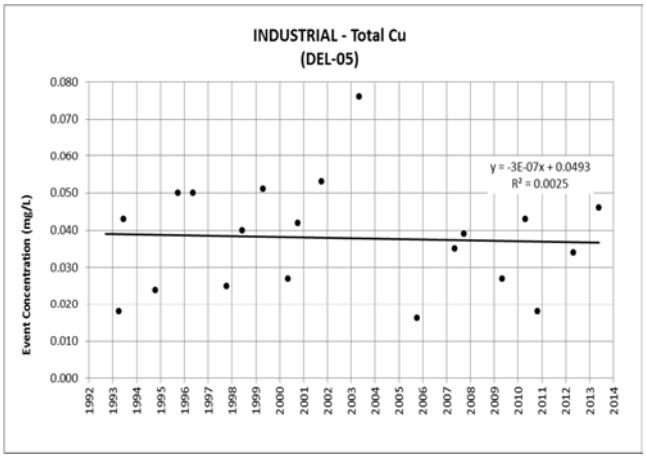

COMMERCIAL - BOD
(DEL-02/01)
Event Concentrations (mg/L
y = 0.0006x - 12.24
R² = 0.0503

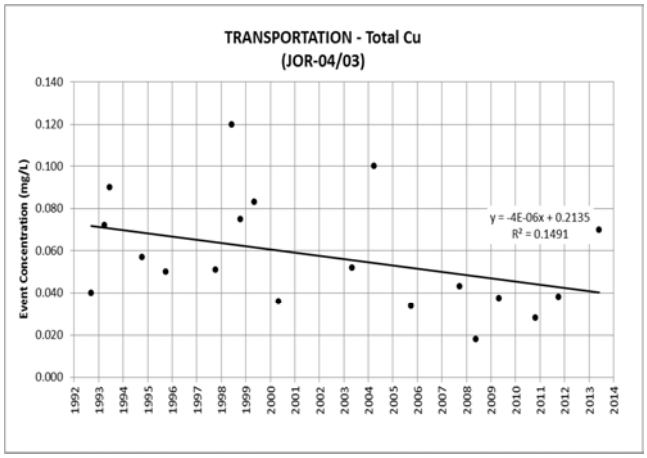

INDUSTRIAL - BOD
(DEL-05)
Event Concentrations (mg/L
y = 0.0003x + 3.7247
R² = 0.0025

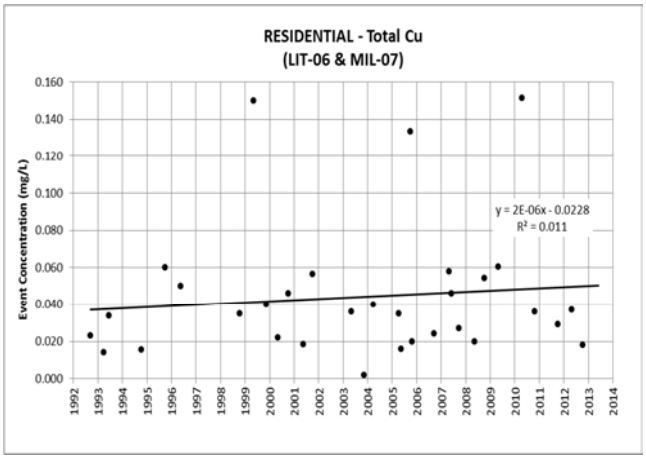

TRANSPORTATION - BOD
(JOR-04/03)
Event Concentrations (mg/L
y = -0.0004x + 26.686
R² = 0.0474

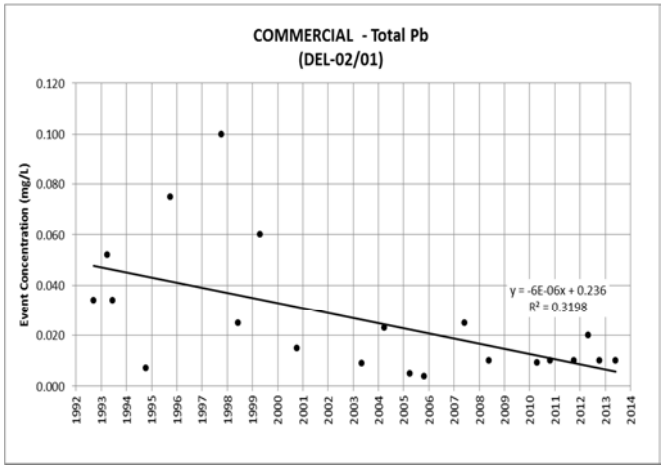

RESIDENTIAL - BOD
(LIT-06 & MIL-07
Event Concentrations (mg/L)
y = 0.0002x + 7.5285
R² = 0.0058

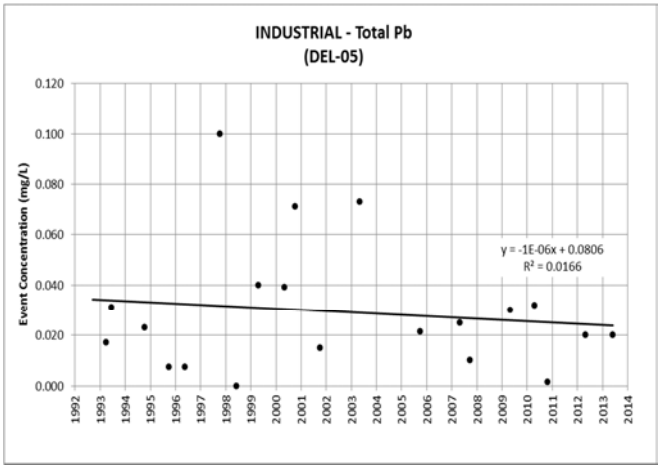

COMMERCIAL - Total Cu
(DEL-02/01)
Event Concentration (mg/L)
y = -3E-07x + 0.0411
R² = 0.01

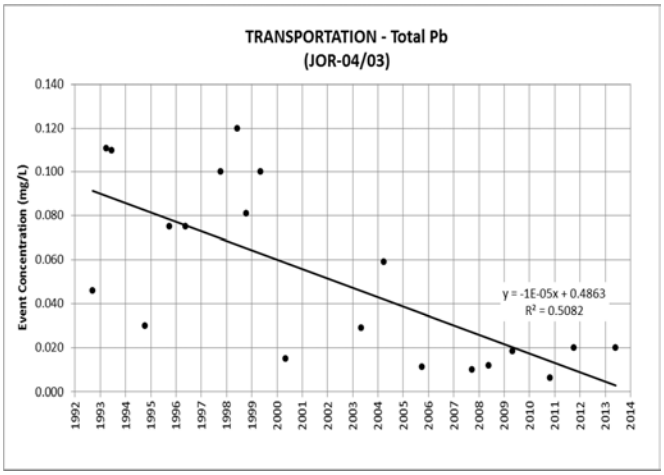

INDUSTRIAL - Total Cu
(DEL-05)
Event Concentration (mg/L)
y = -3E-07x + 0.0493
R² = 0.0025

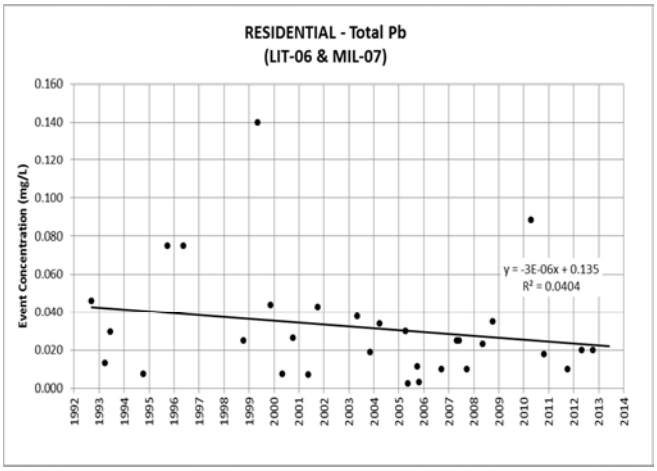

TRANSPORTATION - Total Cu
(JOR-04/03)
Event Concentration (mg/L)
y = -4E-06x + 0.2135
R² = 0.1491

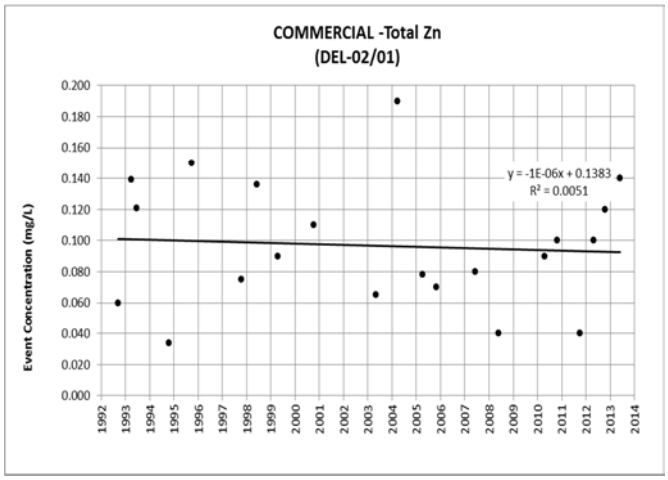

RESIDENTIAL - Total Cu
(LIT-06 & MIL-07)
Event Concentration (mg/L)
y = 2E-06x - 0.0228
R² = 0.011

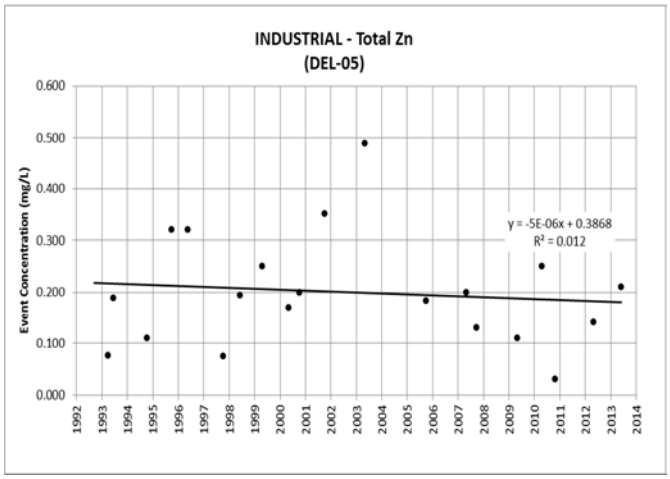

COMMERCIAL - Total Pb
(DEL-02/01)
Event Concentration (mg/L)
y = -6E-06x + 0.236
R² = 0.3198

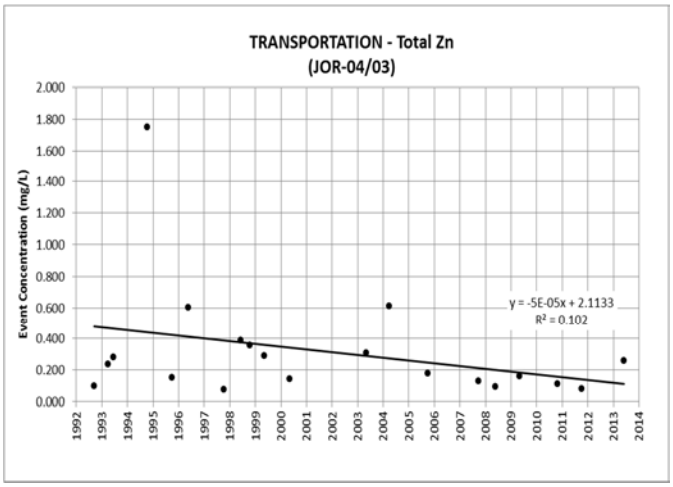

INDUSTRIAL - Total Pb
(DEL-05)
Event Concentration (mg/L)
y = -1E-06x + 0.0806
R² = 0.0166

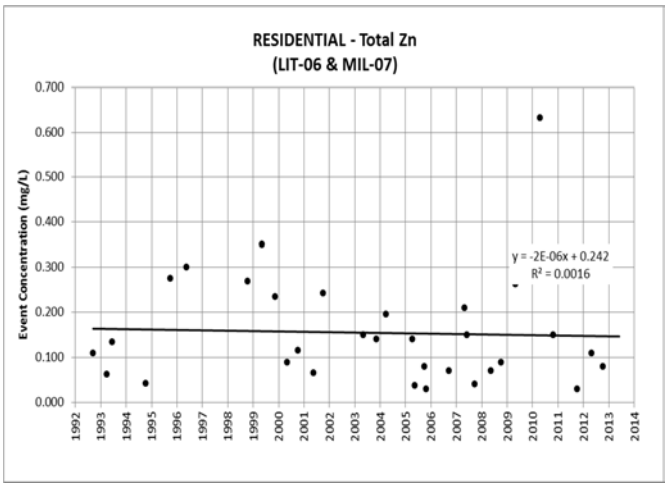

TRANSPORTATION - Total Pb
(JOR-04/03)
Event Concentration (mg/L)
y = -1E-05x + 0.4863
R² = 0.5082


RESIDENTIAL - Total Pb
(LIT-06 & MIL-07)
Event Concentration (mg/L)
y = -3E-06x + 0.135
R² = 0.0404


COMMERCIAL -Total Zn
(DEL-02/01)
Event Concentration (mg/L)
y = -1E-06x + 0.1383
R² = 0.0051


INDUSTRIAL - Total Zn
(DEL-05)
Event Concentration (mg/L)
y = -5E-06x + 0.3868
R² = 0.012





The results of this trend analysis indicate a general decrease in these stormwater pollutants. The following specific trends were noted:

- TSS showed a slight increase in commercial and residential landuses, however, the strength of the trend was poor (R^2 = 0.002 and 0.02 respectively). The TSS concentrations in the industrial and transportation landuses showed a general decrease; the decrease for transportation had the strongest correlation (R^2 = 0.094).
- Total Phosphorus trends were downward with the exception of the commercial landuse, which showed a poor strength of trend (R^2 = 0.007).
- BOD_5 trends were generally upwards with the exception of the transportation landuse.
- Total Copper trended downwards with the exception of the residential landuse. Total Lead trended downwards in all landuses, particularly in the transportation, with a strong trend (R^2 = 0.5). Total Zinc also trended downwards, however, the strength of the trend was poor in commercial, residential and transportation landuses (R^2 between 0.01 and 0.002).

4.2 EVENT MEAN CONCENTRATIONS

Event Mean Concentrations (EMCs) for constituents are calculated at each outfall using the composite sample results only. Initially, outliers are removed from the results using *Grubbs Test for Outliers* (Motulsky, 1997). To calculate an EMC, the calculated loading per event for each of the sampled storms is summed and divided by the total precipitation for the sampled events. The result is divided by the serviced basin area and runoff coefficient and converted to milligrams per liter. The following equation was used:

$$EMC = \frac{\Sigma L_x \bullet 12}{\Sigma P \bullet R_a \bullet A_s \bullet 2.72}$$

where: L_x = load for the storm event (pounds)

P = precipitation for the storm event (inches)

R_a = weighted average runoff coefficient based on land use of serviced area

A_s = serviced area of basin (acres)

(12 and 2.72 are conversion factors for pounds to mg/L)

The EMCs for each constituent were calculated on a storm event basis and averaged to obtain an EMC for unincorporated Salt Lake County. The EMCs are computed from the sum of the loads for each of the sampled storm events. Table 4-2 summarizes the EMCs for six constituents; Figures 4-3 and 4-4 present this data graphically; a complete list of the EMCs is provided in Appendix D.

TABLE 4-2
Unincorporated Salt Lake County Event Mean Concentration Summary

Constituent	2009 EMC (mg/L)	2010 EMC (mg/L)	2011 EMC (mg/L)	2012 EMC (mg/L)	2013 EMC (mg/L)
Total Suspended Solids	126	144	139	137	137
Total Phosphorus	0.6	0.61	0.59	0.56	0.53
BOD_5	14.5	14.5	14.6	14.7	14.7
Total Copper	0.0415	0.0443	0.0435	0.0427	0.0427
Total Lead	0.038	0.0405	0.0396	0.039	0.039
Total Zinc	0.1546	0.1678	0.1622	0.1596	0.1596

FIGURE 4-3
Salt Lake County Stormwater TSS, BOD, Total Phosphorus EMCs

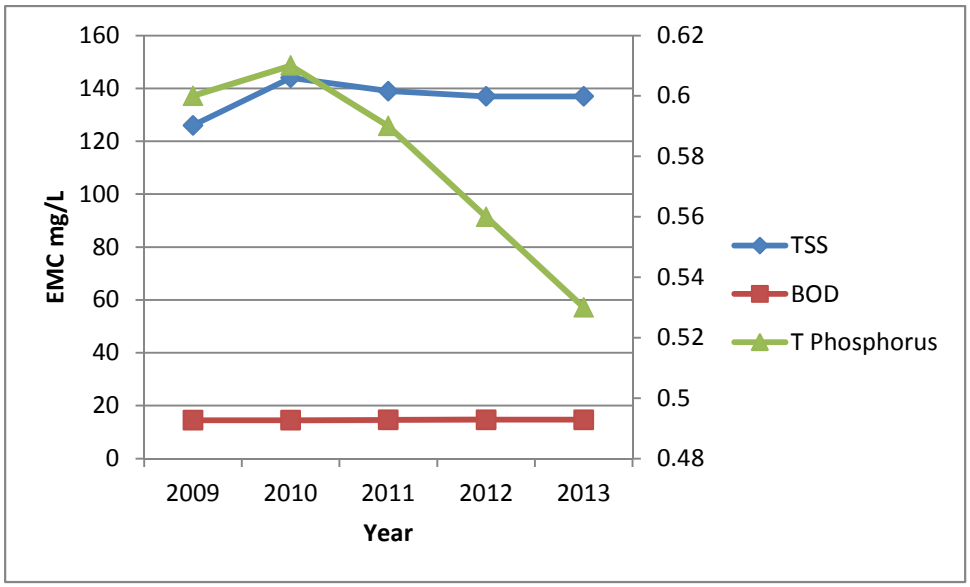
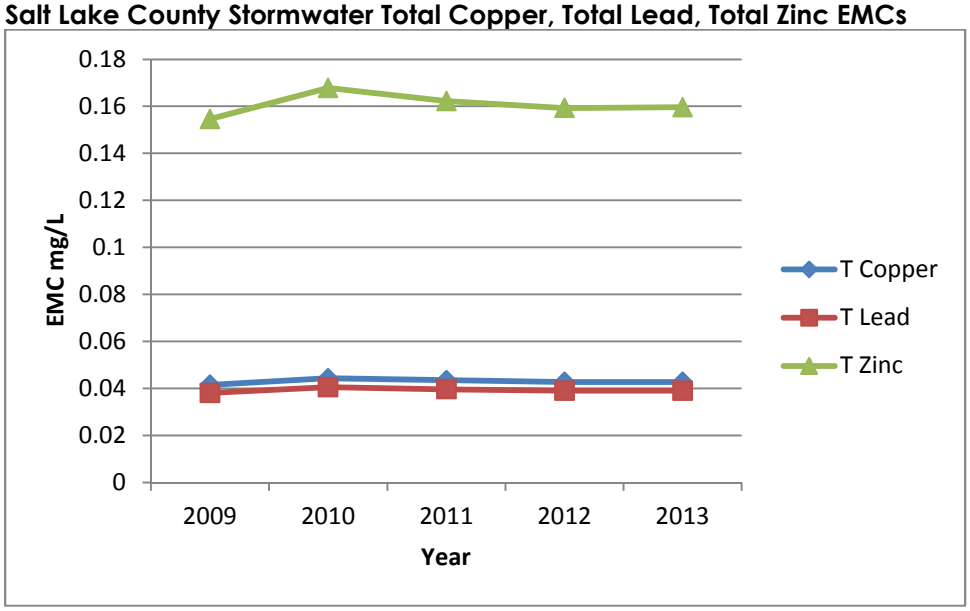


FIGURE 4-4
Salt Lake County Stormwater Total Copper, Total Lead, Total Zinc EMCs

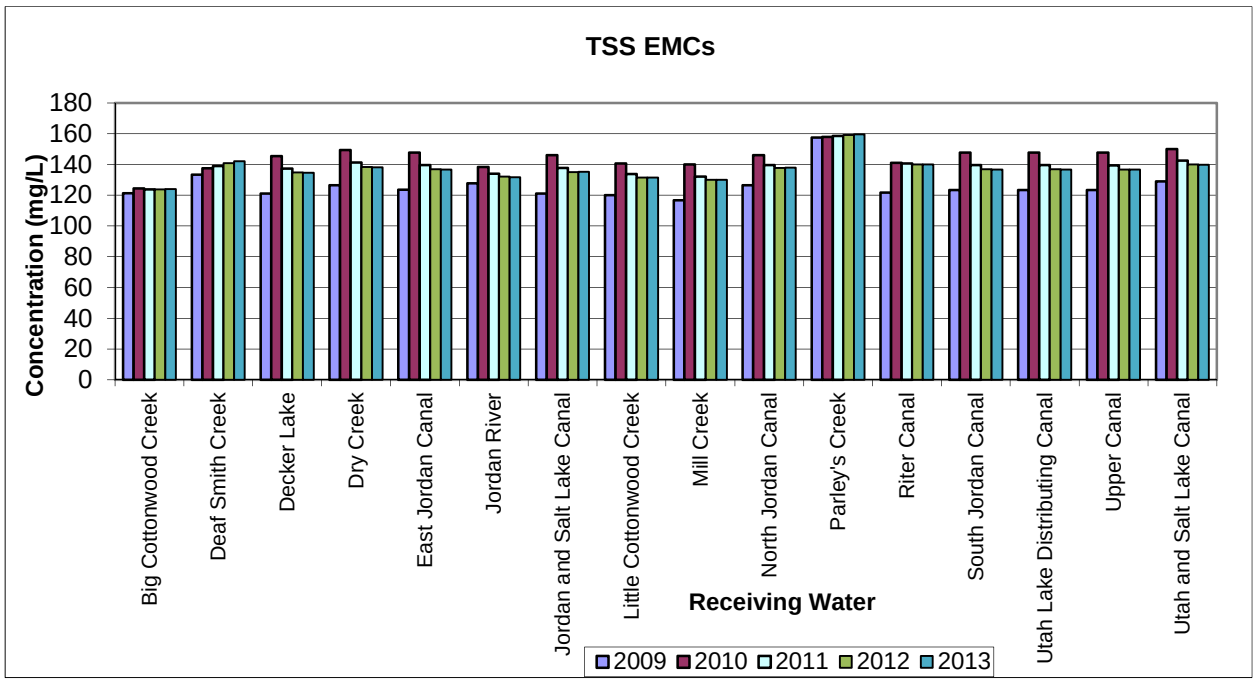


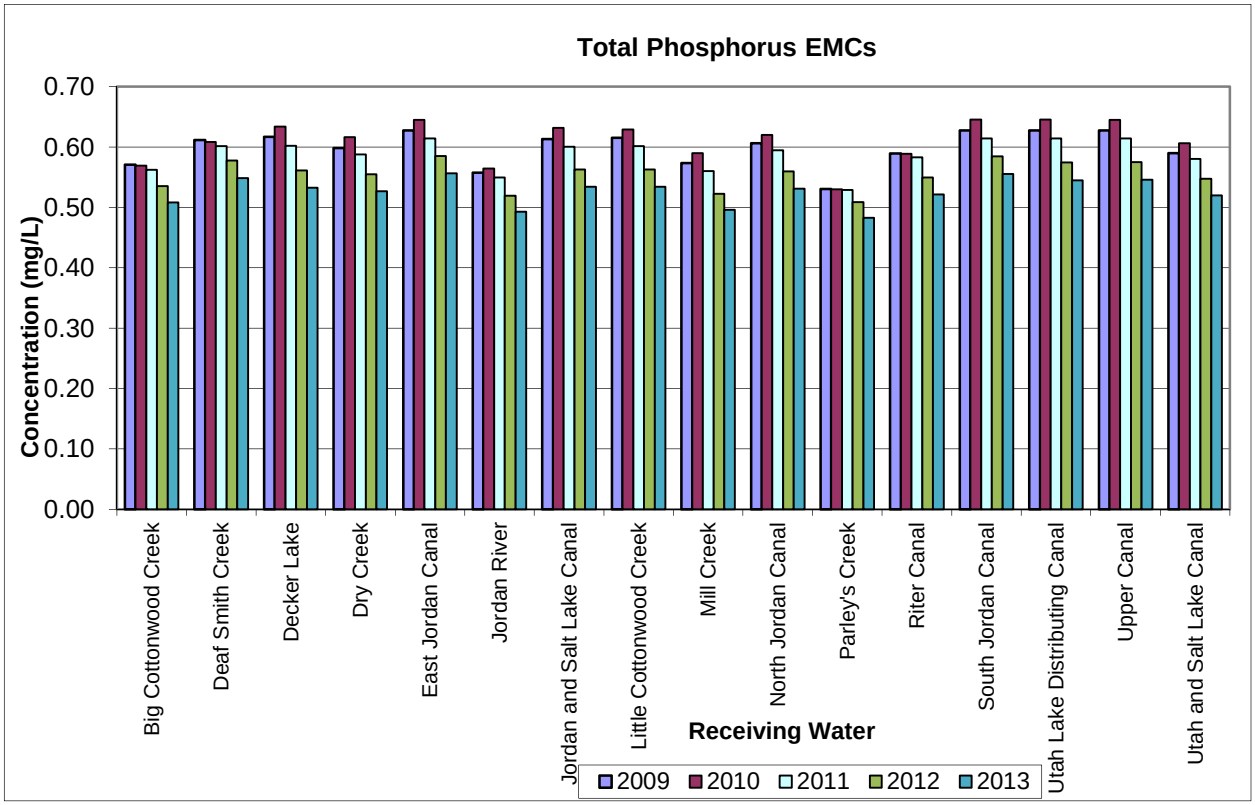
There was a general decrease EMCs during the 5-year period from 2009 to 2013. It is difficult to attribute this decrease to any particular action; Salt Lake County continues to implement the Stormwater Management Plan and stormwater BMPs in compliance with the UPDES permit. It can be assumed that these activities, including a strong public education program, contribute to this decrease, this, in spite of an increase in population. It is noted that the EMCs are stabilizing (with the exception of total phosphorus which is decreasing), providing a good estimate of overall stormwater quality in the Salt Lake valley.

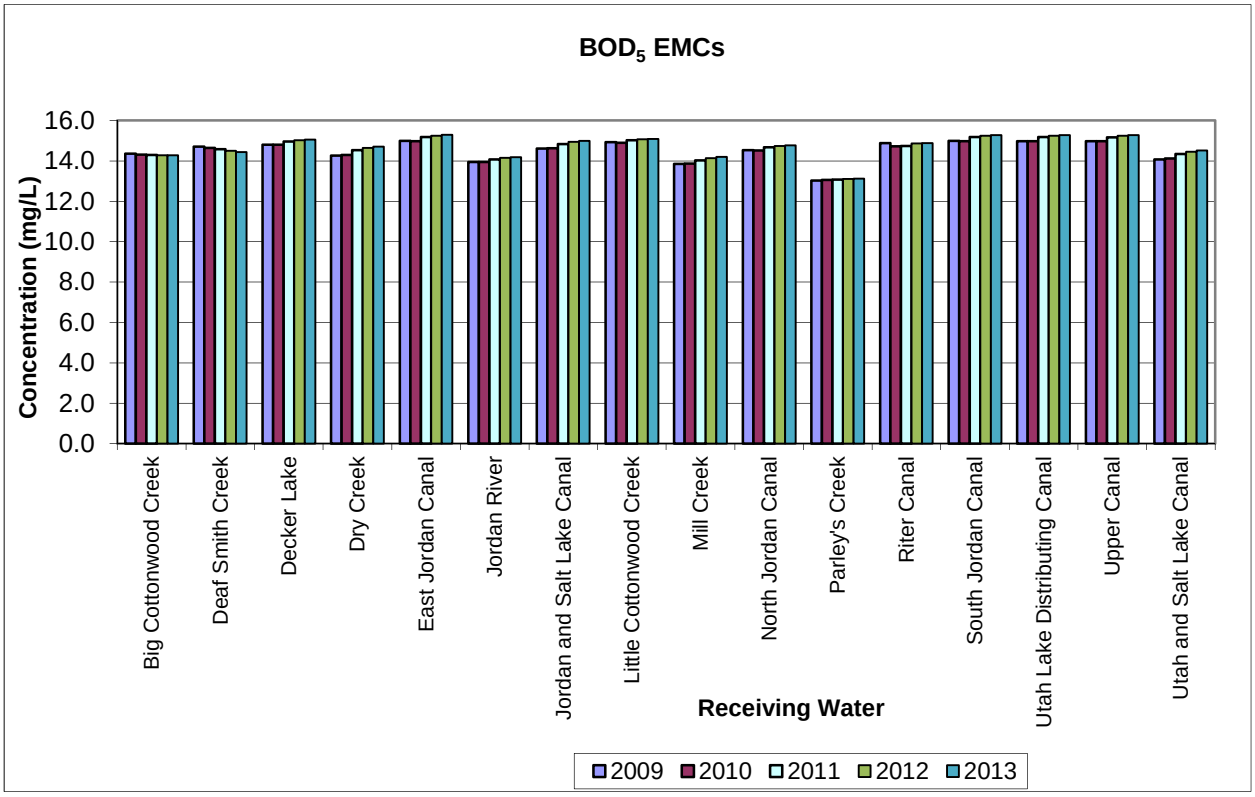
4.2.1 Receiving Water Event Mean Concentrations

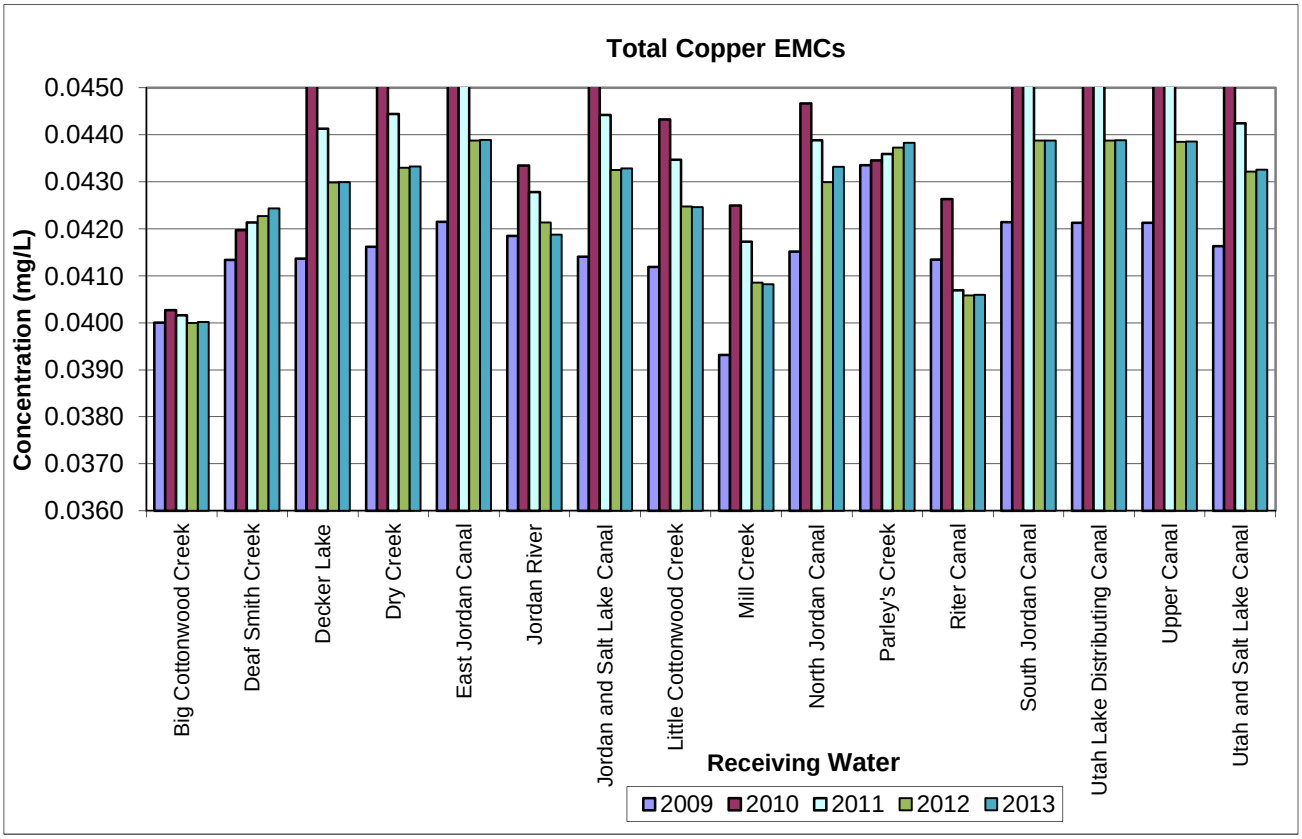
Event Mean Concentrations (EMCs) were calculated for stormwater discharges to specific receiving waters in Salt Lake County. This provides information regarding pollutants being discharged into specific waterbodies and may assist in identifying priority areas. Figure 4-5 presents these results; Figure 4-6 identifies the landuses in these basins.

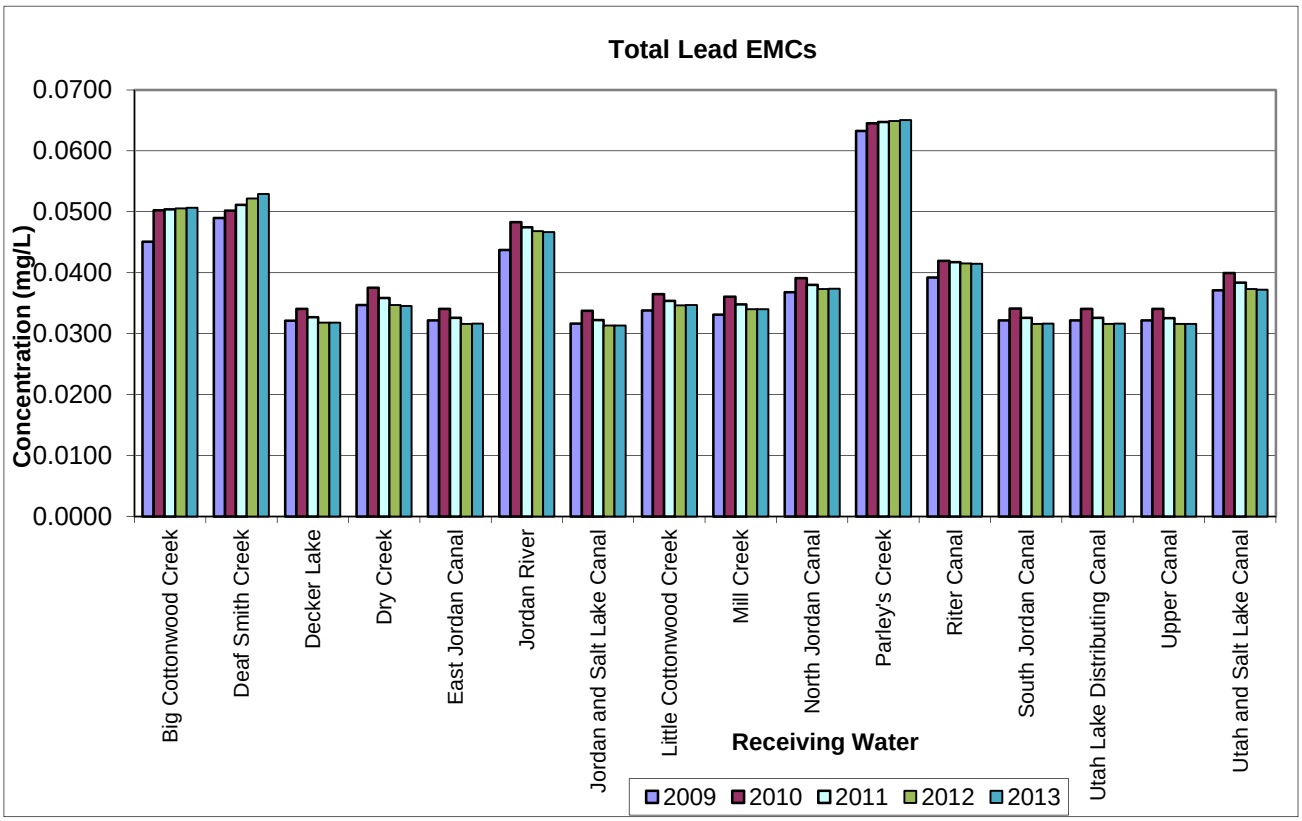
FIGURE 4-5
EMCs by Receiving Waters




Total Phosphorus EMCs
Concentration (mg/L)
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
Big Cottonwood Creek
Deaf Smith Creek
Decker Lake
Dry Creek
East Jordan Canal
Jordan River
Jordan and Salt Lake Canal
Little Cottonwood Creek
Mill Creek
North Jordan Canal
Parley's Creek
Riter Canal
South Jordan Canal
Utah Lake Distributing Canal
Upper Canal
Utah and Salt Lake Canal
Receiving Water
2009
2010
2011
2012
2013


BOD5 EMCs
Concentration (mg/L)
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
Big Cottonwood Creek
Deaf Smith Creek
Decker Lake
Dry Creek
East Jordan Canal
Jordan River
Jordan and Salt Lake Canal
Little Cottonwood Creek
Mill Creek
North Jordan Canal
Parley's Creek
Riter Canal
South Jordan Canal
Utah Lake Distributing Canal
Upper Canal
Utah and Salt Lake Canal
Receiving Water
2009
2010
2011
2012
2013


Total Copper EMCs
Concentration (mg/L)
0.0450
0.0440
0.0430
0.0420
0.0410
0.0400
0.0390
0.0380
0.0370
0.0360
Big Cottonwood Creek
Deaf Smith Creek
Decker Lake
Dry Creek
East Jordan Canal
Jordan River
Jordan and Salt Lake Canal
Little Cottonwood Creek
Mill Creek
North Jordan Canal
Parley's Creek
Riter Canal
South Jordan Canal
Utah Lake Distributing Canal
Upper Canal
Utah and Salt Lake Canal
Receiving Water
2009
2010
2011
2012
2013


Total Lead EMCs
Concentration (mg/L)
0.0700
0.0600
0.0500
0.0400
0.0300
0.0200
0.0100
0.0000
Big Cottonwood Creek
Deaf Smith Creek
Decker Lake
Dry Creek
East Jordan Canal
Jordan River
Jordan and Salt Lake Canal
Little Cottonwood Creek
Mill Creek
North Jordan Canal
Parley's Creek
Riter Canal
South Jordan Canal
Utah Lake Distributing Canal
Upper Canal
Utah and Salt Lake Canal
Receiving Water
2009
2010
2011
2012
2013

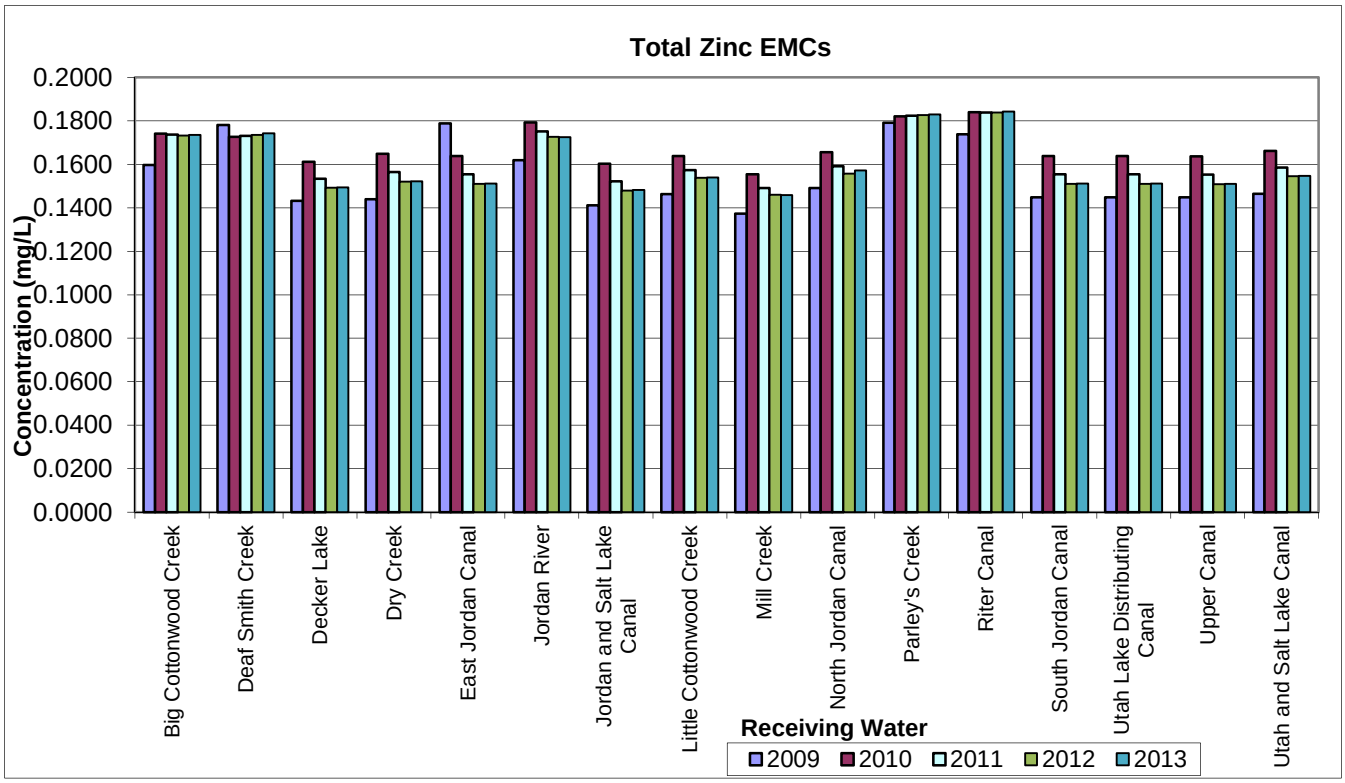
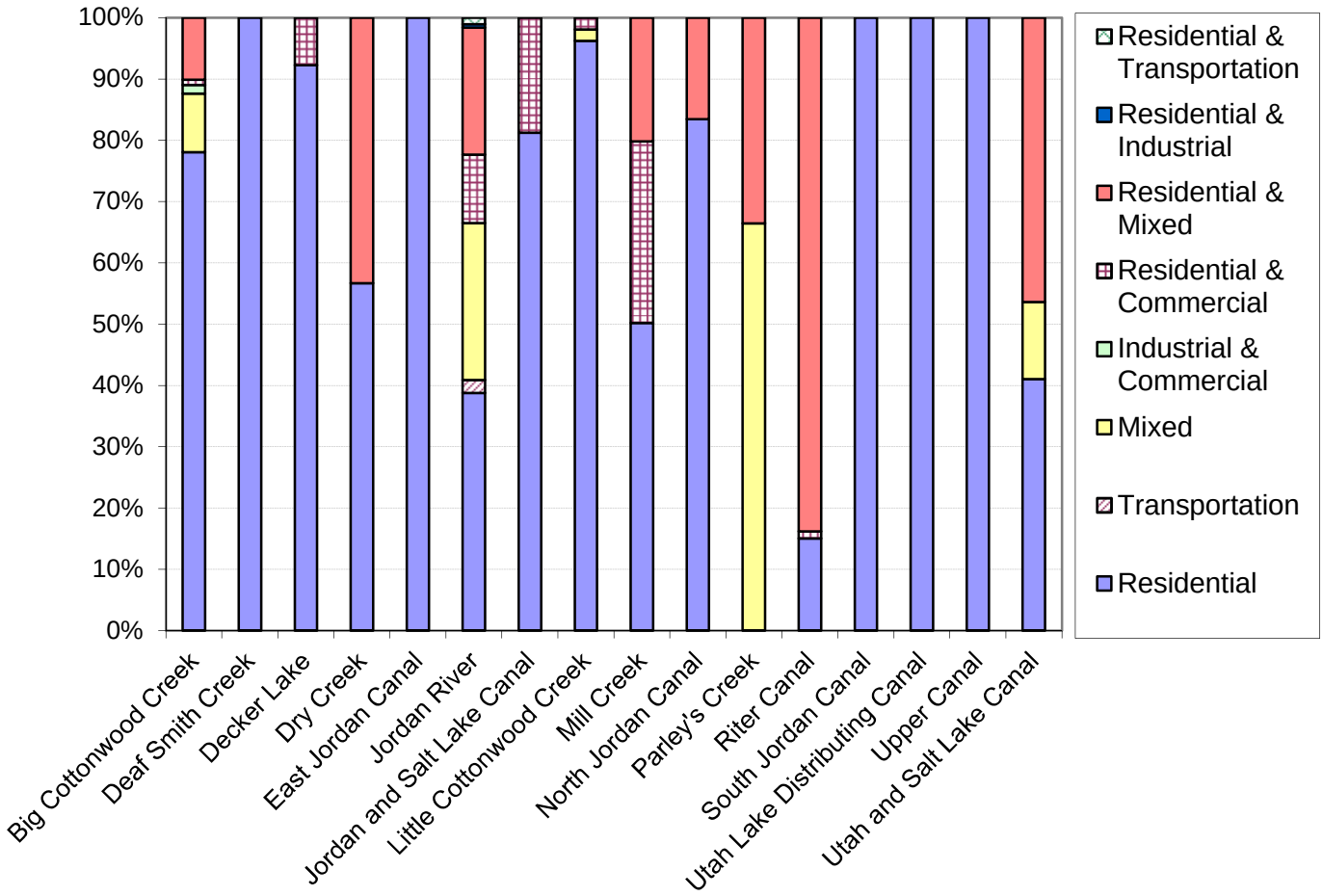

Total Zinc EMCs
Concentration (mg/L)
0.2000
0.1800
0.1600
0.1400
0.1200
0.1000
0.0800
0.0600
0.0400
0.0200
0.0000
Big Cottonwood Creek
Deaf Smith Creek
Decker Lake
Dry Creek
East Jordan Canal
Jordan River
Jordan and Salt Lake Canal
Little Cottonwood Creek
Mill Creek
North Jordan Canal
Parley's Creek
Riter Canal
South Jordan Canal
Utah Lake Distributing Canal
Upper Canal
Utah and Salt Lake Canal
Receiving Water
2009
2010
2011
2012
2013

FIGURE 4-6
Landuse by Receiving Water



The landuses for each basin are based on outfall catchment, and do not reflect overland flow from non-connected areas. The following trends are noted for the receiving water EMC results:

- The 2013 TSS and Total Copper EMCs for Big Cottonwood Creek were the lowest compared to the other receiving waters. The Total Copper EMC is consistently lower in Big Cottonwood Creek during this five-year period. The majority of the landuse in this basin is residential.
- In 2013, Parleys Creek had the highest TSS and Total Lead EMCs, and the lowest Total Phosphorus and BOD EMCs. The EMC for Total Lead in Parleys Creek is consistently higher than the other receiving waters for this five-year period. The landuse in this basin consists of mixed and residential mixed.

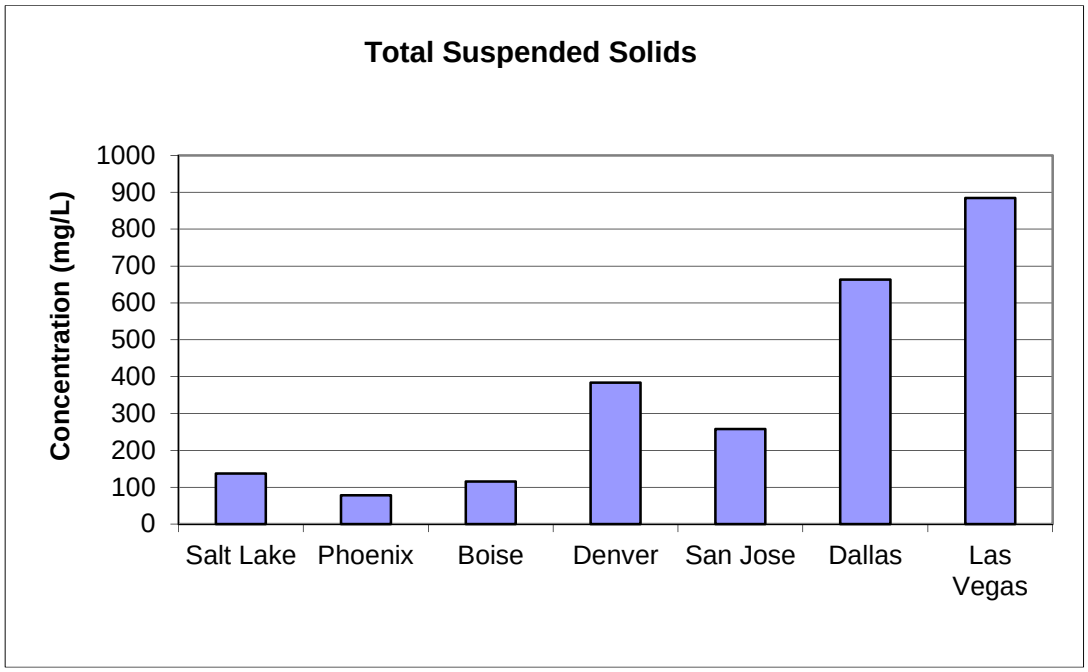
- Mill Creek had the lowest Total Zinc EMC and the Riter Canal had the highest Total Zinc EMC in 2013. Mill Creek's landuse is 50% residential and 30 % residential/commercial. The landuse for the Riter Canal is mostly residential/mixed.
- In general, the Total Phosphorus EMC is lower in all receiving waters in 2013.
- BOD EMCs remained relatively stable through all receiving waters during this five-year period.

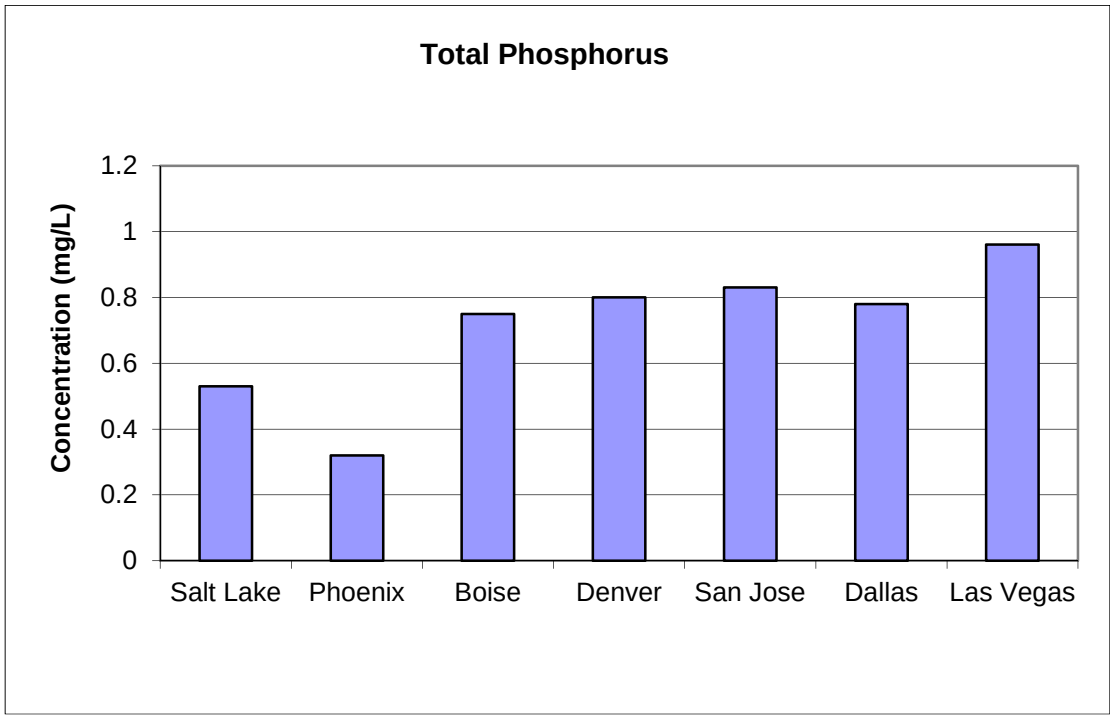
4.2.2 Municipality Event Mean Concentration Comparison

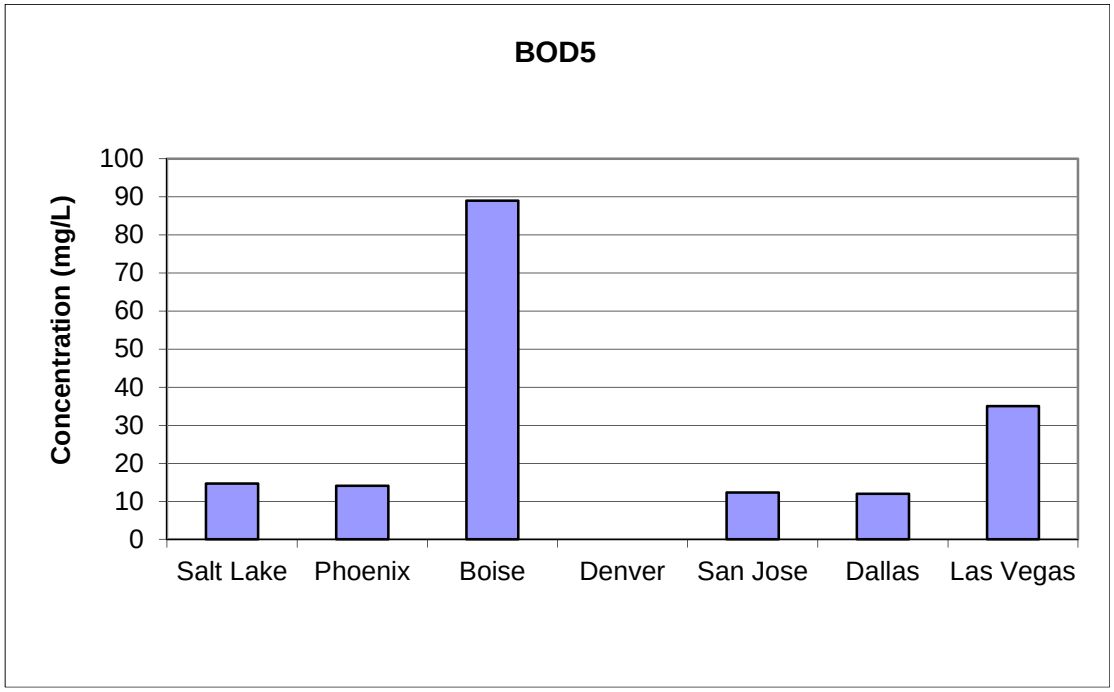
A comparison of EMCs was conducted to determine how the Salt Lake County EMC corresponds with other municipalities with similar dry climates. The municipalities chosen for the comparison were Phoenix, Arizona; Boise, Idaho; Denver, Colorado; San Jose, California; Dallas, Texas and Las Vegas, Nevada (The Practice of Watershed Protection: Article 66, 2000). While it is recognized that this data is dated, it provides a good method of comparison.

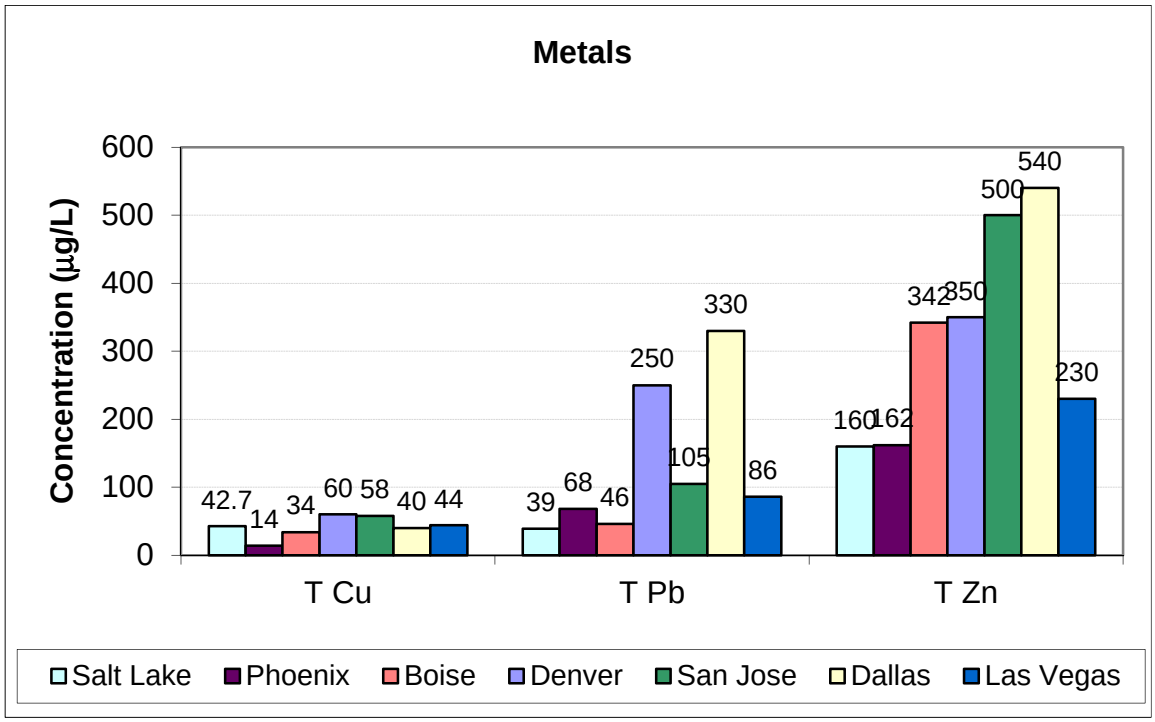
Figure 4-7 shows the breakdown of the comparison with Salt Lake County EMCs. The graphs indicate that Salt Lake County's EMCs are typically lower in comparison with the other municipalities.

FIGURE 4.7
Municipal EMC Comparison




Total Phosphorus
Concentration (mg/L)
1.2
1
0.8
0.6
0.4
0.2
0
Salt Lake
Phoenix
Boise
Denver
San Jose
Dallas
Las Vegas


BOD5
Concentration (mg/L)
100
90
80
70
60
50
40
30
20
10
0
Salt Lake
Phoenix
Boise
Denver
San Jose
Dallas
Las Vegas



A review of current permit monitoring requirements and stormwater monitoring for these cities included in this comparison is presented in Appendix D.

4.3 ANNUAL STORMWATER POLLUTANT LOADS

Salt Lake County uses the stormwater data to calculate an estimate of annual cumulative pollutant loadings from the stormwater system. A statistical method is utilized in the estimation of annual pollutant loads to provide a comparative number for outfalls. The results of this analysis should only be used for comparative purposes. The following equation, based on EPA guidance, is used to estimate annual pollutant loads:

$$L_i = [(P_a)(P_j)(R_a)/12](EMC)(A_s)(2.72)$$

where:

L_i = annual pollutant loading (lbs)

P_a = annual rainfall depth (inches) = 15.3

P_j = correction factor for storms that produce no runoff = 0.9

R_a = weighted average runoff coefficient

EMC = calculated event mean concentration of pollutant

A_s = catchment area serviced by existing stormwater facilities (acres)

(12 and 2.72 are conversion factors)

This equation is used to estimate the annual pollutant loadings from unincorporated County outfalls for the constituents sampled during the representative storm sampling program. The following charts present the loads estimated for the last five-year period.

Figure 4-8
Unincorporated County Estimated Pollutant Loads – TSS, BOD and Total Phosphorus

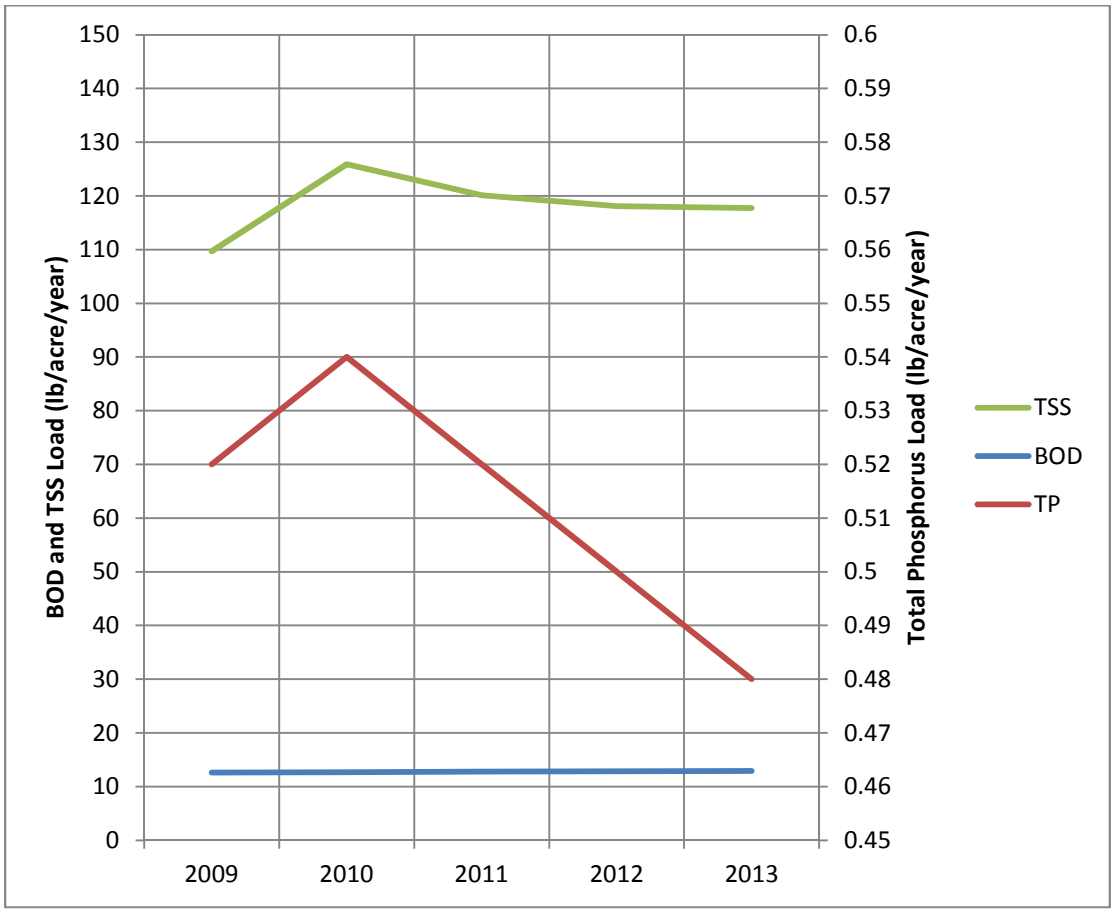
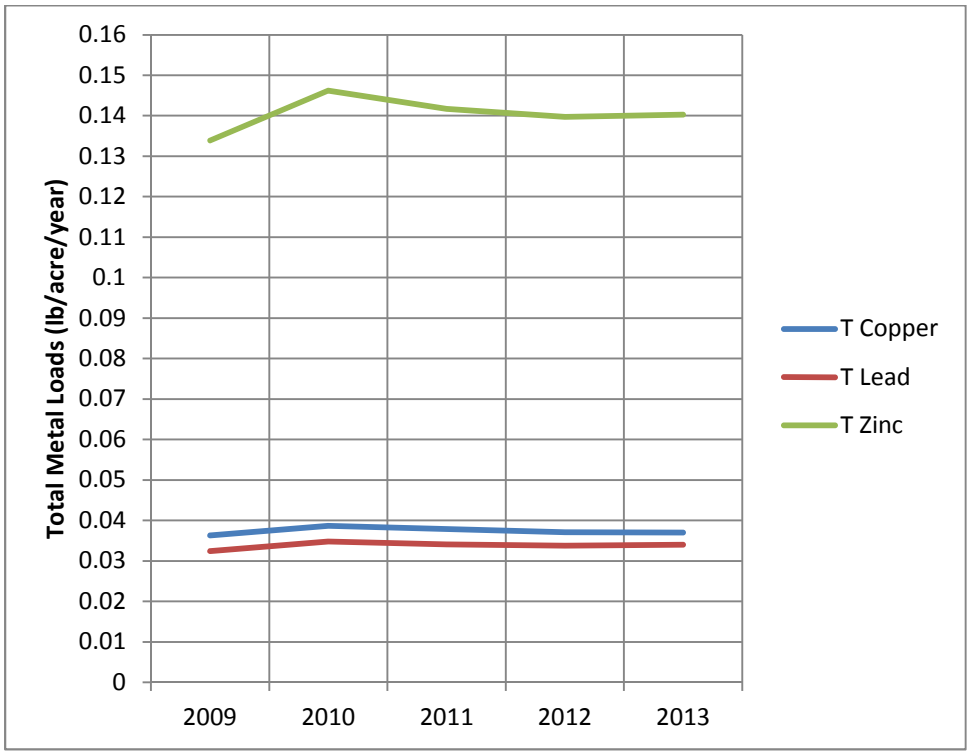


Figure 4-9
Unincorporated County Estimated Pollutant Loads – Total Copper, Total Lead and Total Zinc



In general, the results of this comparison indicate either an overall decrease or leveling of the pollutant loads within unincorporated County. The County will continue representative sampling, implementing the Stormwater Management Plan and evaluating stormwater BMPs.

4.4 ADDITIONAL MONITORING

Additional stormwater analyses may be of value in the future when considering BMP implementation and monitoring plans. The following list is presented as suggestions for additional analysis:

- Instream Sampling - currently representative sampling is conducted on six stormwater outfalls. Instream water quality sampling during storm events would serve to accurately describe and portray the response of stream water quality to stormwater runoff inputs.

- County-wide Stormwater Quality - currently, stormwater analyses are conducted in unincorporated Salt Lake County. The inclusion of the entire county may be beneficial for watershed management purposes.

5.0 REFERENCES

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Salt Lake County, 1991. UPDES Permit Application for Discharges from Municipal Separate Storm Sewer Systems. Prepared by Eckhoff Watson and Preator Engineering for Salt Lake County Engineering Division.

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Salt Lake County, 2008. Stormwater Quality Data Technical Report. Prepared by Stantec Consulting Services for Salt Lake County Engineering Division.

Salt Lake County, 2006. Sampling Plan for Representative Storm Monitoring. Prepared by Stantec Consulting Services for Salt Lake County Engineering Division.

Schueler, Thomas and Heather Holland, 2000. The Practice of Watershed Protection: Article 66", Center for Watershed Protection, Ellicott City, MD.

Appendix A

Hydrologic Summary

Summary of Hydrologic Data for Salt Lake County Monitored Stations

	Date	Station	Land Use	Antecedent Dry Period (days)	Total Precipitation (in)	Approximate Rainfall Duration (hrs)	Average Rainfall Intensity (in/hr)
Fall 92	9/4/92	DEL-02	Commercial / Residential	4	0.29	9	0.03
		JOR-01	Representative Mix	5	0.37	8.25	0.04
		JOR-04	Transportation	5	0.37	8.25	0.04
		LIT-06	Residential	3	0.52	8.5	0.06
		MIL-07	Residential	3	0.27	8.25	0.03
Spring 93	4/1/93	DEL-02	Commercial / Residential	3	0.48	4	0.12
		DEL-05	Light Industrial	3	0.48	4	0.12
		JOR-01	Representative Mix	3	0.5	4	0.13
		JOR-04	Transportation	3	0.52	3.5	0.15
		LIT-06	Residential	3	0.69	4.5	0.15
Spring 93	6/17/93	DEL-02	Commercial / Residential	10	0.51	3	0.17
		DEL-05	Light Industrial	10	0.44	3	0.15
		JOR-01	Representative Mix	10	0.55		
		JOR-04	Transportation	10	0.55		
		LIT-06	Residential	9	0.48		
		MIL-07	Residential	10	0.44		
Fall 94	10/14/94	DEL-02	Commercial / Residential	9	0.81	8.25	0.10
		DEL-05	Light Industrial	9	0.81	8.25	0.10
		JOR-01	Representative Mix	9	1.4	6.5	0.22
		JOR-04	Transportation	9	1.4	6.5	0.22
		LIT-06	Residential	9	0.9	8.25	0.11
		MIL-07	Residential	9	0.71	7.25	0.10
Fall 95	9/29/95	DEL-02	Commercial / Residential	12	0.22	5	0.04
		DEL-05	Light Industrial	12	0.24	5	0.05
		JOR-01	Representative Mix	28	0.16	2.5	0.06
		JOR-04	Transportation	28	0.19	2	0.10
		LIT-06	Residential	8			
		MIL-07	Residential	25	0.19	2.25	0.08
Spring 96	5/16/96	DEL-02	Commercial / Residential	26	0.64	3	0.21
		DEL-05	Light Industrial	26	0.64	3.75	0.17
		JOR-01	Representative Mix	26	0.51	1.75	0.29
		JOR-04	Transportation	26	0.41	2	0.21
		LIT-06	Residential	8	0.42	3	0.14
		MIL-07	Residential	26	0.51	3	0.17
Fall 97	10/11/97	DEL-02	Commercial / Residential	4	0.44	3	0.15
		DEL-05	Light Industrial	4	0.44	3	0.15
		JOR-01	Representative Mix	4	0.48	3	0.16
		JOR-04	Transportation	4	0.74	6	0.12
Spring 98	6/4/98	DEL-02	Commercial / Residential	11	0.51	5.25	0.10
		DEL-05	Light Industrial	11	0.51	5.25	0.10
		JOR-01	Representative Mix	20	0.41	4.25	0.10
		JOR-04	Transportation	20	0.41	4.25	0.10
Fall 98	10/15/98	JOR-01	Representative Mix	11	0.19	2.25	0.08
		JOR-04	Transportation	11	0.19	2.25	0.08
		LIT-06	Residential	11	0.33	5.5	0.06
		MIL-07	Residential	11	0.3	3	0.10
Spring 99	4/20/99	DEL-02	Commercial / Residential	11	0.44	3.5	0.13
		DEL-05	Light Industrial	11	0.44	3.5	0.13
Spring 99	5/13/99	JOR-04	Transportation	4	0.3	3.5	0.09
		LIT-06	Residential	9	0.47	7	0.07
		MIL-07	Residential	4	0.41	5.5	0.07
Spring 99	6/2/99	DEL-02	Commercial / Residential	4	0.17	9	0.02
		DEL-05	Light Industrial	4	0.17	9	0.02
		JOR-01	Representative Mix	18	0.18	8	0.02
Fall 99	11/17/99	MIL-07	Residential	20	0.41	5.25	0.08
Spring 00	5/10/00	DEL-05	Light Industrial	3	0.3	4.5	0.07
		JOR-01	Representative Mix	17	0.3	4.5	0.07
		JOR-03	Transportation	17	0.3	4.5	0.07
		LIT-06	Residential	3	0.47	7	0.07
		MIL-07	Residential	3	0.41	5.5	0.07
Fall 00	10/5/00	DEL-01	Commercial / Residential		0.14	5.25	0.03
		DEL-05	Light Industrial		0.14	5.25	0.03
		LIT-06	Residential		0.22	5.75	0.04
		MIL-07	Residential		0.22	5	0.04
Spring 01	5/16/01	DEL-01	Commercial / Residential		0.38	5	0.08
		DEL-05	Light Industrial		0.38	5	0.08
		JOR-01	Representative Mix		0.11	3.25	0.03
		JOR-03	Transportation		0.11	3.25	0.03
		LIT-06	Residential		0.18	4.75	0.04
		MIL-07	Residential		0.36	4.5	0.08
Fall 01	10/8/01	DEL-01	Commercial / Residential		0.23	1.5	0.15
		DEL-05	Light Industrial		0.23	1.5	0.15
		LIT-06	Residential		0.32	10.25	0.03
		MIL-07	Residential		0.39	11.5	0.03
Spring 02	4/15/02	DEL-01	Commercial / Residential		0.44	13.75	0.03
		DEL-05	Light Industrial		0.44	13.75	0.03
		JOR-01	Representative Mix		0.22	5.5	0.04
		JOR-03	Transportation		0.22	5.5	0.04
		LIT-06	Residential		0.4	6	0.07
		MIL-07	Residential		0.78	11.25	0.07
Spring 03	5/7/03	DEL-01	Commercial / Residential		0.37	9	0.04
		DEL-05	Light Industrial		0.37	9	0.04
		JOR-03	Transportation		0.76	9.5	0.08
		MIL-07	Residential		0.85	9.25	0.09
Fall 03	11/13/03	MIL-07	Residential		0.11	2	0.06
Spring 04	3/26/04	DEL-01	Commercial / Residential		0.59	6.5	0.09
		JOR-03	Transportation		0.66	6.5	0.10
		LIT-06	Residential		1.11	7.75	0.14
		MIL-07	Residential		0.94	8.25	0.11
Spring 05	4/4/05	DEL-01	Commercial / Residential	3	0.27	7	0.04
		JOR-01	Representative Mix	3	0.24	14.5	0.02
	4/8/05	MIL-07	Residential	4	0.78	5.25	0.15
	5/16/05	LIT-06	Residential	3	0.96	10	0.10
Fall 05	10/4/05	DEL-05	Light Industrial	6	0.43	12.5	0.03
		JOR-01	Representative Mix	6	0.61	12.5	0.05
		JOR-03	Transportation	6	0.61	16.25	0.04
		MIL-07	Residential	6	0.47	13	0.04
	10/28/05	DEL-01	Commercial / Residential	1	0.26	18.25	0.01
		LIT-06	Residential	1	0.9	19.75	0.05
Fall 06	9/20/06	JOR-01	Representative Mix	3	0.2	12.25	0.02
		MIL-07	Residential	3	0.22	12	0.02
Spring 07	5/3/07	DEL-05	Light Industrial	10	0.24	9	0.03
		MIL-07	Residential	8	0.24	9.5	0.03

	Date	Station	Land Use	Antecedent Dry Period (days)	Total Precipitation (in)	Approximate Rainfall Duration (hrs)	Average Rainfall Intensity (in/hr)
Spring 07	6/6/07	DEL-01	Commercial / Residential	15	0.96	17.3	0.06
		MIL-07	Residential	1	1.6	20	0.08
Fall 07	9/22/2007	DEL-01	Commercial / Residential	17	0.28	5.75	0.05
		DEL-05	Light Industrial	17	0.28	5.75	0.05
		JOR-01	Representative Mix	8	0.25	5.5	0.05
		LIT-06	Residential	18	0.3	5.5	0.05
Spring 08	5/12/2008	LIT-06	Residential	4	0.28	2.5	0.11
	5/21/2008	DEL-01	Commercial / Residential	8	0.27	3.25	0.08
		DEL-05	Light Industrial	8	0.27	3.25	0.08
		JOR-03	Transportation	8	0.26	3.75	0.07
		MIL-07	Residential	8	0.24	5.75	0.04
Fall 08	10/4/2008	DEL-01	Commercial / Residential	12	0.99	24.25	0.04
		DEL-05	Light Industrial	12	0.99	24.25	0.04
		JOR-03	Transportation	12	0.61	10.25	0.06
		LIT-06	Residential	12	0.71	14.5	0.05
		MIL-07	Residential	12	0.53	10.25	0.05
Spring 09	5/2/2009	DEL-05	Light Industrial	6	0.52	10.5	0.05
		JOR-03	Transportation	6	0.37	11.5	0.03
		LIT-06	Residential	6	0.58	12.75	0.05
		MIL-07	Residential	7	0.79	13.5	0.06
Spring 10	4/21/2010	DEL-01	Commercial / Residential	16	0.45	12	0.04
		DEL-05	Light Industrial	16	0.45	12	0.04
		MIL-07	Residential	16	0.79	10.75	0.07
Fall 10	10/23/2010	DEL-01	Commercial / Residential	30+	0.33	8	0.04
		DEL-05	Light Industrial	30+	0.33	8	0.04
		JOR-03	Transportation	30+	0.36	7.25	0.05
		MIL-07	Residential	30+	0.36	7.25	0.05
Fall 11	10/5/2011	DEL-01	Commercial / Residential	19	0.34	8.25	0.04
		JOR-03	Transportation	19	0.53	11.5	0.05
		LIT-06	Residential	19	0.56	11.75	0.05
Spring 12	4/26/2010	DEL-01	Commercial / Residential	15	0.6	8.25	0.07
		DEL-05	Light Industrial	15	0.6	8.25	0.07
		LIT-06	Residential	9	0.82	8.5	0.1
Fall 12	10/12/2012	DEL-01	Commercial / Residential	16	0.45	22.75	0.02
		MIL-07	Residential	16	0.8	13	0.06
Spring 13	5/28/2013	DEL-01	Commercial / Residential	9	1.03	16	0.06
		DEL-05	Light Industrial	9	1.03	16	0.06
		JOR-03	Transportation	9	0.9	17	0.05

APPENDIX B

Analytical Results

SUMMARY OF REPRESENTATIVE SAMPLING ANALYSES
DEL-02/DEL-01 OUTFALL - COMMERCIAL/ RAW LAB RESULTS

			DEL-02																				DEL-01													
	EPA		STORM COMPOSITE	STORM COMPOSITE	BASEFLOW GRAB	STORM COMPOSITE	STORM COMPOSITE	STORM GRAB	STORM COMPOSITE	(sampler problems)	BASEFLOW GRAB	STORM GRAB STORM COMPOSITE (2)	BASEFLOW GRAB	STORM GRAB	STORM COMPOSITE	BASEFLOW GRAB	STORM GRAB	STORM COMPOSITE	(lack of precipitation)	BASEFLOW GRAB	STORM GRAB	STORM COMPOSITE	(not sampled)	BASEFLOW GRAB	STORM GRAB	(not sampled)	(not sampled/being relocate	STORM GRAB	STORM COMPOSITE	STORM GRAB	STORM COMPOSITE	STORM COMPOSITE	BASEFLOW GRAB	STORM GRAB	STORM COMPOSITE	STORM COMPOSITE	COMPOSITE DUPLICATE	(not sampled)	BASEFLOW GRAB	STORM GRAB	STORM COMPOSITE	STORM COMPOSITE	(not sampled, sampled on 4/4/05)	(not sampled, sampled on 4/4/05)	(not sampled, station not active)
			Event 1	Event 2	Event 3		Event 4	Event 5		Event 6	Event 7		Event 8		Event 9			Event 10	Event 11			Event 12	Event 13		Event 14	Event 15	Event 16		Event 17		Event 18	Event 19			Event 20		Event 21	Event 22			Event 23	Event 24	Event 25	Event 26
CONSTITUENT	Method	Method Limit	9/14/92	4/1/93	6/18/93		10/14/94	9/29/95		5/16/96	9/26/97		10/11/97		6/4/98			10/16/98	4/20/99			5/13/99	6/2/99		11/17/99	5/10/00	10/10/00		5/16/01		10/8/01	4/15/02			5/8/03		11/3/03	3/26/04			4/4/05	4/8/05	5/16/05	10/4/05
METALS (mg/l)																																														
Selenium	270.3	0.005 mg/l	<0.005	<0.005	ND	ND	<0.005																																							
Selenium-Dissolved	270.3	0.005 mg/l	<0.005	<0.005	0.005	0.008																																								
Antimony	204.2	0.005 mg/l	<0.005	<0.01	ND	ND	<0.01																																							
Antimony-Dissolved	240.2	0.01 mg/l	<0.005	<0.01	ND	ND																																								
Arsenic	206.2	0.01 mg/l	<0.01	<0.01	0.01	<0.01	<0.01																																							
Arsenic-Dissolved	206.2	0.01 mg/l	<0.01	<0.01	<0.01	<0.01																																								
Beryllium	210.2	0.00025 mg/l	<0.0005	<0.00025	ND	ND	<0.005																																							
Beryllium-Dissolved	7091	0.00025 mg/l	<0.0005	<0.00025	ND	ND																																								
Cadmium	213.2	0.0005 mg/l	0.0009	0.0006	ND	0.0009	<0.004	<0.02	<0.02				<0.020	<0.020	0.002	<0.004			0.002	0.003	0.003		0.002	0.004			<0.003	<0.003	<0.0005		<0.0005	<0.004	<0.004	<0.004	<0.004	<0.004		< 0.004	< 0.004	< 0.004	<0.0040			
Cadmium-Dissolved	200.7	0.0005 mg/l	<0.0005	0.0011	ND	ND																					<0.006	<0.003	<0.0005	<0.0005	<0.0005	<0.004	<0.004	<0.004	<0.004	<0.004		< 0.004	< 0.004	< 0.004	<0.0040			
Chrominum	218.2	0.0015 mg/l	0.0073	0.009	ND	0.0039	<0.006																																							
Chrominum-Dissolved	218.2	0.002 mg/l	0.0053	0.008	ND	0.0028																																								
Copper	220.2	0.002 mg/l	0.021	0.037	0.003	0.037	0.018	0.02	0.03				<0.050	<0.050	0.15	0.04			0.009	0.053	0.036		0.007	0.027			0.021	0.033	0.02		0.02	<0.01	0.04	0.037	0.018	0.032		0.0042	0.0044	0.042	0.038			
Copper-Dissolved	200.7	0.002 mg/l	0.014	0.035	0.003	0.025																					<0.2	0.015	0.01	0.011	0.01	<0.01	<0.01	<0.01	0.0066	0.0062		< 0.004	< 0.004	0.008	<0.040			
Lead	239.2	0.003 mg/l	0.034	0.052	ND	0.034	0.007	<0.15	<0.15				<0.20	<0.20	0.1	<0.05			0.04	0.10	0.06		<0.03	0.03				<0.03	<0.005		<0.005	<0.03	<0.03	<0.03	0.0089	0.016		< 0.005	< 0.005	0.023	0.005			
Lead-Dissolved	200.7	0.003 mg/l	0.014	0.05	ND	0.004																						<0.03	<0.005	<0.005	<0.005	<0.03	<0.03	<0.03	<0.005	<0.005		< 0.005	< 0.005	< 0.005	<0.0050			
Nickel	249.2	0.002 mg/l	0.004	<0.002	ND	0.003	<0.02																																							
Nickel-Dissolved	249.2	0.002 mg/l	0.003	0.002	ND	ND																																								
Silver	272.2	0.001 mg/l	<0.005	<0.0005	0.001	ND	<0.003																																							
Silver-Dissolved	272.2	0.0005 mg/l	<0.005	<0.0005	ND	ND																																								
Zinc	289.2	0.0025 mg/l	0.06	0.139	0.00237	0.121	0.034	<0.3	<0.30				<0.15	<0.15	0.6	0.136			<0.18	<0.18	<0.18		<0.18	<0.18			<0.08	0.11	0.03		0.03	<0.05	0.17	0.17	0.065	0.12		0.06	0.06	0.19	0.078			
Zinc-Dissolved	200.7	0.0005 mg/l	0.04	0.123	0.00218	0.0717																					<0.16	<0.08	0.05	0.04	0.05	<0.05	<0.05	<0.05	0.017	0.017		0.045	0.04	0.034	<0.10			
Thallium	279.2	0.01 mg/l	<.002	<0.01	ND	ND	<0.01																																							
Thallium-Dissolved	279.2	0.01 mg/l	<0.002	<0.01	ND	ND																																								
Mercury	245.1	0.0005 mg/l	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005																																							
Mercury-Dissolved	245.1	0.0005 mg/l	<0.0005	<0.0005	<0.0005	<0.0005																																								
FECAL STREPTOCOCCI (cfu/100 ml)	SM 910A	1		1,000 CFU		1,800 CFU		TNTC			TNTC	TNTC			TNTC				72	168																		< 1,000	7,800							
FECAL COLIFORMS (cfu/100 ml)	SM909C	1		30 CFU		7,000 CFU		TNTC			TNTC	TNTC			TNTC				100	>800																		3,000	1,200							
E. COLI (Org/100ml)																																														
pH	150.1	0.01			7.93	7.94	7.65	7.77	8.02		7.97	7.89	8.27	8.25	8.09	8.05			8.15	8.13	8.27		8.19	8.11			7.93	7.26	7.57	7.48	7.57	8.67	8.1	8.03	7.9	7.9		7.92	8.02	8.08	8.08			
TSS (mg/l)	160.2	4 mg/l	50	114	<4	87	20	145	63				52	34	625	242			7.2	22.8	126		7.6	116			78.9	51	77.0	22	77.0	42.4	335	206	67	28		7	12	170	21			
SSC- Coarse (mg/l)																																														
SSC - Fine (mg/L)																																														
VSS (mg/l)																																														
TDS (mg/l)	160.1	10 mg/l	520	440	1850	360	124	632	288				1230	795	233	409			930	807	788		898	818			1450	439	154	322	154	2500	2230	1040	140	140		2,600	2,600	310	480			
HARDNESS (mg/l)	130.2	5 mg/l	188		910			310	140				528	380	188	220			460	412	416		444	452			564	176	72.0		72.0	766	642	295	72	98		720	700	120	160			
TKN (mg/l)	351.2	0.2 mg/l			<0.5								1.6	1.6	3	1			<2.0	<2.0	<2.0		<2.0	<2.0			5.04		2.46	1.68	2.46	1.6	5.38	4.2	1.2	0.95		2.1	3.3	6.6	3.2			
N (nitrate) (mg/l)	353.3	0.05 mg/l			3.79		0.42						1.9	1.4	0.79	1.08			1.24	1.61			1.24	1.61			1.9	1.9	0.53	0.607	0.53	5.72	6.09	4.49	0.7	0.7		4.30	4.2	0.83	1.1			
N (nitrite) (mg/l)	300.0	0.02 m/gl											<0.2	<0.2	<0.05	<0.05			<0.01	<0.01			<0.01	<0.01			<0.05	<0.02	<0.02	<0.02	<0.02	<0.075	<0.075	2.86										
N (ammonia) (mg/l)	350.2	0.1 mg/l			<0.5								<1	<1	0.4	0.2			0.2	0.2	0.3		0.4	0.2			1.06		1.06		1.06	0.4	1.68	1.57	0.31	0.29		0.15	0.18	0.93	0.43			
N (organic) (mg/l)	350.3	.15 mg/l			<0.5		<0.5	2.1	1.8				<2	<2	2	0.9																													
N (total N) (mg/l)																																														
Orthophosphate P (mg/l)	365.3	.02 mg/l			0.06		0.16	0.15	0.09				<0.5	<0.5	<0.3	<0.3			<0.1	<0.1	<0.1		<0.1	<0.02			<0.5	<0.2	<0.2	<0.2	<0.2	<0.5	<0.5	<0.5	0.11	0.097		0.14	0.14	0.26	0.13			
P (total P) (mg/l)	365.3	.02 mg/l			0.07		0.24	0.39	0.18				0.13	0.19	0.84	0.2			0.2	0.3	0.3		0.14	0.3			1.24	0.62	0.527	0.378	0.527	0.187	0.818	0.638	0.18	0.14		0.31	0.31	0.49	0.29			
P (soluble P) (mg/l)	365.3	.02 mg/l			0.06		0.22																																							
Total Recoverable Phenolics	420.1	.05 mg/l			<0.05			0.002																																						
BOD (total) (mg/l)	405.1	2 mg/l	9	7	<2	13	5	22	9		24	7	<6	7	6	4			<12	10	6		2	16			22	51	24.6	12.5	24.6	5.32	>36.8	25	6	6		< 5	< 5	26	14			
CBOD (mg/l)																																														
SCBOD (mg/l)																																														
COD (mg/l)	410.1	20 mg/l		20	<20		71	121	58				63	66	217	89			37	71	73		2	16			172	123	92.7	88.5	92.7	71.1	243	193	43	36		28	38	130	54			
Cyanide (total) (mg/l)	335.2	.005 mg/l			<0.005		<0.005																																							
Oil and Grease (mg/l)	413.2	1 mg/l		5	1.1	<1.0	2.4	7					<5		10				<4	<4			<4				<1.9		<2.1		<2.1	<1.8	1.9					3.9	< 3						
TPH (mg/l)	418.1	1 mg/l		<2.0	<1.0	<1.0	<1.0	<1																																						

ND Not Detected
TNTC To Numerous to Count
(1) No priority pollutant constituents were detected (mg/l)
(2) Not enough precipitation for composite
(3) DEL-02 Station moved in 2000 due to difficulities w/ existing station
Highlighted area indicates this data was not included in load or EMC calculations (see annual report text for further description)

SUMMARY OF REPRESENTATIVE SAMPLING ANALYSES
DEL-02/DEL-01 OUTFALL - COMMERCIAL/ RAW LAB RESULTS

	STORM GRAB	STORM COMPOSITE	(sampling equipment malfunction)	Not sampled - Station did not trigger	STORM GRAB	STORM COMPOSITE	Not sampled - unable to access station	Not sampled - not enough precipitation	BASEFLOW GRAB	STORM GRAB	STORM COMPOSITE	BASEFLOW GRAB	STORM GRAB	Not sampled - station not active	STORM GRAB	STORM COMPOSITE	BASEFLOW GRAB	STORM GRAB	STORM COMPOSITE	BASEFLOW GRAB	STORM COMPOSITE	BASEFLOW GRAB	STORM GRAB	STORM COMPOSITE	BASEFLOW GRAB	STORM GRAB	STORM COMPOSITE	BASEFLOW GRAB	STORM GRAB	STORM COMPOSITE
	Event 27		Event 28	Event 29	Event 30		Event 31	Event 32	Event 33			Event 34		Event 35	Event 36		Event 37			Event 38		Event 39			Event 40			Event 41		
CONSTITUENT	10/28/05		9/20/06	5/3/07	6/6/07		9/22/07	5/12/08	5/21/08			10/4/08		5/2/09	4/21/10		10/23/10			10/5/11		4/26/12			10/12/12			5/28/13		
METALS (mg/l)																														
Selenium																														
Selenium-Dissolved																														
Antimony																														
Antimony-Dissolved																														
Arsenic																														
Arsenic-Dissolved																														
Beryllium																														
Beryllium-Dissolved																														
Cadmium	0.0006	<0.0005			<0.005	<0.005			<0.005	<0.005	<0.005	<0.005	<0.005		0.0013	<0.0005	<0.005	<0.005	<0.0005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Cadmium-Dissolved	<0.0005	<0.0005			<0.005	<0.005			<0.005	<0.005	<0.005	<0.005	<0.005		<0.0005	<0.0005	<0.005	<0.005	<0.0005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chrominum																														
Chrominum-Dissolved																														
Copper	0.01	0.02			0.02	0.03			0.011	0.016	0.029	0.007	0.016		0.138	0.021	0.018	0.031	0.031	0.009	0.015	0.009	0.011	0.026	0.006	0.02	0.033	0.006	0.036	0.037
Copper-Dissolved	0.01	0.01			0.005	0.021			<0.005	<0.005	0.022	<0.005	<0.005		<0.005	0.007	0.007	<0.005	0.009	0.006	<0.005	0.007	0.006	<0.005	<0.005	0.008	0.005	0.006	0.006	0.006
Lead	0.004	0.004			<0.05	<0.05			<0.02	0.02	<0.02	<0.02	0.02		0.084	0.0093	<0.02	0.04	0.0101	0.04	<0.02	<0.02	<0.02	0.02	0.02	<0.02	<0.02	<0.02	0.02	<0.02
Lead-Dissolved	<0.001	0.005			<0.05	<0.05			<0.02	<0.02	<0.02	<0.02	<0.02		0.0054	<0.0005	<0.02	<0.02	<0.0005	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.02	0.02	<0.02
Nickel																														
Nickel-Dissolved																														
Silver																														
Silver-Dissolved																														
Zinc	0.04	0.07			0.07	0.08			0.03	0.05	0.04	0.01	0.05		0.74	0.09	0.09	0.13	0.1	<0.01	0.04	0.01	0.02	0.1	<0.01	0.04	0.12	<0.01	0.12	0.14
Zinc-Dissolved	0.02	0.04			0.02	0.03			<0.01	0.01	0.02	<0.01	0.01		<0.01	0.02	0.05	0.03	0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	0.01
Thallium																														
Thallium-Dissolved																														
Mercury																														
Mercury-Dissolved																														
FECAL STREPTOCOCCI (cfu/100 ml)	>1800																													
FECAL COLIFORMS (cfu/100 ml)	>2400														>2400															
E. COLI (Org/100ml)					2000				1300	980		1100	>2400		1400		1200	>2400		>2400		46	>2400		410	>2400		690	>2400	
pH	7.71	7.31			7.89	7.73			8.02	7.99	7.64	8.03	7.65		7.7	7.4	7.8	7.6	7.6	8.4	8	8.9	8.2	8.2	8	8	8	8.7	8.3	7.9
TSS (mg/l)	30	34			103	53			68	108	27	74	162		901	77	41	86	76	<4	44	39	105	132	120	39	92	10	290	204
SSC- Coarse (mg/l)															55.7	14				1.8	10.5	17.5	3.2	17.5						
SSC - Fine (mg/L)															801	50.5				1.3	27.2	65.1	27	94.2						
VSS (mg/l)															138	13			14	<4	6	<4	9	15	38	14	25	<10	60	50
TDS (mg/l)	742	202			948	250			1080	1110	384	1230	810		216	212	764	738	190	1490	74	1440	1480	122	1200	916	186	1410	948	188
HARDNESS (mg/l)	367	90			401	85			478	528	122	491	352		277	86	251	271	101	493	42	468	494	87	440	334	94	504	411	99
TKN (mg/l)	1.6	2.2			1.7	2.5			1	10	<1	1	3		5	1	3	3	2	<1	<1	1	2	2	2	3	2	1	4	2
N (nitrate) (mg/l)	1.2	<1			1	0.6			1.2	1.3	0.7	1	1.2		0.8	0.6	2.1	1.6	0.6	1.9	0.3	2	2.4	0.3	2	2	0.6	2.2	1.8	0.4
N (nitrite) (mg/l)					<0.1	<0.1			<0.1	<0.1	<0.1				<0.1	<0.1			<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.02	<0.1	<0.1	<0.1	<0.1	<0.1
N (ammonia) (mg/l)	<0.4	<0.4			0.3	0.6			<0.2	0.4	<0.2	<0.2	0.3		0.6	0.3	0.8	0.6	0.5	<0.2	<0.2	<0.2	<0.2	0.3	<0.2	0.4	0.5	<0.2	0.3	0.5
N (organic) (mg/l)																														
N (total N) (mg/l)																						3	4.4	2.3	4	5	2.6	1	3.6	1.9
Orthophosphate P (mg/l)	0.05	0.11			<0.01	0.06			0.02	0.03	0.14	0.07	0.14		0.09	0.08	0.06	0.03	0.12	0.09	0.05	0.03	0.06	0.06	0.11	0.18	0.1	0.05	0.06	0.03
P (total P) (mg/l)	0.16	0.27			0.29	0.41			0.16	0.27	0.31	0.15	0.59		1.1	0.2	0.29	0.41	0.3	0.15	0.16	0.16	0.19	0.31	0.27	0.39	0.29	0.16	0.53	0.38
P (soluble P) (mg/l)																														
Total Recoverable Phenolics																														
BOD (total) (mg/l)	9	13			12	20			7	8	21	<5	14		31	<5	26	58	10	<5	<5	<5	9	12	<5	16	7	6	31	13
CBOD (mg/l)															23	<5			10	<5	<5	<5	<5	<5	<5	11	6	<5	16	11
SCBOD (mg/l)															15	<5			9	<5	<5									
COD (mg/l)	43	62			82	105			165	39	86	16	98		333	46	112	159	60	26	27	36	54	56	21	69	48	24	113	90
Cyanide (total) (mg/l)																														
Oil and Grease (mg/l)	<5				<5				<5	5		<5	6		16		<5	<5		<5		<5	<5		<5	<5		<5	6	
TPH (mg/l)																														

ND Not Detected
TNTC To Numerous to Count
(1) No priority pollutant constituents w were detected (mg/l)
(2) Not enough precipitation for compc
(3) DEL-02 Station moved in 2000 due difficulties w/ existing station
Highlighted area indicates this data was not included in load or EMC calculations (see annual report text for further description)

SUMMARY OF REPRESENTATIVE SAMPLING ANAYLSES
DEL-05 OUTFALL - INDUSTRIAL/ RAW RESULTS

			DEL-05																														
	EPA		STORM COMPOSITE	STORM COMPOSITE	BASEFLOW GRAB	STORM COMPOSITE	STORM COMPOSITE	STORM GRAB	STORM COMPOSITE	BASEFLOW GRAB	STORM GRAB	STORM COMPOSITE	BASEFLOW GRAB	STORM GRAB	STORM COMPOSITE (2)	BASEFLOW GRAB	STORM GRAB	STORM COMPOSITE	BASEFLOW GRAB	STORM GRAB	STORM COMPOSITE	(lack of precipitation)	BASEFLOW GRAB	STORM GRAB	STORM COMPOSITE	(not sampled)	BASEFLOW GRAB	STORM GRAB	STORM COMPOSITE	(not sampled)	BASEFLOW GRAB	STORM GRAB	STORM COMPOSITE	STORM GRAB	STORM COMPOSITE	STORM GRAB	STORM COMPOSITE	STORM GRAB	STORM COMPOSITE	BASEFLOW GRAB	STORM GRAB	STORM COMPOSITE	STORM COMPOSITE	(not sampled)	(station not active)
			Event 1	Event 2	Event 3	Event 4	Event 5			Event 6			Event 7			Event 8			Event 9			Event 10	Event 11			Event 12	Event 13			Event 14	Event 15			Event 16		Event 17		Event 18		Event 19			Event 20	Event 21	Event 22
CONSTITUENT	Method	Method Limit	9/14/92	4/1/93	6/18/93	10/14/94	9/29/95			5/16/96			9/26/97			10/11/97			6/4/98			10/16/98	4/20/99			5/13/99	6/2/99			11/17/99	5/10/00			10/10/00		5/16/01		10/8/01		4/15/02			5/8/03	11/3/03	3/26/04
METALS (mg/l)																																															
Selenium	270.3	0.005 mg/l		<0.005	ND	<0.005																																									
Selenium-Dissolved	270.3	0.005 mg/l		<0.005	<0.005																																										
Antimony	204.2	0.005 mg/l		<0.01	ND	<0.01																																									
Antimony-Dissolved	240.2	0.01 mg/l		<0.01	ND																																										
Arsenic	206.2	0.01 mg/l		<0.01	<0.01	<0.01																																									
Arsenic-Dissolved	206.2	0.01 mg/l		<0.01	<0.01																																										
Beryllium	210.2	0.00025 mg/l		<0.00025	ND	<0.005																																									
Beryllium-Dissolved	7091	0.00025 mg/l		<0.00025	ND																																										
Cadmium	213.2	0.0005 mg/l		0.0008	0.0009	<0.004	<0.02	<0.02	<0.02	<0.02	<0.02					<0.020	<0.020		<0.002	<0.004			0.002	0.003	0.003		<0.002	0.004	0.004		<0.003	<0.003	<0.003	<0.003	0.003	0.0005		<0.004	<0.004	<0.004	0.0046	<0.004	<0.004			
Cadmium-Dissolved	200.7	0.0005 mg/l		0.001	ND																													<0.006	<0.003	<0.0005	<0.0005	<0.004	<0.004			<0.004	<0.004			
Chrominum	218.2	0.0015 mg/l		0.01	0.0077	<0.006																																									
Chrominum-Dissolved	218.2	0.002 mg/l		0.009	0.0019																																										
Copper	220.2	0.002 mg/l		0.018	0.043	0.024	0.02	0.05	<0.1	<0.1	<0.1					<0.050	<0.050		0.06	0.04			0.034	0.078	0.051		0.014	0.112	0.123		0.07	0.042	0.027	0.027	0.042	0.02		<0.01	0.053	0.05	0.161	0.0516	0.076			
Copper-Dissolved	200.7	0.002 mg/l		0.017	0.024																													0.028	0.027	0.008	0.012	<0.01	<0.01			0.013	<0.004			
Lead	239.2	0.003 mg/l		0.017	0.031	0.023	<0.15	<0.15	<0.15	<0.15	<0.15					<0.20	<0.20		0.1	<0.05			0.03	0.06	0.04		<0.03	0.12	0.1		0.077	0.06	0.039		0.071	0.02		<0.03	<0.03	0.05	0.14	0.047	0.073			
Lead-Dissolved	200.7	0.003 mg/l		0.015	0.003																														<0.03	<0.005	<0.005	<0.03	<0.03			<0.03	<0.005			
Nickel	249.2	0.002 mg/l		<0.005	0.004	<0.02																																									
Nickel-Dissolved	249.2	0.002 mg/l		<0.002	0.002																																										
Silver	272.2	0.001 mg/l		<0.0005	0.003	<0.003																																									
Silver-Dissolved	272.2	0.0005 mg/l		<0.0005	ND																																										
Zinc	289.2	0.0025 mg/l		0.0766	0.189	0.11	<0.3	0.32	<0.25	0.4	0.32					<0.15	<0.15		0.3	0.194			0.2	0.4	0.25		<0.18	0.5	0.6		0.384	0.365	0.17	0.21	0.2	0.17		<0.05	0.351	0.2	0.685	0.329	0.49			
Zinc-Dissolved	200.7	0.0005 mg/l		0.0732	0.0546																													<0.16	<0.08	0.02	0.03	<0.05	0.091			<0.05	0.016			
Thallium	279.2	0.01 mg/l		<0.01	ND	<0.01																																									
Thallium-Dissolved	279.2	0.01 mg/l		<0.01	ND																																										
Mercury	245.1	0.0005 mg/l		<0.0005	<0.0005	<0.0005																																									
Mercury-Dissolved	245.1	0.0005 mg/l		<0.0005	0.0005																																										
FECAL STREPTOCOCCI (cfu/100 ml)	SM 910A	1		11,000 CFU	1,700 CFU		2940 CFU		400 CFU	230 CFU			TNTC	TNTC					TNTC				80	60																							
FECAL COLIFORMS (cfu/100 ml)	SM909C	1		20 CFU	5,000 CFU		TNTC		240 CFU	160 CFU			TNTC	TNTC					TNTC				300	>800																							
E. Coli (Org/100ml)																																															
pH	150.1	0.01			7.95	8.38	8.06	7.92	8.25	8.02	7.99	7.86	8.02			7.38	7.68		8.88	8.32			8.10	7.85	8.39		7.62	8.2	7.84		8.13	8.4	8.01	8.97	7.69	8.90	8.09	8.45	8.00	8.08	8.31		7.89			
TSS (mg/L)	160.2	4 mg/l		60	102	188	119	144	<20	206	117					64			296	652			<5	<12.5	182		38.8	483	81.2		185	182	64	58	52	71.0	44	9.6	162	217	1630	353	300			
SSC - Coarse (mg/L)																																															
SSC - Fine (mg/L)																																															
VSS (mg/l)																																															
TDS (mg/l)	160.1	10 mg/l		410	190	130	808	348	3030	200	318					120			75	124			1660	623	259		808	146	449		205	456	262	490	482	333	292	1050	369	2500	1310	932	250			
HARDNESS (mg/l)	130.2	5 mg/l					487	140	530	112	110					60	56		96	84			340	240	104		268	184	200		120	112	76	136	108	64.0				478	762	258	130			
TKN (mg/l)	351.2	0.2 mg/l														<1.5	<1.5		1.0	1.0			<2.0	4.7	33		2.24	<2	3.7		<2.0	<2.0	<2.0	2.35	2.18	1.51		0.90	3.47	6.1	9.8	3.92	2.8			
N (nitrate) (mg/l)	353.3	0.05 mg/l				0.42			2	<0.2	<0.5					0.40	0.29		0.39	0.41			0.37	0.48	0.44		0.37	0.48	0.44		0.92	0.05	0.47	0.63	0.99	0.47	0.534			5.58	4.53	4.55	0.6			
N (nitrite) (mg/l)	300.0	0.02 mg/l														<0.2	<0.2		<0.05	0.05			<0.01	<0.01	<0.01		<0.01	<0.02	<0.01		0.17	<0.03	<0.05	0.27	0.33	<0.02	<0.02			<0.075	<0.075	<0.075				
N (ammonia) (mg/l)	350.2	0.1 mg/l														<1	<1		0.5	0.2			0.2	2	1		0.3	0.5	4		0.78	0.53	5.82	1.06		0.896		<0.1		6.72	2.46	1.51	0.44			
N (organic) (mg/l)	350.3	.15 mg/l					1.5		<3	<2	<2					<2	<2		0.7	0.7																											
N (total N) (mg/l)																																															
Orthophosphate P (mg/l)	365.3	.02 mg/l					0.18	0.15	0.29	0.18	0.12					<0.1	<0.5		<0.3	<0.3			0.1	0.4	<0.1		<0.1	<0.02	<0.1		<0.1	<0.3	<0.1	<0.1	<0.2	<0.2	<0.2	<1.2	<1.2	<0.5	<0.5	<0.5	0.11			
P (total P) (mg/l)	365.3	.02 mg/l					0.49		0.35	0.62	0.49					0.17	0.17		0.44	0.24			0.5	0.9	0.3		0.3	0.6	0.7		0.68	0.58	0.46	0.36	0.42	0.213	0.243	3.49	1.93	1.4	0.771	0.779	0.64			
P (soluable P) (mg/l)	365.3	.02 mg/l																																													
Total Recoverable Phenolics (mg/l)	420.1	.05 mg/l					<0.001																																								
BOD (total) (mg/l)	405.1	2 mg/l		<6	25	8	26	30	5.9	12.1	14.3	20	20			11			5	4			9	35	10		5	9	14		29.4	11.9	17.2	19	21	9.54	10.3	<2	23.9	>34.7	66.7	20.9	10			
CBOD (mg/l)																																															
SCBOD (mg/l)																																															
COD (mg/l)	410.1	20 mg/l		20	120		125		<50	<50	<50					68	62		82	78			81	272	107		57	178	230		70.4	53.5	57.8	119	103	53	65.7	46.8	141	344	434	216	130			
Cyanide (total) (mg/l)	335.2	.005 mg/l																																													
Oil and Grease (mg/l)	413.2	1 mg/l		6	3.8	2.1	2		<5	7	<5					<4			3				<4	<4			<4	33			<1.9	<2.7		<1.9		4.6		2.3		4.9	6.1					
TPH (mg/l)	418.1	1 mg/l		2.4	2.1	1.3	<1																																								

ND Not Detected
TNTC To Numerous to Count
(1) No priority pollutant constituents were detected (mg/l)
(2) Not enough precipitation for composite
Highlighted area indicates this data was not included in load or EMC calculations (see annual report text for further description)
O&G samples not identified as Base or Rise/ Given TSS data, it is assumed that these levels are in the correct column

SUMMARY OF REPRESENTATIVE SAMPLING ANAYLSES
DEL-05 OUTFALL - INDUSTRIAL/ RAW RESULTS

	(station not active)	(station not active)	(station not active)	STORM GRAB	STORM COMPOSITE (calculated from pollutograph)	(station not active, sampled on 10.4/05)	(sampling equipment malfunction)	STORM GRAB	STORM COMPOSITE	(sampling equipment malfunction)	STORM GRAB	STORM COMPOSITE	(station did not receive enough precipitation)	BASEFLOW GRAB	STORM GRAB	BASEFLOW GRAB	STORM GRAB	BASEFLOW GRAB	STORM GRAB	STORM COMPOSITE	STORM GRAB	STORM COMPOSITE	BASEFLOW GRAB	STORM GRAB	STORM COMPOSITE	(sampling equipment malfunctioned)	BASEFLOW GRAB	STORM GRAB	STORM COMPOSITE	BASEFLOW GRAB	STORM GRAB	STORM GRAB	STORM COMPOSITE
	Event 23	Event 24	Event 25	Event 26		Event 27	Event 28	Event 29		Event 30	Event 31		Event 32	Event 33		Event 34		Event 35			Event 36		Event 37			Event 38	Event 39			Event 40		Event 41	
CONSTITUENT	4/4/05	4/8/05	5/16/05	10/4/05		10/28/05	9/20/06	5/3/07		6/6/07	9/22/07		5/12/08	5/21/08		10/4/08		5/2/09			4/21/10		10/23/10			10/5/11	4/26/12			10/12/12		5/28/13	
METALS (mg/l)																																	
Selenium																																	
Selenium-Dissolved																																	
Antimony																																	
Antimony-Dissolved																																	
Arsenic																																	
Arsenic-Dissolved																																	
Beryllium																																	
Beryllium-Dissolved																																	
Cadmium				0.0006	0.0005121			<0.005	<0.005		<0.005	<0.005		<0.005	<0.005	<0.005	<0.005	<0.002	<0.002	<0.002	0.0009	0.0008	<0.005	<0.005	<0.0005		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Cadmium-Dissolved				<0.0005				<0.005	<0.005		<0.005	<0.005		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.0005	<0.0005	<0.005	<0.005	<0.0005		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chrominum																				0.01													
Chrominum-Dissolved																				<0.005													
Copper				0.02	0.01614			0.046	0.035		0.032	0.039		0.03	0.026	0.008	0.028	0.023	0.023	0.027	0.061	0.043	0.019	0.077	0.018		0.009	0.071	0.034	0.008	0.034	0.048	0.046
Copper-Dissolved				<0.01				0.029	0.021		0.009	0.019		0.007	0.011	<0.005	<0.005	0.009	0.005	0.008	0.005	0.008	0.005	0.006	0.009		0.006	0.02	0.01	0.005	0.011	0.008	<0.005
Lead				0.022	0.02149			<0.05	<0.05		0.02			0.03	0.02	<0.02	0.03	0.02	0.03	0.03	0.052	0.0318	<0.02	0.07	0.0016		<0.02	0.05	0.02	0.02	0.02	0.02	0.02
Lead-Dissolved				0.015				<0.05	<0.05		<0.02	<0.02		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.0005	<0.0005	<0.02	<0.02	<0.0005		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Nickel																																	
Nickel-Dissolved																																	
Silver																																	
Silver-Dissolved																																	
Zinc				0.21	0.18303			0.029	0.2		0.21	0.13		0.14	0.17	0.01	0.25	0.11	0.15	0.11	0.37	0.25	0.16	0.43	0.03		0.02	0.42	0.14	0.02	0.22	0.23	0.21
Zinc-Dissolved				0.04				0.05	0.04		0.06	0.03		0.02	0.02	<0.01	0.02	0.02	<0.01	0.02	<0.01	<0.01	0.02	0.02	0.01		0.01	0.07	<0.01	<0.01	0.08	0.02	<0.01
Thallium																																	
Thallium-Dissolved																																	
Mercury																																	
Mercury-Dissolved																																	
FECAL STREPTOCOCCI (cfu/100 ml)				410																													
FECAL COLIFORMS (cfu/100 ml)				>900																	>2400												
E. Coli (Org/100ml)								150						100	650	1600	110	19	920		160			>2400			8	42		16	190	2400	
pH				7.44				7.7	7.32		7	7.15		8.01	8.3	7.98	7.83	7.8	8.2	8.5	8.4	8.2	8.4	7.2	7.9		8.2	8.2	8.1	8.3	8.2	8.4	8.5
TSS (mg/L)				140	69.7988			190	87		107	77		122	103	60	124	82	114	106	430	291	81	209	17		24	164	115	14	61	194	182
SSC - Coarse (mg/L)																					16.4				8.6		4.8	29.8	24.5				
SSC - Fine (mg/L)																					369				3.2		4.6	105	67.8				
VSS (mg/l)																					57	37			5		5	27	20	11	30	44	44
TDS (mg/l)				264				528	412		456	374		1280	194	1120	74	574	144	134	108	418	102	300	1760		2290	1150	194	1210	428	116	136
HARDNESS (mg/l)				104				138	110		284	158		256	84	439	65	108	69	69	171	216		127	507		304	189	74	310	123	78	78
TKN (mg/l)				2.3				3.8	2.4		3.6	2.2		3	2	1	1	2	1	<1	2	2	1	3	2		1	5	2	<1	7	2	2
N (nitrate) (mg/l)				2				1.6	1.2		1.1	0.8		1.1	0.5	0.4	0.3	0.8	0.3	0.2	0.4	0.5	0.4	0.8	0.6		0.5	1.7	0.4	0.5	1.2	0.4	0.3
N (nitrite) (mg/l)											ND	ND		<0.1	<0.1			0.2	<0.1	<0.1	<0.1	<0.1			<0.1		0.2	<0.1	<0.1	<0.02	0.2	<0.1	<0.1
N (ammonia) (mg/l)				0.6				0.7	0.3		0.9	0.4		0.6	0.5	<0.2	0.2	0.3	0.2	<0.2	0.5	0.3	<0.4		<0.4		<0.2	1.4	0.4	<0.2	1.9	0.5	0.4
N (organic) (mg/l)																					0.06												
N (total N) (mg/l)																											1.7	6.7	2.4	<1	8.4	2.3	1.6
Orthophosphate P (mg/l)				0.13				<0.01	<0.01		0.06	0.05		0.3	0.13	0.05	0.15	0.01	0.01	0.04		0.04	0.06	<0.01	0.05		0.33	0.02	0.06	0.21	0.18	0.08	0.01
P (total P) (mg/l)				0.35	0.22477			0.51	0.36		0.32	0.28		0.7	0.3	0.13	0.22	0.2	0.2	0.22	0.5	0.4	0.19		0.14		0.38	0.58	0.27	0.25	0.31	0.3	0.26
P (soluable P) (mg/l)																								0.53									
Total Recoverable Phenolics (mg/l)																																	
BOD (total) (mg/l)				27				191	79		39	18		28	21	<5	10	31	<5	<5	11	9	11	26	9		<5	42	16	<5	35	20	9
CBOD (mg/l)																					9	<5			8		<5	34	12	<5	32	12	8
SCBOD (mg/l)																					<5	<5			<5								
COD (mg/l)				127				269	145		178	104		153	122	22	67	92	74	37	119	83		215	51		41	246	72	19	235	126	98
Cyanide (total) (mg/l)																																	
Oil and Grease (mg/l)				6				10			6			9	9	<5	<5	7	8		9		5	12			<5	10		<5	11	18	
TPH (mg/l)																																	

ND Not Detected
TNTC To Numerous to Count
(1) No priority pollutant constitu were detected (mg/l)
(2) Not enough precipitation for composite
Highlighted area indicates this data was not included in load or EMC calculations (see annual report text for further description)
O&G samples not identified as Base or Rise/ Given TSS data, it is assumed that these levels are in the correct column

SUMMARY OF REPRESENTATIVE SAMPLING ANALYSES
JOR-04/JOR-03[3] OUTFALL - TRANSPORTATION/ RAW LAB RESULTS

			JOR-04																											JOR-03										
	EPA		STORM COMPOSITE	STORM COMPOSITE	BASEFLOW GRAB	STORM COMPOSITE	STORM COMPOSITE	STORM GRAB	STORM COMPOSITE	BASEFLOW GRAB	STORM GRAB	STORM COMPOSITE	BASEFLOW GRAB	STORM GRAB	STORM COMPOSITE (2)	BASEFLOW GRAB	STORM GRAB	STORM COMPOSITE	BASEFLOW GRAB	STORM GRAB	STORM COMPOSITE	BASEFLOW GRAB	STORM GRAB	STORM COMPOSITE	COMPOSITE DUPLICATE	(<0.1 predicted)	BASEFLOW GRAB	STORM GRAB	STORM COMPOSITE	(w/in 45 day criteria)	(lack of precipitation)	BASEFLOW GRAB	STORM GRAB	STORM COMPOSITE	(missed storm peak)	STORM GRAB	STORM COMPOSITE	(missed peak storm)	BASEFLOW GRAB	STORM GRAB	STORM COMPOSITE	STORM COMPOSITE
			Event 1	Event 2	Event 3		Event 4	Event 5		Event 6			Event 7			Event 8			Event 9			Event 10				Event 11	Event 12			Event 13	Event 14	Event 15			Event 16	Event 17		Event 18	Event 19			Event 20
CONSTITUENT	Method	Method Limit	9/14/92	4/1/93	6/18/93	6/18/93	10/14/94	9/29/95	9/29/95	5/16/96	5/16/96	5/16/96	9/26/97	9/26/97	9/26/97	10/11/97	10/11/97	10/11/97	6/4/98	6/4/98	6/4/98	10/16/98	10/16/98	10/16/98	10/16/98	4/20/99	5/13/99	5/13/99	5/13/99	6/2/99	11/17/99	5/10/00	5/10/00	5/10/00	10/10/00	5/16/01	5/16/01	10/8/01	4/15/02	4/15/02	4/15/02	5/8/03
METALS (mg/l)																																											
Selenium	270.3	0.005 mg/l	<0.005	<0.005	ND	ND	<0.005																																				
Selenium-Dissolved	270.3	0.005 mg/l	<0.005	<0.0005	0.006	<0.005																																					
Antimony	204.2	0.005 mg/l	0.005	<0.01	ND	ND	<0.01																																				
Antimony-Dissolved	240.2	0.01 mg/l	<0.005	<0.01	ND	ND																																					
Arsenic	206.2	0.01 mg/l	<0.01	<0.01	ND	<0.01	<0.01																																				
Arsenic-Dissolved	206.2	0.01 mg/l	<0.01	<0.01	ND	<0.01																																					
Beryllium	210.2	0.00025 mg/l	<0.0005	<0.00025	ND	ND	<0.005																																				
Beryllium-Dissolved	7091	0.00025 mg/l	<0.0005	<0.00025	ND	ND																																					
Cadmium	213.2	0.0005 mg/l	0.0008	0.0022	ND	0.0016	<0.004	<0.02	<0.02	<0.02	<0.02	<0.02				<0.020		<0.020	<0.002	<0.002	<0.004	0.004	<0.004	<0.004			0.002	<0.002	0.003			<0.003	<0.003	<0.003		0.0023	0.0011		<0.004	0.019	<0.004	<0.004
Cadmium-Dissolved	213.2	0.0005 mg/l	0.0012	0.0025	ND	ND																														0.0009	<0.0005		<0.004	0.0096	<0.004	<0.004
Chrominum	218.2	0.0015 mg/l	0.0091	0.013	0.0025	0.0058	<0.01																																				
Chrominum-Dissolved	218.2	0.002 mg/l	0.0082	0.011	0.0019	0.0042																																					
Copper	220.2	0.002 mg/l	0.04	0.072	0.01	0.09	0.057	<0.02	0.05	<0.1	0.2	0.17				<0.050		0.051	0.98	0.03	0.12	0.011	<0.01	0.075			0.009	0.027	0.083			0.018	0.02	0.036		0.082	0.046		<0.01	0.0572	0.106	0.052
Copper-Dissolved	220.2	0.002 mg/l	0.057	0.114	0.009	0.028																														0.036	0.027		<0.01	0.015	0.022	0.0077
Lead	239.2	0.003 mg/l	0.046	0.111	ND	0.11	0.03	<0.15	<0.15	<0.15	0.150	<0.15				<0.20		<0.20	0.02	0.03	0.12	<0.050	<0.050	0.081			<0.03	0.04	0.10			<0.03	<0.03	<0.03		0.04	0.01		<0.03	<0.03	0.069	0.029
Lead-Dissolved	239.2	0.003 mg/l	<0.005	0.114	ND	0.008																														<0.005	<0.005		<0.03	<0.03	<0.03	<0.005
Nickel	249.2	0.002 mg/l	0.005	0.003	ND	0.01	<0.02																																				
Nickel-Dissolved	249.2	0.002 mg/l	0.007	0.002	ND	0.002																																					
Silver	272.2	0.001 mg/l	<0.005	<0.0005	ND	0.003	<0.003																																				
Silver-Dissolved	272.2	0.0005 mg/l	<0.005	0.0008	ND	ND																																					
Zinc	289.2	0.0025 mg/l	0.1	0.236	0.0317	0.283	<3.5	<0.3	<0.3	<0.25	0.83	0.603				<0.15		<0.15	1.3	0.1	0.387	0.045	0.053	0.356			<0.18	<0.18	0.29			0.129	<0.08	0.141		0.49	0.19		0.16	0.513	0.673	0.31
Zinc-Dissolved	289.2	0.0005 mg/l	0.15	0.242	0.04	0.0938																														0.15	0.07		<0.05	0.065	<0.05	0.029
Thallium	279.2	0.01 mg/l	<0.002	<0.01	ND	ND	<0.01																																				
Thallium-Dissolved	279.2	0.01 mg/l	<0.002	<0.01	ND	ND																																					
Mercury	245.1	0.0005 mg/l	<0.005	0.0018	<0.0005	<0.0005	<0.0005																																				
Mercury-Dissolved	245.1	0.0005 mg/l	0.0006	<0.0005	<0.0005	<0.0005																																					
FECAL STREPTOCOCCI (cfu/100 ml)	SM 910A	1		7,000	20	1,600		1070		23	2,000		TNTC	TNTC					628	>800																							
FECAL COLIFORMS (cfu/100 ml)	SM909C	1		500	16	22,000		TNTC		70	900		TNTC	TNTC					106	TNTC																							
E. COLI (Org/100ml)																																											
pH	150.1	0.01			8.32	8.06	7.96	8.26	8.13	8.24	7.77	7.81	8.04	7.96		8.19	8.13	8.25	8.20	8.15	8.05	8.20	8.19	8.18	8.25		8.12	7.98	8.09			8.40	8.04	8.13		7.84	7.82		8.37	8.16	8.17	7.84
TSS (mg/l)	160.2	4 mg/l	118	142	<4	193	121	33	163	<20	380	323				<10	302	228	10	51	944	2.4	7.6	254	380		<5	130	259			64	16.4	56		208	52		19	318	390	150
SSC - Coarse (mg/l)																																											
SSC - Fine (mg/L)																																											
VSS (mg/l)																																											
TDS (mg/l)	160.1	10 mg/l	500	350	1200	460	208	1040	814	834	660	328				1050	723	216	1200	1100	461	1030	1050	508	516		1250	902	522			598	588	403		440	381		784	820	938	120
HARDNESS (mg/l)	130.2	5 mg/l	120		570			470	395	378	462	174				512		148	560	516	128	544	552	312	316		556	432	264			316	316	184		232	180		418	406	282	89
TKN (mg/l)	351.2	0.2 mg/l			<0.5											<1.5	2.4	<1.5	<1	1	1	<1	<1	3			<2	<2	<2			<2.0	<2.0	<2.0		5.66	2.35		0.59	4	3.36	1.2
N (nitrate) (mg/l)	353.3	0.05 mg/l			5.3		0.81			4	1.2	0.87				7	5.5	1.3	8.30	7.52	2.30	7.13	7.05	3.53	3.61		7.24	5.13	2.48			1.90	2	1.1		1.75	1.44		5.44	5.15	4.53	0.8
N (nitrite) (mg/l)	300.0	0.02 mg/l														<0.2	<0.5	<0.2	<0.05	<0.05	0.07	<0.03	<0.03	0.10	0.10		<0.05	<0.05	<0.05			<0.03	<0.03	0.39		<0.02	<0.02		<0.075	<0.075	<0.075	
N (ammonia) (mg/l)	350.2	0.1 mg/l			<0.5											<1	<1	<1	0.1	0.2	0.3	0.2	<0.1	0.8			<0.2	0.2	0.4			<0.2	0.28	0.25		1.57	0.504		0.28	1.4	1.9	0.23
N (total N) (mg/l)																																											
Orthophosphate P (mg/l)	365.3	.02 mg/l			0.04		0.22	0.05	<0.08	0.05	0.41	0.18				<0.5	<0.5	<0.5	<0.3	<0.3	0.5	<0.2	<0.2	<0.2	<0.2		<0.5	<0.5	<0.2			<0.3	<0.3	<0.3		<0.2	<0.2		<0.5	<0.5	<0.5	0.13
P (total P) (mg/l)	365.3	.02 mg/l			0.03		0.4	0.11	0.32	<0.08	1.25	0.9				<0.08	0.48	0.64	<0.08	0.17	0.59	<0.08	1.27	0.56	0.51		0.07	0.13	0.6			0.046	0.06	0.49		0.476	0.312		1.59	<0.02	0.686	0.25
P (soluble P) (mg/l)	365.3	.02 mg/l			0.02		0.35																																				
Total Recoverable Phenolics	420.1	.05 mg/l			<0.05		0.052	<0.001																																			
BOD (total) (mg/l)	405.1	2 mg/l	14.5	6	<2	17	5	6	17	13.6	39.8	15.5	14	17		<6	21	10	2	2	8	2	2	17	19		3	16	7			2.75	5.29	10.7		25.9	17.2		2.03	>36.8	15.8	5
CBOD (mg/l)																																											
SCBOD (mg/l)																																											
COD (mg/l)	410.1	20 mg/l		<20	<20	100	74	<50	201	<50	<50	<50				<50	109	75	80	191	137	46	46	158	148		<14	25	57			70.4	32.4	57.8		159	107		35.4	268	203	71
Cyanide (total) (mg/l)	335.2	.005 mg/l			<0.005		0.007																																				
Oil and Grease (mg/l)	413.2	1 mg/l		<2.0	<1.0	<1.0	1.5	<2		52	11	7				199	8		2	2		<4.0	<4.0				<4	<4	NA			<2.6	<2.5			2.0			<1.8	5.8		
TPH (mg/l)	418.1	1 mg/l		<1.0	<1.0	<1.0	1.5	<1																																			

TNTC To Numerous to Count
(1) No priority pollutant constituents were detected (mg/l)
(2) Not enough precipitation for composite
(3) JOR-04 Station moved in 2000 due to difficulties w/ existing station
Highlighted area indicates this data was not included in load or EMC calculations (see annual report text for further description)

SUMMARY OF REPRESENTATIVE SAMPLING ANALYSES
JOR-04/JOR-03[3] OUTFALL - TRANSPORTATION/ RAW LAB RESULTS

	(only MIL07 sampled)	BASEFLOW GRAB	STORM GRAB	STORM COMPOSITE	(station not active)	(station not active)	(sampling equipment malfunction)	STORM GRAB	STORM COMPOSITE (calculated from pollutograph)	(station not active, sampled on 10/4/05)	(sampling equipment malfunction)	Not sampled - Station noise interference	(station not active)	STORM GRAB	STORM COMPOSITE	(precipitation varied such that sample collection was not successful)	BASEFLOW GRAB	STORM GRAB	STORM COMPOSITE (calculated from pollutograph)	BASEFLOW GRAB	STORM GRAB	STORM COMPOSITE (calculated from pollutograph)	BASEFLOW GRAB	STORM GRAB	STORM COMPOSITE (calculated from pollutograph)	BASEFLOW GRAB	STORM GRAB	BASEFLOW GRAB	STORM GRAB	STORM COMPOSITE	BASEFLOW GRAB	STORM GRAB	STORM COMPOSITE	BASEFLOW GRAB	STORM GRAB	BASEFLOW GRAB	STORM GRAB	BASEFLOW GRAB	STORM GRAB	STORM COMPOSITE
	Event 21	Event 22			Event 23	Event 24	Event 25	Event 26		Event 27	Event 28	Event 29	Event 30	Event 31		Event 32	Event 33			Event 34			Event 35			Event 36		Event 37			Event 38			Event 39		Event 40		Event 41		
CONSTITUENT	11/13/03	3/26/04			4/4/05	4/8/05	5/16/05	10/4/05		10/28/05	9/20/06	5/3/07	6/6/07	9/22/07		5/12/08	5/21/08			10/4/08			5/2/09			4/21/10		10/23/10			10/5/11			4/26/12		10/12/12		5/28/13		
METALS (mg/l)																																							
Selenium																																							
Selenium-Dissolved																																							
Antimony																																							
Antimony-Dissolved																																							
Arsenic																																							
Arsenic-Dissolved																																							
Beryllium																																							
Beryllium-Dissolved																																							
Cadmium		< 0.004	< 0.004	< 0.004				<0.0005	0.0007					<0.005	<0.005		<0.005	<0.005	0.0022	<0.005	<0.005	0.005	<0.002	<0.002	0.0012	0.0019	0.0033	<0.05	<0.005	<0.0005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Cadmium-Dissolved		< 0.004	< 0.004	< 0.004				<0.0005						<0.005	<0.005		<0.005	<0.005		<0.005	<0.005		<0.005	<0.005		<0.0005	<0.0005	<0.005	<0.005	<0.0005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chrominum																																							
Chrominum-Dissolved																																							
Copper		< 0.004	0.0047	0.10				0.02	0.0338					0.01	0.043		0.005	0.012	0.0177	<0.005	0.011	0.021	<0.005	0.023	0.0376	0.1240	0.466	0.0430	0.027	0.028	<0.005	0.02	0.038	<0.005	0.006	<0.005	0.023	<0.005	0.043	0.07
Copper-Dissolved		< 0.004	< 0.004	0.023				<0.01						0.005	0.021		<0.005	0.006		<0.005	0.009		<0.005	0.01		0.0050	0.013	0.0140	0.01	0.012	<0.005	0.008	0.015	<0.005	<0.005	<0.005	0.009	<0.005	0.005	0.015
Lead		< 0.005	< 0.005	0.059				0.008	0.0113					<0.02	<0.02		<0.02	<0.02	0.0115	<0.02	<0.02	0.02	<0.02	0.02	0.0184	0.0938	0.199	0.0200	0.05	0.0063	<0.02	0.02	0.02	<0.02	<0.02	<0.02	0.03	0.02	0.02	0.02
Lead-Dissolved		< 0.005	< 0.005	0.007				<0.001						<0.02	<0.02		<0.02	<0.02		<0.02	<0.02		0.02	0.02		<0.0005	<0.0005	<0.02	<0.02	<0.0005	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.02	<0.02	<0.02
Nickel																																							
Nickel-Dissolved																																							
Silver																																							
Silver-Dissolved																																							
Zinc		0.06	0.085	0.61				0.17	0.1772					0.1	0.13		0.02	0.06	0.0937	0.01	0.03	0.086	0.02	0.11	0.1622	1.0700	2.46	0.1800	0.15	0.11	<0.01	0.06	0.08	<0.01	0.02	<0.01	0.11	<0.01	0.26	0.26
Zinc-Dissolved		0.042	0.045	0.085				0.05						0.05	0.03		0.01	0.04		0.01	0.02		0.01	0.04		0.0300	0.04	0.0500	0.07	0.03	0.01	0.03	0.03	<0.01	<0.01	<0.01	0.03	<0.01	0.07	0.04
Thallium																																							
Thallium-Dissolved																																							
Mercury																																							
Mercury-Dissolved																																							
FECAL STREPTOCOCCI (cfu/100 ml)		< 100	100					590																															
FECAL COLIFORMS (cfu/100 ml)		< 100	300					>1300																		>2400	>2400												
E. COLI (Org/100ml)																				56	730		410	1400		22.00	2400	>2400	>2400		2400	>2400		150	77	460	240	410	1700	
pH		8.33	8.33	8.14				7.52						7.8	8		8.06	8.03		8.02	7.9		8.2	8		8.10	8	7.70	8	7.9	8.50	8.2	8.2	8.4	8.4	8.3	8.2	8.2	8.2	8
TSS (mg/l)		4	10	280				46	83.2289					41	92		<4	18	77.55	<4	14	48.15	<4	48	143.19	396.00	1520	188.00	66	59	4.00	28	42	<4	24	<4	50	<4	156	164
SSC - Coarse (mg/l)																										35.30	218			8	<0.1	11.2	8.1	<0.1	36.2					
SSC - Fine (mg/L)																										802.00	1960			53.7	2.60	15.4	36.7	2	11.1					
VSS (mg/l)																										55.00	205			12	<4	9	12	<4	6	<10	13	<10	76	42
TDS (mg/l)		890	850	400				1050						590	572		832	712		786	754		938	694		730.00	438	404.00	484	372	660.00	690	522	742	692	764	716	988.00	700	356
HARDNESS (mg/l)		420	420	170				227						308	275		391	374		400	341		410	260		312.00	566	180.00	202	159	320.00	301	231	352	331	366	353	460	207	164
TKN (mg/l)		0.1	0.7	4				1.8						1.7	2		<1	1		<1	1		<1	2		2.00	6	12	2	1	<1	<1	2	<1	1	<1	2	<1	4	2
N (nitrate) (mg/l)		4.00	4.1	0.85				3						2	2.2		2.5	2.2		2.7	2.8		2.6	1.8		0.80	0.8	1.4	1.6	1.2	1.9	2.1	1.7	1.8	1.7	2.2	1.9	2	1.1	0.8
N (nitrite) (mg/l)														<0.1	<0.1		<0.1	<0.1					<0.1	0.1		<0.1	<0.1			<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.02	0.03	,0.1	<0.1	<0.1
N (ammonia) (mg/l)		0.08	0.12	0.44				0.4						<0.2	0.3		0.3	<0.2		<0.2	<0.2		<0.2	<0.2		<0.2	0.4	<0.4	<0.4	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.3	<0.2	0.4	0.3
N (total N) (mg/l)																																		1.8	2.7	2.2	3.9	<1.0	3.9	1.8
Orthophosphate P (mg/l)		< 0.05	< 0.05	0.11				0.05						0.04	0.06		0.02	0.07		<0.01	0.03		<0.01	<0.01		0.02	0.05	0.06	0.05	0.04	<0.01	0.01	0.06	0.01	0.02	0.02	0.09	0.02	0.09	<0.01
P (total P) (mg/l)		< 0.05	0.11	0.36				0.2	0.1818					0.17	0.23		0.02	0.1	0.2053	0.02	0.07	0.5	0.02	0.1	0.216	0.500	1.7	0.210	0.17	0.14	0.020	0.1	0.14	0.02	0.13	0.02	0.17	0.03	0.26	0.28
P (soluble P) (mg/l)																																							
Total Recoverable Phenolics																																							
BOD (total) (mg/l)		< 5	< 5	15				15						11	15		<5	6		<5	<5		<5	<5		<5	24	13	11	<5	<5	<5	9	<5	<5	<5	<5	7	29	12
CBOD (mg/l)																										<5	15			<5	<5	<5	<5	<5	<5	<5	<5	<5	24	10
SCBOD (mg/l)																										<5	<5			<5	<5	<5	<5							
COD (mg/l)		< 10	< 10	140				71						37	83		<10	33		<10	40		<10	44		99	573	73	77	45	<10	46	76	20	27	<10	72	17	154	95
Cyanide (total) (mg/l)																																							
Oil and Grease (mg/l)		< 3	< 3					<5						<5			<5	<5		<5	5		<5	5		8	26	6	5		<5	<5		<5	<5	<6	6	<6	<5	
TPH (mg/l)																																							

TNTC To Numerous to Count
(1) No priority pollutant constituwere detected (mg/l)
(2) Not enough precipitation for composite
(3) JOR-04 Station moved in 20000 due to difficulties w/ existing station
Highlighted area indicates this data was not included in load or EMC calculations (see annual report text for further description)

SUMMARY OF REPRESENTATIVE SAMPLING ANALYSES
LIT-06 OUTFALL - RESIDENTIAL/ RAW LAB RESULTS

	EPA		LIT-06																																
			STORM COMPOSITE	STORM COMPOSITE	BASEFLOW GRAB STORM COMPOSITE	STORM COMPOSITE	STORM GRAB STORM COMPOSITE	BASEFLOW GRAB STORM GRAB STORM COMPOSITE	(station relocated)	(station relocated)	(not sampled/gage data)	BASEFLOW GRAB STORM GRAB STORM COMPOSITE	(<0.1 predicted)	BASEFLOW GRAB STORM GRAB STORM COMPOSITE	(w/in 45 day criteria)	(sampling cancelled)	STORM GRAB STORM COMPOSITE	STORM GRAB STORM COMPOSITE	STORM GRAB STORM COMPOSITE	STORM COMPOSITE	BASEFLOW GRAB STORM GRAB STORM COMPOSITE	(sampler problems)	(station inactive)	STORM GRAB STORM COMPOSITE STORM COMPOSITE SPLIT	(sampler malfunction)	(sampler malfunction)	STORM GRAB STORM COMPOSITE	(not sampled, delayed stor
			Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Event 11	Event 12	Event 13	Event 14	Event 15	Event 16	Event 17	Event 18	Event 19	Event 20	Event 21	Event 22	Event 23	Event 24	Event 25	Event 26
CONSTITUENT	Method	Method Limit	9/14/92	4/1/93	6/18/93	10/14/94	9/29/95	5/16/96	9/26/97	10/11/97	6/4/98	10/16/98 10/16/98 10/16/98	4/20/99	5/13/99	6/2/99	11/17/99	5/10/00	10/10/00	5/16/01	10/8/01	4/15/02 4/15/02 4/15/02	5/7/03	11/13/03	3/26/04	4/4/05	4/8/05	5/16/05	10/4/05
METALS (mg/l)																												
Selenium	270.3	0.005 mg/l	<0.005	<0.005	ND	<0.005																						
Selenium-Dissolved	270.3	0.005 mg/l	<0.005	<0.005	0.018																							
Antimony	204.2	0.005 mg/l	<0.005	<0.01	ND	<0.01																						
Antimony-Dissolved	240.2	0.01 mg/l	<0.005	<0.01	ND																							
Arsenic	206.2	0.01 mg/l	<0.01	<0.01	<0.01	<0.01																						
Arsenic-Dissolved	206.2	0.01 mg/l	<0.01	<0.01	<0.01																							
Beryllium	210.2	0.00025 mg/l	<0.0005	<0.00025	ND	<0.005																						
Beryllium-Dissolved	7091	0.00025 mg/l	<0.0005	<0.00025	ND																							
Cadmium	213.2	0.0005 mg/l	<0.0005	<0.0005	0.0006	<0.004	<0.02 <0.02	<0.02 <0.02 <0.02				<0.004 <0.004		<0.002 0.004 0.005			<0.003 <0.003	<0.003 <0.003	<0.0005 <0.0005		<0.004 0.009 <0.004			< 0.004 < 0.004 < 0.004			<0.004 <0.004	
Cadmium-Dissolved	200.7	0.0005 mg/l	<0.0005	<0.0005	ND													<0.003 <0.003	<0.0005 <0.0005	<0.004	0.0051 <0.004 <0.004			< 0.004 < 0.004 < 0.004			<0.004 <0.004	
Chrominum	218.2	0.0015 mg/l	0.003	0.012	0.006	<0.006																						
Chrominum-Dissolved	218.2	0.002 mg/l	0.0046	0.011	<0.0015																							
Copper	220.2	0.002 mg/l	0.009	0.014	0.028	0.019	<0.02 0.04	<0.1 0.19 <0.1				<0.01 0.035		0.005 0.08 0.15			0.017 0.026	0.084 0.043	0.015 0.014		<0.01 0.335 0.0653			0.095 0.035 0.038			0.082 0.016	
Copper-Dissolved	200.7	0.002 mg/l	0.014	0.012	0.01													0.02 0.022	0.01 0.029	0.013	<0.01 0.027 0.011			0.025 0.0064 0.0067			0.024 0.015	
Lead	239.2	0.003 mg/l	0.012	0.013	0.023	0.006	<0.15 <0.15	<0.15 0.220 <0.15				<0.050 <0.050		<0.03 0.06 0.14			<0.03 <0.03	<0.03	<0.005 <0.005		<0.03 0.349 0.047			0.053 0.019 0.047			0.041 <0.005	
Lead-Dissolved	200.7	0.003 mg/l	0.016	0.01	0.003													<0.03	<0.005 <0.005	<0.03	<0.03 <0.03 <0.03			< 0.005 < 0.005 < 0.005			<0.005 <0.005	
Nickel	249.2	0.002 mg/l	<0.002	<0.002	0.003	<0.02																						
Nickel-Dissolved	249.2	0.002 mg/l	0.003	<0.002	ND																							
Silver	272.2	0.001 mg/l	<0.005	<0.0005	0.004	<0.003																						
Silver-Dissolved	272.2	0.0005 mg/l	<0.005	<0.0005	ND																							
Zinc	289.2	0.0025 mg/l	0.05	0.063	0.117	0.051	<0.3 <0.3	<0.25 0.71 0.27				0.036 0.155		<0.18 0.29 0.35			<0.08 0.082	0.26 0.13	0.06 0.04		<0.05 1.25 0.238			0.6 0.15 0.17			0.26 0.037	
Zinc-Dissolved	200.7	0.0005 mg/l	0.07	0.051	0.0466													<0.08 <0.08	0.03 0.03	0.05	<0.05 <0.05 <0.05			0.095 0.014 0.019			0.023 <0.01	
Thallium	279.2	0.01 mg/l	<.002	<0.01	ND	<0.01																						
Thallium-Dissolved	279.2	0.01 mg/l	<0.002	<0.01	ND																							
Mercury	245.1	0.0005 mg/l	<0.002	<0.01	ND	<0.0005																						
Mercury-Dissolved	245.1	0.0005 mg/l	<0.0005	<0.0005	<0.0005																							
FECAL STREPTOCOCCI (cfu/100r	SM 910A	1		2,800	TNTC		2890	370 2,000																3,000				
FECAL COLIFORMS (cfu/100 ml)	SM909C	1		240	TNTC		TNTC	90 24,000																< 1,000				
E. COLI (Org/100ml)																												
pH	150.1	0.01			7.36	8.85	8.46 8.49	8.04 7.65 7.68				7.75 7.79 7.77		7.60 7.34 7.62			7.71 7.74	9.2	7.57 7.57	7.65	8.09 7.66 8.04			7.28 7.92 7.93			7.33 7.29	
TSS (mg/l)	160.2	4 mg/l	57	189	89	27	<4 128	<20 892 135				2.4 172 54		<5 159 1500			21 114	152 130	43 20	142	<7.1 2580 337			660 160 130			420 34	
SSC - Coarse (mg/l)																												
SSC - Fine (mg/L)																												
VSS (mg/l)																												
TDS (mg/l)	160.1	10 mg/l	810	130	80	60	264 150	192 216 <100				415 260 120		562 171 156			482 103	172 98.5	89.5 180	<5600	641 965 265			330 24 20			180 40	
HARDNESS (mg/l)	130.2	5 mg/l	106				200 103	140 264 80				348 280		400 148 232			240 80	100 64	60.0 100		459 475 154			160 44 53			100 33	
TKN (mg/l)	351.2	0.2 mg/l										1 2 3		<2 4.2 5			3.98 <2.0	3.5	2.80 1.96	2.86	0.7 16.9			14 3.8 9.9			7.6 2.1	
N (nitrate) (mg/l)	353.3	0.05 mg/l		0.45	0.66	0.19		<0.2 <0.2 <0.2				0.92 1.72 0.79		2.6 1.63 0.71			2.9 0.59	0.4 0.2	0.712 1.26		6.72 <0.12 3.92			1.9 0.36 0.36			1.1 0.5	
N (nitrite) (mg/l)	300.0	0.02 mg/l										<0.03 0.065 0.061		<0.05 <0.05 0.270			0.47 <0.03	0.18 <0.02	<0.02 <0.02		<0.075 <0.075 2.53							
N (ammonia) (mg/l)	350.2	0.1 mg/l		0.5	0.6							0.1 0.3 0.6		<0.2 1 1			0.9 <0.29	0.73	<0.1		<0.1 5.04 2.69			1.7 0.61 0.58			0.9 0.3	
N (organic) (mg/l)	365.3	.02 mg/l		0.13																								
N (total N) (mg/l)																												
Orthophosphate P (mg/l)	365.3	.02 mg/l		0.03	0.11	0.34	0.09 0.17	0.04 0.31 0.12				<0.2 <0.2 <0.2		<0.5 <0.5 <0.2			2.6 <0.3	<0.1 <0.2	<0.2 <0.2	<0.5	<0.5 <0.5 <0.5			0.46 0.16 0.16			0.1 0.077	
P (total P) (mg/l)	365.3	.02 mg/l		0.17	0.41	2.65	0.13 0.54	<0.08 1.3 0.56				<0.08 0.68 0.44		0.11 0.5 1.3			0.49 0.1	0.51 0.67	0.432 0.314	1.46	<0.02 1.99 0.947			1.0 0.42 0.44			0.96 1	
P (soluble P) (mg/l)	365.3	.02 mg/l		0.13		2.48																						
Total Recoverable Phenolics	420.1	.05 mg/l					<0.001																					
BOD (total) (mg/l)	405.1	2 mg/l	7.5	8	13	10	<6 19	6.6 12 11.7				2 9 13		<4.87 4 22			9.4 11.2	67 18	<2 12.6		2.15 >185 22.7			58 15 14			56 9	
CBOD (mg/l)																												
SCBOD (mg/l)																												
COC (mg/l)	410.1	20 mg/l		<20	100	126	<50 149	<50 163 <50				135 205 153		<14 83 663			66.2 66.2	276 127	145 86.4	102	12 685 214			450 100 120			300 42	
Cyanide (total) (mg/l)	335.2	.005 mg/l				<0.005																						
Oil and Grease (mg/l)	413.2	1 mg/l		10	3.3	2.4	4	44 13 <5				<4.0 5.8		<4 <4 NA			2.9	<1.9	2.0		<2 4.7			69				
TPH (mg/l)	418.1	1 mg/l		2.5	1.7	1.1	<1																					

ND Not Detected
TNTC To Numerous to Count
(1) No priority pollutant constituents were detected (mg/l)
(2) Station out of order due to relocation
Highlighted area indicates this data was not included in load or EMC calculations (see annual report text for further description)

SUMMARY OF REPRESENTATIVE SAMPLING ANALYSES
LIT-06 OUTFALL - RESIDENTIAL/ RAW LAB RESULTS

	STORM GRAB	STORM COMPOSITE	(sampling equipment malfunction)	Not sampled - Station inactive, parts on order	Not sampled - Station inactive, parts on order	STORM GRAB	STORM COMPOSITE	BASEFLOW GRAB	STORM GRAB	STORM COMPOSITE (calculated from pollutograph)	Not sampled - sampled on 5/12/08	BASEFLOW GRAB	STORM GRAB	STORM COMPOSITE (calculated from pollutograph)	BASEFLOW GRAB	STORM GRAB	STORM GRAB	BASEFLOW GRAB	STORM GRAB	BASEFLOW GRAB	STORM GRAB	STORM COMPOSITE	BASEFLOW GRAB	STORM GRAB	STORM COMPOSITE	BASEFLOW GRAB	STORM GRAB	STORM GRAB
	Event 27		Event 28	Event 29	Event 30	Event 31		Event 32			Event 33	Event 34			Event 35		Event 36	Event 37		Event 38			Event 39			Event 40		Event 41
CONSTITUENT	10/28/05		9/20/06	5/3/07	6/6/07	9/22/07		5/12/08			5/21/08	10/4/08			5/2/09		4/21/2010	10/23/10		10/5/11			4/26/12			10/12/12		5/28/13
METALS (mg/l)																												
Selenium																												
Selenium-Dissolved																												
Antimony																												
Antimony-Dissolved																												
Arsenic																												
Arsenic-Dissolved																												
Beryllium																												
Beryllium-Dissolved																												
Cadmium	0.0019	<0.0005				<0.005	<0.005	<0.005	<0.005	0.01		<0.005	<0.005	<0.01	<0.002	<0.002		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Cadmium-Dissolved	<0.0005	<0.0005				<0.005	<0.005	<0.005	<0.005			<0.005	<0.005		<0.005	<0.005		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chrominum																												
Chrominum-Dissolved																												
Copper	0.03	0.02				0.028	0.027	<0.005	0.026	0.02		<0.005	0.014	0.05	0.005	0.017		0.014	0.041	0.005	0.079	0.029	0.062	<0.005	0.037	<0.005	0.023	0.009
Copper-Dissolved	0.01	0.01				0.014	0.022	<0.005	0.019			<0.005	0.012		0.005	0.007		0.005	0.007	0.005	<0.005	0.016	<0.005	0.018	0.011	<0.005	0.007	0.006
Lead	0.015	0.003				<0.02	<0.02	<0.02	<0.02	0.02		<0.02	<0.02	0.04	<0.02	<0.02		<0.02	0.02	<0.02	0.06	<0.02	0.04	<0.02	0.02	<0.02	0.02	<0.02
Lead-Dissolved	0.018	0.012				<0.02	<0.02	<0.02	<0.02			<0.02	<0.02		<0.02	<0.02		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.02
Nickel																												
Nickel-Dissolved																												
Silver																												
Silver-Dissolved																												
Zinc	0.14	0.03				0.21	0.04	0.01	0.07	0.07		0.01	0.03	0.04	0.02	0.06		0.08	0.19	<0.01	0.19	0.03	0.31	<0.01	0.11	<0.01	0.07	0.02
Zinc-Dissolved	0.04	0.02				0.06	0.02	0.01	0.04			0.01	0.02		0.01	0.02		0.03	0.03	<0.01	<0.01	0.02	<0.01	<0.01	0.01	<0.01	0.02	0.02
Thallium																												
Thallium-Dissolved																												
Mercury																												
Mercury-Dissolved																												
FECAL STREPTOCOCCI (cfu/100r																												
FECAL COLIFORMS (cfu/100 ml)																												
E. COLI (Org/100ml)												20	>2400		290	2400		>2400	1600	3	2400		3	>2400		4	>2400	410
pH	6.55	6.16				7.06	7.4	7.68	7.34			7.44	7.09		7.5	7.3		7	7.3	7.9	7.6	7.6	7.7	8.2	7.3	7.9	7.4	7.8
TSS (mg/l)	96	17				70	39	11	47	126		<4	18	36.6	<4	48	509	42	205	<4	141	16	<4	544	125	<4	83	21
SSC - Coarse (mg/l)																	380			<0.1	128	12.4	0.3	121	51.9			
SSC - Fine (mg/L)																	157			0.2	75	5.6	<0.1	391	42.4			
VSS (mg/l)																	345			<4	35	9	<4	122	32	<4	45	10
TDS (mg/l)	<5	<5				220	176	700	376			534	226		700	390		114	232	580	282	244	552	164	52	564	260	128
HARDNESS (mg/l)	72	31.7				109	84	402	147			346	133		432	220		51	102	360	174	115	107	371	45	346	149	44
TKN (mg/l)	3.9	1.6				4	2.8	1	7			<1	2		<1	2			5	<1	5	2	1	8	2	<1	6	1
N (nitrate) (mg/l)	0.7	0.3				<0.1	0.9	5	<0.1			3	1.1		4.7	2.3		0.7	0.6	3	1	1	3.3	0.8	0.3	2.5	1.2	0.4
N (nitrite) (mg/l)	<0.1	<0.1				<0.1	<0.1	<0.1	0.2						<0.1	<0.1				<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.02	<0.1	<0.1
N (ammonia) (mg/l)	0.9	<0.4				0.8	0.6	<0.2	1.7			<0.2	0.2		<0.2	0.2		1	<0.1	<0.2	0.3	<0.2	<0.2	1.3	0.4	<0.2	1.1	<0.2
N (organic) (mg/l)																				<0.2								
N (total N) (mg/l)																							4.4	1.6	2.3	2.5	7.2	1.1
Orthophosphate P (mg/l)	0.48	0.1				0.03	0.13	<0.01	0.21			0.04	0.06		<0.01	0.04		0.09	0.02	<0.01	<0.01	0.07	0.02	0.34	0.07	0.02	0.39	0.1
P (total P) (mg/l)	0.83	0.23				0.41	0.35	0.04	0.47	0.33		0.05	0.2	1	0.03	0.4		0.27	0.45	0.03	0.68	0.18	0.03	1	0.33	0.04	0.66	0.18
P (soluble P) (mg/l)																												
Total Recoverable Phenolics																												
BOD (total) (mg/l)	56	18				39	19	<5	49			<5	12		<5	10		20	30	<5	37	18	<5	84	22	<5	101	11
CBOD (mg/l)																	54			<5	32	14	<5	56	13	<5	83	7
SCBOD (mg/l)																	34			<5	28	15						
COD (mg/l)	198	57				192	114	19	211			<10	87		<10	54		98	217	<10	322	122	20	355	75	59	246	48
Cyanide (total) (mg/l)																												
Oil and Grease (mg/l)	<5					<5		<5	<5			<5	<5		<5	<5		<5	10	<5	8		<5	5		<5	7	<5
TPH (mg/l)																												

ND Not Detected
TNTC To Numerous to Count
(1) No priority pollutant constituents were detected (mg/l)
(2) Station out of order due to location
Highlighted area indicates this data was not included in load or EMC calculations (see annual report text for further description)

SUMMARY OF RESPRESENTATIVE SAMPLING ANALYSES

SUMMARY OF REPRESENTATIVE SAMPLING ANALYSES
MIL-07 OUTFALL - RESIDENTIAL/ RAW LAB RESULTS

	EPA		MIL-07																												
			STORM COMPOSITE	STORM COMPOSITE	BASELOW GRAB STORM COMPOSITE	STORM COMPOSITE	STORM GRAB STORM COMPOSITE	BASELOW GRAB STORM GRAB STORM COMPOSITE	(lack of precipitation)	BASELOW GRAB STORM GRAB STORM COMPOSITE (3)	BASELOW GRAB STORM GRAB STORM COMPOSITE	BASELOW GRAB STORM GRAB STORM COMPOSITE	(<0.1 predicted)	BASELOW GRAB STORM GRAB STORM COMPOSITE	(w/in 45 day criteria)	BASELOW GRAB STORM GRAB STORM COMPOSITE	BASELOW GRAB STORM GRAB STORM COMPOSITE	STORM GRAB STORM COMPOSITE	STORM GRAB STORM COMPOSITE	STORM COMPOSITE	BASELOW GRAB STORM GRAB STORM COMPOSITE	STORM COMPOSITE	STORM GRAB STORM COMPOSITE	STORM GRAB STORM COMPOSITE	(not analyzed due to compositing error)	STORM COMPOSITE	(not sampled, sampled on 4/8/05)
			Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Event 11	Event 12	Event 13	Event 14	Event 15	Event 16	Event 17	Event 18	Event 19	Event 20	Event 21	Event 22	Event 23	Event 24	Event 25
CONSTITUENT	Method	Method Limit	9/14/92	4/1/93	6/18/93	10/14/94	9/29/95	5/16/96	9/26/97	10/11/97	6/4/98	10/16/98	4/20/99	5/13/99	6/2/99	11/17/99	5/10/00	10/10/00	5/16/01	10/8/01	4/15/02	5/7/03	11/13/03	3/26/04	4/4/05	4/8/05	5/16/05
METALS (mg/l)																											
Selenium	270.3	0.005 mg/l	<0.005		ND	<0.005																					
Selenium-Dissolved	270.3	0.005 mg/l	<0.005		<0.005																						
Antimony	204.2	0.005 mg/l	<0.005		ND	<0.01																					
Antimony-Dissolved	240.2	0.01 mg/l	<0.005		ND																						
Arsenic	206.2	0.01 mg/l	<0.01		<0.01	<0.01																					
Arsenic-Dissolved	206.2	0.01 mg/l	<0.01		<0.01																						
Beryllium	210.2	0.00025 mg/l	<0.0005		ND	<0.005																					
Beryllium-Dissolved	7091	0.00025 mg/l	<0.0005		ND																						
Cadmium	213.2	0.0005 mg/l	0.0012		0.001	<0.004	<0.02 <0.02	<0.02 <0.02 <0.02		<0.020		<0.004 <0.004		<0.002 NA		<0.002 <0.002	<0.003 <0.003 <0.003	<0.003 <0.003	<0.0005 <0.0005	<0.004	<0.004 0.005 <0.004	<0.004	<0.004 <0.004	< 0.004 < 0.004		<0.0040	
Cadmium-Dissolved	200.7	0.0005 mg/l	0.0011		0.0005													<0.003 <0.003	<0.0005 <0.0005	<0.004	<0.004 <0.004	<0.004	<0.004 <0.004	< 0.004 < 0.004		<0.0040	
Chrominum	218.2	0.0015 mg/l	0.0082		0.0076	<0.006																					
Chrominum-Dissolved	218.2	0.002 mg/l	0.0084		0.0026																						
Copper	220.2	0.002 mg/l	0.037		0.04	0.012	0.04 0.08	<0.1 0.25 <0.1		<0.050		0.063 0.035		0.013 NA		0.084 0.04	0.027 0.037 0.018	0.032 0.049	0.028 0.023	0.0565	0.112 0.196 0.025	0.036	0.0057 <0.004	0.13 0.045		0.035	
Copper-Dissolved	200.7	0.002 mg/l	0.031		0.017													0.029 0.027	0.007 0.018	0.015	0.034 0.018	0.0062	<0.004 <0.004	0.019 0.0076		0.0082	
Lead	239.2	0.003 mg/l	0.08		0.036	0.009	<0.15 <0.15	<0.15 0.450 <0.15		<0.20		0.068 <0.050		<0.03 NA		0.105 0.044	<0.03 <0.03 <0.03	0.038	0.029 0.014	0.043	0.065 0.164 <0.03	0.038	0.026 0.019	0.13 0.049		0.03	
Lead-Dissolved	200.7	0.003 mg/l	0.057		0.0005													<0.03	<0.005 <0.005	<0.03	<0.03 <0.03	<0.005	<0.005 <0.005	< 0.005 < 0.005		<0.0050	
Nickel	249.2	0.002 mg/l	0.006		0.004	<0.02																					
Nickel-Dissolved	249.2	0.002 mg/l	0.005		0.004																						
Silver	272.2	0.001 mg/l	<0.005		0.001	<0.003																					
Silver-Dissolved	272.2	0.0005 mg/l	<0.005		ND																						
Zinc	289.2	0.0025 mg/l	0.17		0.153	0.033	<0.30 0.4	<0.25 1.5 0.33		0.22		0.333 0.268		<0.18 NA		0.441 0.234	0.095 0.152 0.097	0.13 0.1	0.16 0.09	0.242	0.499 1.07 0.11	0.15	0.28 0.14	0.64 0.24		0.14	
Zinc-Dissolved	200.7	0.0005 mg/l	0.16		0.0586													<0.16 <0.08	0.03 0.04	0.07	<0.05 <0.05	0.013	0.086 0.047	0.034 0.023		<0.010	
Thallium	279.2	0.01 mg/l	<.002		ND	<0.01																					
Thallium-Dissolved	279.2	0.01 mg/l	<0.002		ND																						
Mercury	245.1	0.0005 mg/l	<0.002		ND	<0.0005																					
Mercury-Dissolved	245.1	0.0005 mg/l	<0.0005		0.0005																						
FECAL STREPTOCOCCI (cfu/100 ml)	SM 910A	1	3,000		2,900		4,230	19																< 1,000			
FECAL COLIFORMS (cfu/100 ml)	SM909C	1	90		5,000		TNTC	130																28,000			
E. COLI (Org/100ml)																											
pH	150.1	0.01			7.81	7.25	7.88 7.97	8.15 6.91 7.99		7.83 7.59		8.27 7.70 7.52		8.01 7.29		7.77 7.86	7.67 7.79 7.54	7.87	7.43 7.25 7.46		7.94 8.09 8.29	7.59	7.88 7.87	8.05 8.1		7.92	
TSS (mg/l)	160.2	4 mg/l	101		112	54	100	<20 1050 277		182		190 134		10 59.2		453 223	35 95 42	62.8 71.2	144 47 195		943 1680 104	180	88 66	51 170		200	
SSC - Coarse (mg/L)																											
SSC - Fine (mg/L)																											
VSS (mg/l)																											
TDS (mg/l)	160.1	10 mg/l	360		140	66	244	260 508 138		225		246 34		520 76		216 113	194 118 97	91.5 96.5	40 31	<5600	978 911 170	44	430 270	280 60		<10	
HARDNESS (mg/l)	130.2	5 mg/l	66				140	152 376 122		72		250 68		252 NA		152 74	56 44 40	104 60	52.0 40.0		502 598 68	51	83 47	160 51		46	
TKN (mg/l)	351.2	0.2 mg/l								2.5		6 3		2.1 <2.0		4.59 2.18	<2.0 <2.0 <2.0	<2.0	2.63 2.30	3.08	11.7 10.1	1.6		11 4.4		6.6	
N (nitrate) (mg/l)	353.3	0.05 mg/l				0.26		0.9 <0.2 <0.5		0.8 0.8		1.95 0.78		1.48 0.6		1.3 0.59	0.67 0.3 0.27	0.1 0.2	0.35 0.40		4.13 4.05 4.02	0.47	0.74 0.48	0.8 0.3		0.4	
N (nitrite) (mg/l)	300.0	0.02 mg/l								<0.2 <0.2		0.16 0.10		<0.02 0.25		0.5 0.15	0.4 0.38 <0.03	<0.01 <0.02	<0.02 <0.02		<0.075 <0.075 <0.075						
N (ammonia) (mg/l)	350.2	0.1 mg/l								<1		2.0		1.0 0.3		11.4 0.9	0.56 0.5 <0.2	0.9	0.17 0.784 1.12		2.02 2.8 1.01		0.52 0.44	1.5 0.56		0.79	
N (total N) (mg/l)																											
Orthophosphate P (mg/l)	365.3	.02 mg/l					0.19	0.03 0.21 0.2		<0.5 <0.5		<0.2 <0.2		<0.2 <0.2		0.18 <0.1	<0.3 <0.3 <0.3	<0.1 <0.2	<0.2 <0.2	<0.5	<0.5 0.932 <0.5	0.097	0.09 0.14	0.36 0.18		0.077	
P (total P) (mg/l)	365.3	.02 mg/l				1.72	0.42 0.63	<0.08 <2 0.77		0.36		0.48 0.53		0.2 0.3		0.96 0.59	0.47 0.34 0.28	0.49 0.52	0.522 0.353	1.52	1.13 1.99 <0.02	0.34	0.28 0.29	1.2 0.45		0.8	
P (soluable P) (mg/l)	365.3	.02 mg/l				1.65																					
Total Recoverable Phenolics	420.1	.05 mg/l					0.008																				
BOD (total) (mg/l)	405.1	2 mg/l	12.9		17	6	32 23	7.1 24 24.5		43 41		2 18		10 8		70 34	13.2 13 13.8	25 17	17.5 16.3	28.1	113 78.2 8.79	8	35 24	38 14		9	
CBOD (mg/l)																											
SCBOD (mg/l)																											
COD (mg/l)	410.1	20 mg/l			150	55	218 205	<50 200 <50		181		355 213		35 57		240 119	113 102 85.2	117 109	78.1 92.7	106	484 597 103	94	200 120	520 110		90	
Cyanide (total) (mg/l)	335.2	.005 mg/l																									
Oil and Grease (mg/l)	413.2	1 mg/l	8		1.6	2.4	5	<5 28 9		7 <5		<4.0		<4 NA		5.48 NA	4.2 2.42	<2.1	2.6		11.7 14		9.3	14			
TPH (mg/l)	418.1	1 mg/l	<2.0		<1.0	1.2	2.6																				

ND Not Detected
TNTC To Numerous to Count
(1) No priority pollutant constituents were detected (mg/l)
(2) Not enough precipitation for composite
(3) Machine failure

Highlighted area indicates this data was not included in load or EMC calculations (see annual report text for further description)
O&G samples not identified as Base or Rise/ Given TSS data, it is assumed that these levels are in the correct column

SUMMARY OF REPRESENTATIVE SAMPLING ANALYSES
MIL-07 OUTFALL - RESIDENTIAL/ RAW LAB RESULTS

	STORM GRAB	STORM COMPOSITE (calculated from pollutograph)	(not sampled, sampled on 10/4/05)	STORM GRAB	STORM COMPOSITE	STORM GRAB	STORM COMPOSITE	STORM GRAB	STORM COMPOSITE	Samples not analyzed - sampler malfuntioned	Samples not analyzed - sampler malfuntioned	BASEFLOW GRAB	STORM GRAB	BASEFLOW GRAB	STORM GRAB	STORM COMPOSITE (calculated from pollutograph)	STORM GRAB	STORM COMPOSITE (calculated from pollutograph)	STORM GRAB	STORM COMPOSITE (calculated from pollutograph)	BASEFLOW GRAB	STORM GRAB	STORM COMPOSITE	Station not operational due to damage during spring floods	BASEFLOW GRAB	STORM GRAB	STORM GRAB	STORM COMPOSITE	Station not operational/ under repair/ safety issues
	Event 26		Event 27	Event 28		Event 29		Event 30		Event 31	Event 32	Event 33		Event 34			Event 35		Event 36		Event 37			Event 38	Event 39		Event 40		Event 41
CONSTITUENT	10/4/05		10/28/05	9/20/06		5/3/07		6/6/07		9/22/07	5/12/08	5/21/08		10/4/08			5/2/09		4/21/10		10/23/10			10/5/11	4/26/12		10/12/12		5/28/13
METALS (mg/l)																													
Selenium																													
Selenium-Dissolved																													
Antimony																													
Antimony-Dissolved																													
Arsenic																													
Arsenic-Dissolved																													
Beryllium																													
Beryllium-Dissolved																													
Cadmium	<0.0005	0.0005		0.0006	<0.0005	<0.005	<0.005	<0.005	<0.005			<0.005	<0.005	<0.005	<0.005	<0.005	<0.002	0.0020	0.0014	0.0016		<0.005	<0.0005		<0.005	<0.005	<0.005	<0.005	
Cadmium-Dissolved	<0.0005			<0.0005	<0.0005	<0.005	<0.005	<0.005	<0.005			<0.005	<0.005	<0.005	<0.005		<0.005		<0.0005			<0.005	<0.0005		<0.005	<0.005	<0.005	<0.005	
Chrominum																													
Chrominum-Dissolved																													
Copper	0.02	0.1333		0.017	0.024	0.067	0.058	0.156	0.046			0.005	0.039	0.008	0.053	0.059	0.024	0.0605	0.213	0.1492		0.015	0.036		<0.005	0.116	0.033	0.018	
Copper-Dissolved	0.01			0.007	0.016	0.025	0.022	0.012	0.036			<0.005	0.018	0.005	0.015		0.012		<0.005			0.011	0.011		<0.005	0.012	0.005	0.005	
Lead	0.012	0.01145		0.014	0.01	0.08	<0.05	0.22	<0.05			<0.02	<0.02	<0.02	0.05	0.03	0.02	0.0589	0.102	0.0871		<0.02	0.0178		<0.02	0.04	0.04	0.02	
Lead-Dissolved	0.01			0.01	<0.001	<0.05	<0.05	<0.05	<0.05			<0.02	<0.02	<0.02	<0.02		<0.02		<0.0005			<0.02	<0.0005		<0.02	<0.02	<0.02	<0.02	
Nickel																													
Nickel-Dissolved																													
Silver																													
Silver-Dissolved																													
Zinc	0.08	0.079422		0.13	0.07	0.48	0.21	0.96	0.15			0.01	0.16	0.02	0.23	0.135	0.1	0.2628	0.94	0.6235		0.05	0.15		0.03	0.5	0.19	0.08	
Zinc-Dissolved	0.04			0.03	0.02	0.1	0.05	0.06	0.02			<0.01	0.05	0.01	0.02		0.03		<0.01			0.03	0.02		0.01	0.12	0.02	<0.01	
Thallium																													
Thallium-Dissolved																													
Mercury																													
Mercury-Dissolved																													
FECAL STREPTOCOCCI (cfu/100 ml)	580																												
FECAL COLIFORMS (cfu/100 ml)	>920																		>2400										
E. COLI (Org/100ml)				690		1200		1700						23	2400		550		170		490	820			1	110	1000		
pH	7.25			7.54	7.59	7	7.35	7.4	7.31			8.01	7.66	8.01	7.74		7.5		7.6		7.8	8	8		8.2	7.4	7.9	7.8	
TSS (mg/l)	48	28.7787		68	46	282	176	1090	203			<4	141	23	469	283.94	78	235.01	462	745.86	92	148	126		9	301	212	66	
SSC - Coarse (mg/L)																			57.6						1.8	218			
SSC - Fine (mg/L)																			7.6						2.8	408			
VSS (mg/l)																			128	142.24			30		<4	96	58	32	
TDS (mg/l)	196			190	102	328	380	258	126			366	346	366	204		260		540		202	178	104		340	484	128	42	
HARDNESS (mg/l)	114			110	60	102	71	237	57			242	167	199	133		110		267		80	70	49		194	288	71	35	
TKN (mg/l)	3.2			2.2	1.5	10.2	4.3	9.2	2.3			<1	8	<1	3		2		8		2	2	1		1	44	2	1	
N (nitrate) (mg/l)	3			1.5	0.8	1.4	0.7	<0.1	0.3			0.5	<0.1	0.5	0.8		1.6		0.9		0.9	0.9	0.3		0.8	0.6	0.4	0.3	
N (nitrite) (mg/l)				<0.1	<0.1			<0.1	<0.1			<0.1	0.4				<0.1		<0.1				<0.1		<0.1	0.2	<0.1	<0.1	
N (ammonia) (mg/l)	0.8			0.7	0.5	0.9	<0.2	1.2	0.4			<0.2	0.8	<0.2	0.4		0.3		0.7		0.7	0.6	<0.4		<0.2	1.2	0.5	0.3	
N (total N) (mg/l)																									1.8	45	2.4	1.3	
Orthophosphate P (mg/l)	0.14			0.16	0.11	<0.01	0.02	0.09	<0.05			0.06	0.3	0.2	1.07		0.05		0.2		0.12	0.14	0.1		0.02	0.02	0.11	0.09	
P (total P) (mg/l)	0.3	0.2587		0.68	0.24	1.34	0.66	1.84	0.43			0.08	0.77	0.23	1.44	0.83	0.3	0.7089	1.2	1.18	0.3	0.23	0.35		0.05	3	0.51	0.21	
P (soluable P) (mg/l)																													
Total Recoverable Phenolics																													
BOD (total) (mg/l)	38			32	16	646	126	71	16			<5	54	<5	28		15		59		26	25	14		<5	256	23	8	
CBOD (mg/l)																			52				11		<5	179	<5	7	
SCBOD (mg/l)																			41				<5						
COD (mg/l)	162			94	48	740	237	499	108			14	253	<16	249		87		434		115	83	97		<5	577	203	50	
Cyanide (total) (mg/l)																													
Oil and Grease (mg/l)	<5			<5		10		15				13	7	<5	7		6		20		9	11			<5	8	12		
TPH (mg/l)																													

ND Not Detected
TNTC To Numerous to Count
(1) No priority pollutant constituents were detected (mg/l)
(2) Not enough precipitation for concomposite
(3) Machine failure
Highlighted area indicates this data was not included in load or EMC calculations (see annual report text for further description)
O&G samples not identified as Base or Rise/ Given TSS data, it is assumed that these levels are in the correct column

APPENDIX C

Salt Lake County Stormwater Event Mean Concentrations

Average Outfall Event Concentrations

Station	Predominant Landuse	Cumulative Average Concentration (mg/L)													
		TSS	TDS	Hard-ness	T Phos	Ortho-Phos	T Nitrogen	Am-monia	TKN	BOD_5	COD	T Cd	T Cu	T Pb	T Zn
DEL-02/01	Commer-cial	82.1	268.6	150.4	0.30	0.11	2.6	0.38	2.00	13.0	69.8	0.002	0.037	0.026	0.097
DEL-05	Industrial	150.6	361.2	149.1	0.41	0.08	2.3	0.39	1.53	16.8	83.3	0.002	0.038	0.029	0.200
JOR-04/03	Transport-ation	187.6	418.4	200.9	0.38	0.11	3.4	0.35	1.57	11.0	87.8	0.002	0.058	0.052	0.315
LIT-06 & MIL-7	Residen-tial	133.3	129.6	70.8	0.55	0.13	3.0	0.47	2.05	05.9	97.4	0.002	0.044	0.032	0.155

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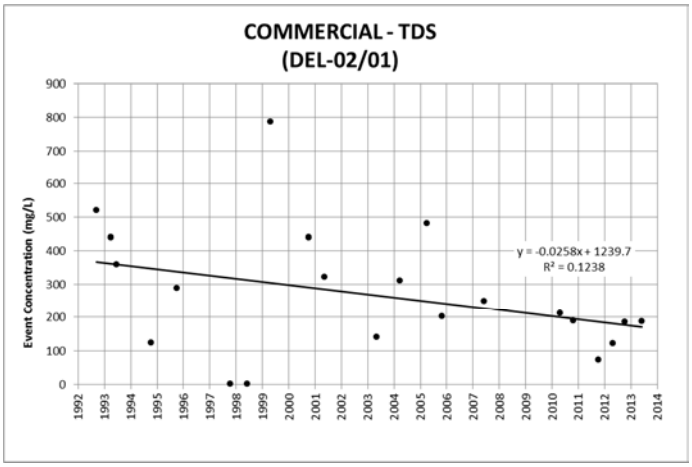
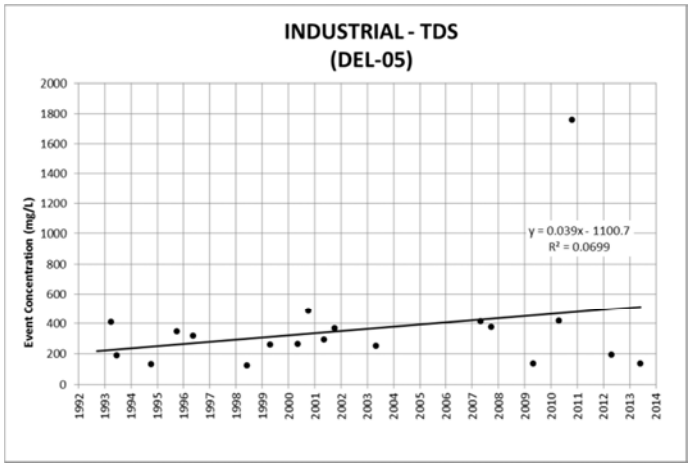
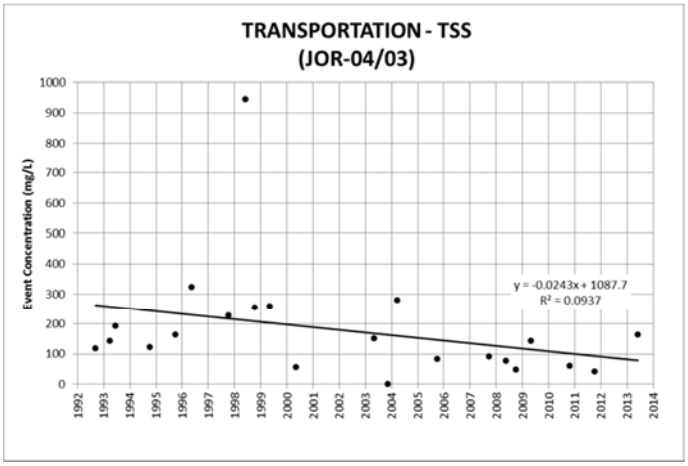
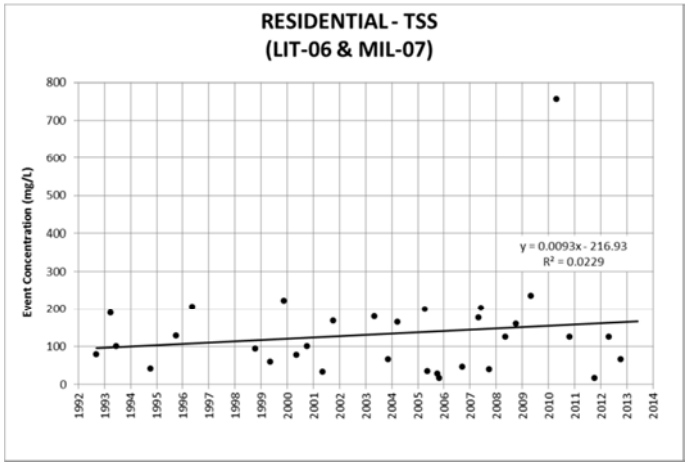
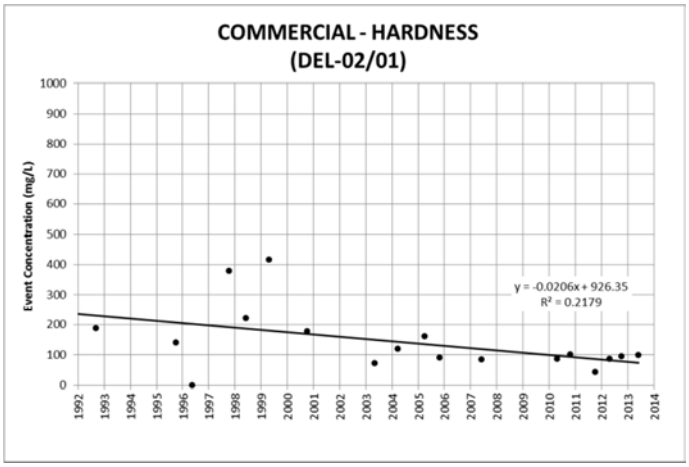
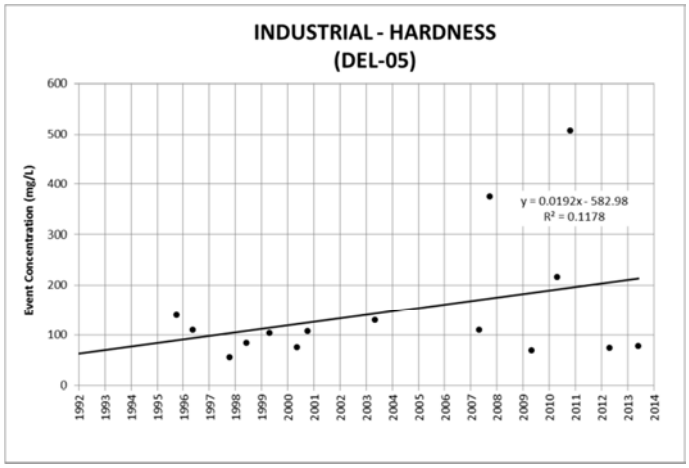


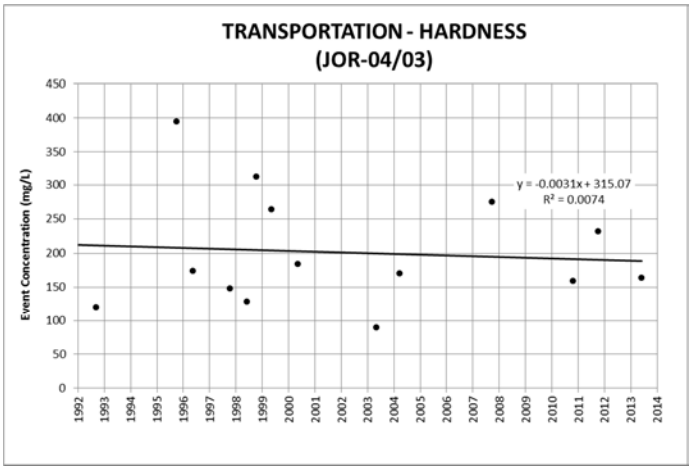


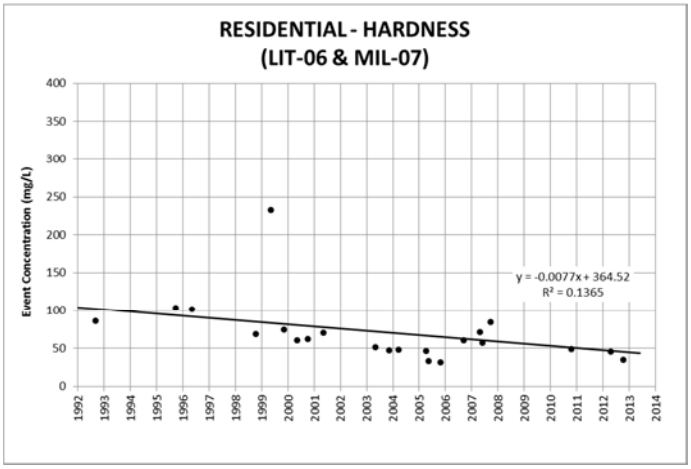


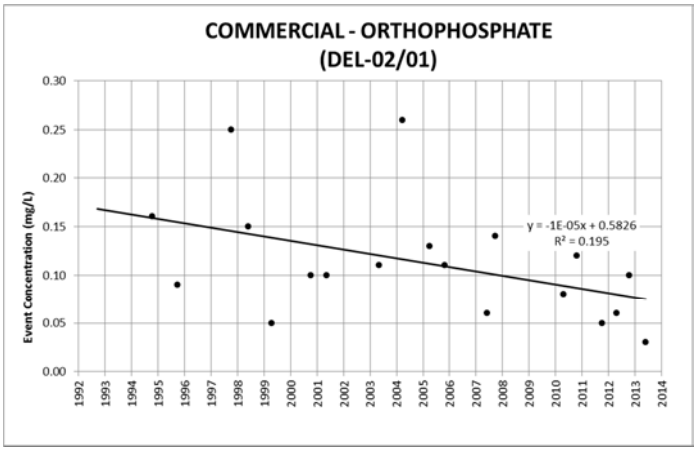


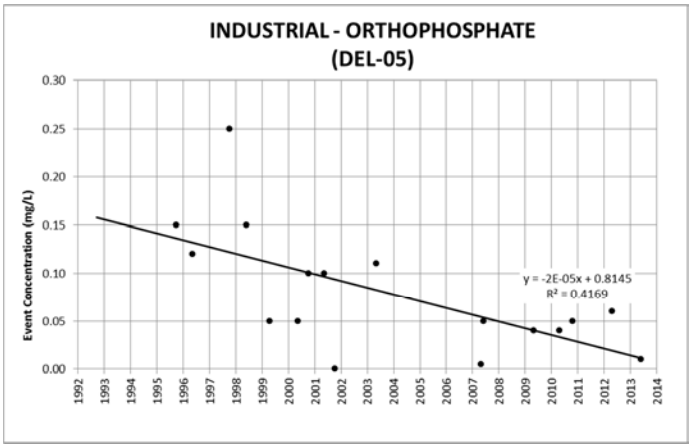


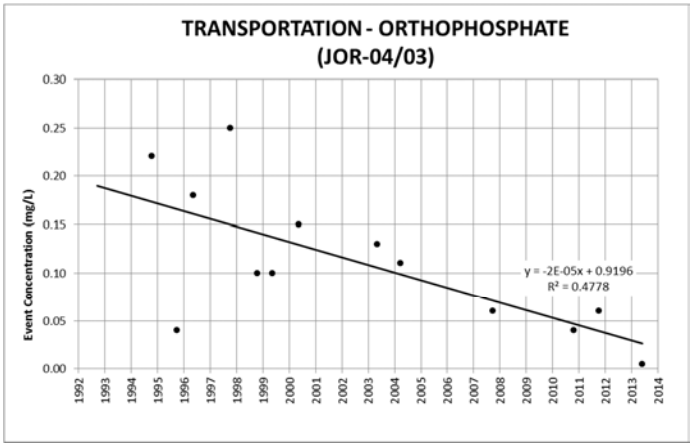


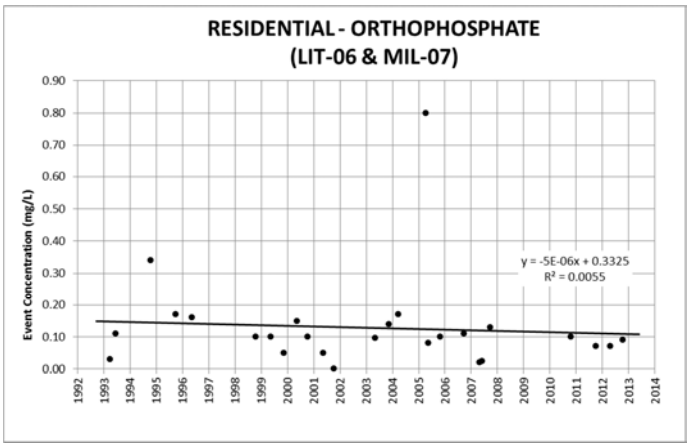

TRANSPORTATION - HARDNESS
(JOR-04/03)
Event Concentration (mg/L)
y = -0.0031x + 315.07
R² = 0.0074


RESIDENTIAL - HARDNESS
(LIT-06 & MIL-07)
Event Concentration (mg/L)
y = -0.0077x + 364.52
R² = 0.1365


COMMERCIAL - ORTHOPHOSPHATE
(DEL-02/01)
Event Concentration (mg/L)
y = -1E-05x + 0.5826
R² = 0.195


INDUSTRIAL - ORTHOPHOSPHATE
(DEL-05)
Event Concentration (mg/L)
y = -2E-05x + 0.8145
R² = 0.4169


TRANSPORTATION - ORTHOPHOSPHATE
(JOR-04/03)
Event Concentration (mg/L)
y = -2E-05x + 0.9196
R² = 0.4778


RESIDENTIAL - ORTHOPHOSPHATE
(LIT-06 & MIL-07)
Event Concentration (mg/L)
y = -5E-06x + 0.3325
R² = 0.0055

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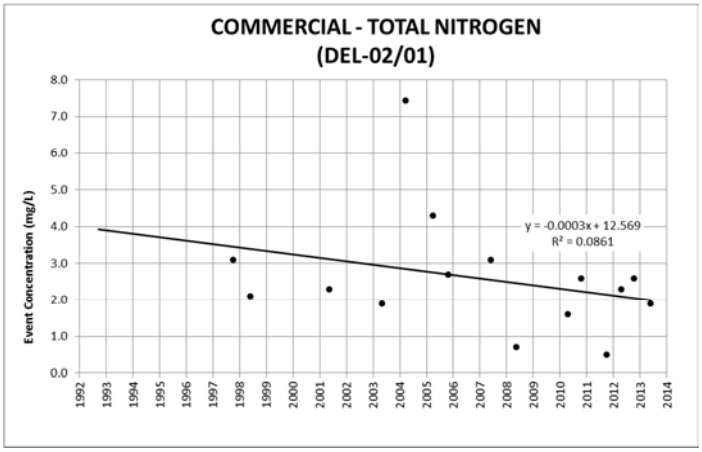

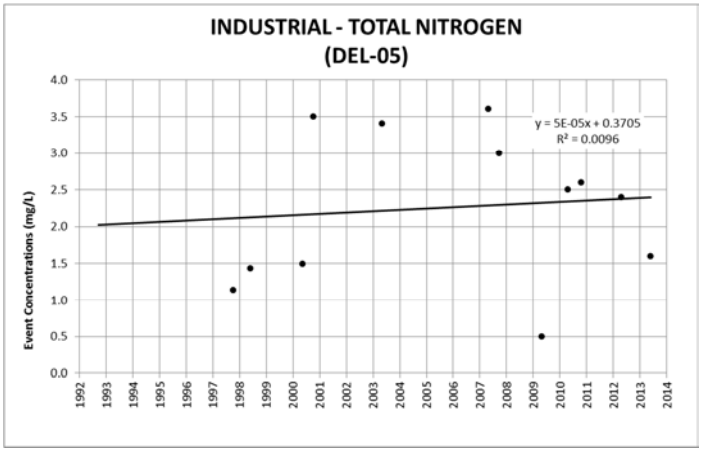

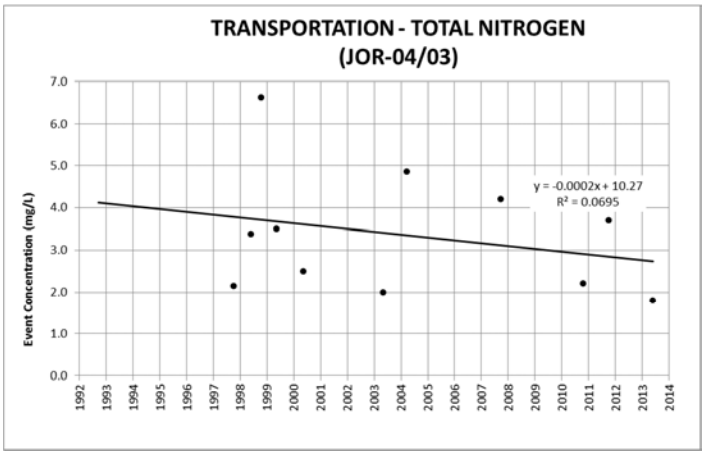

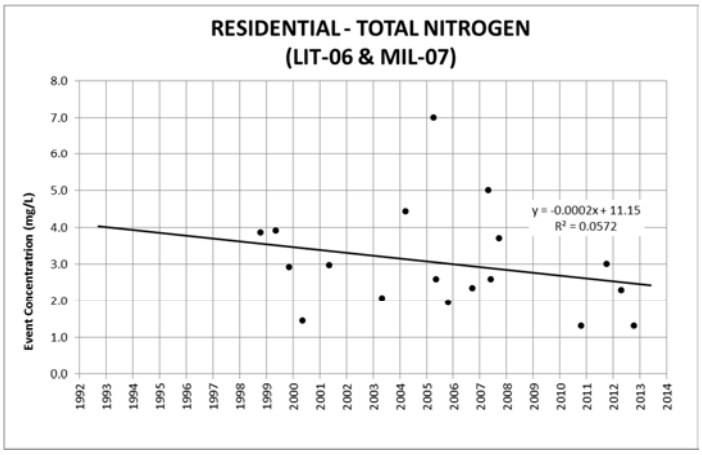

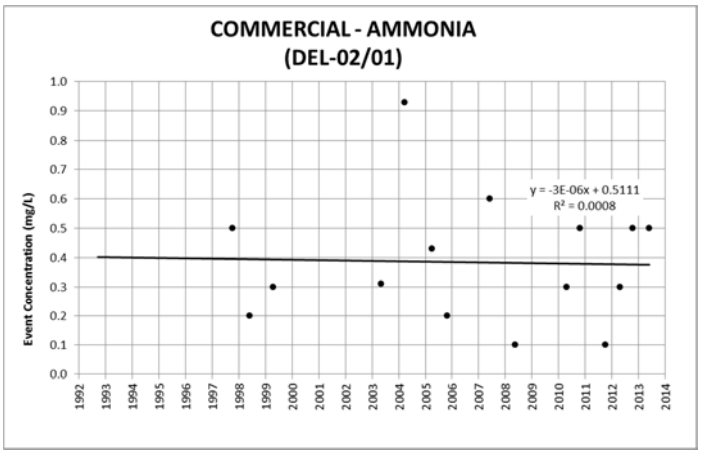

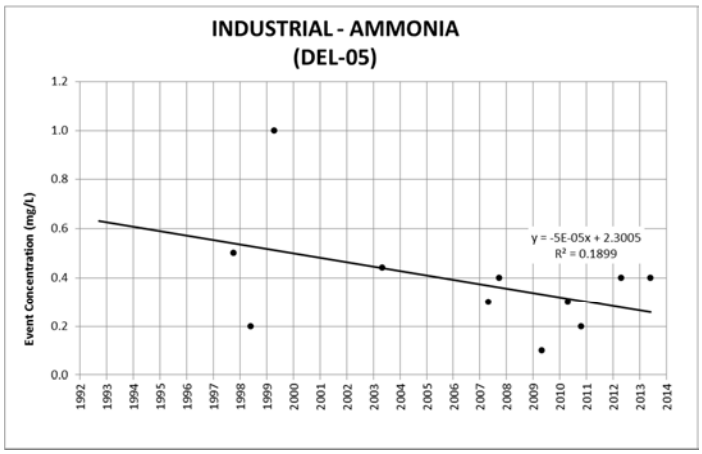

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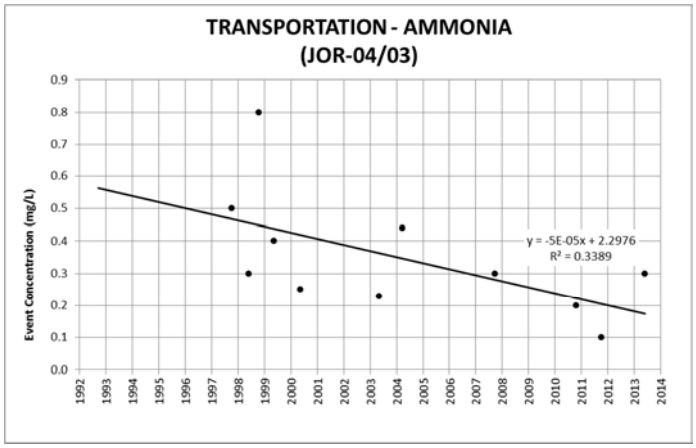

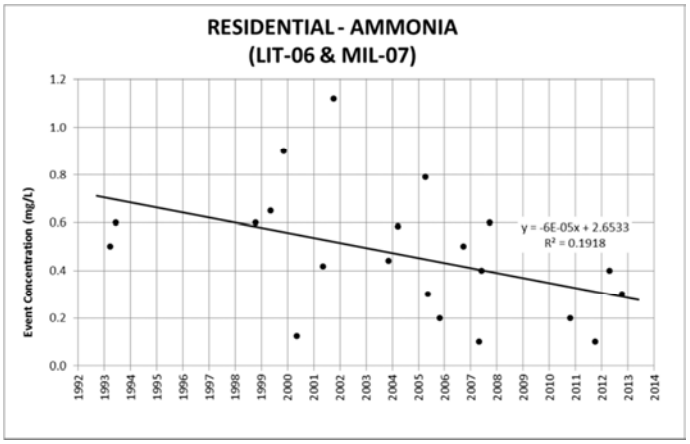

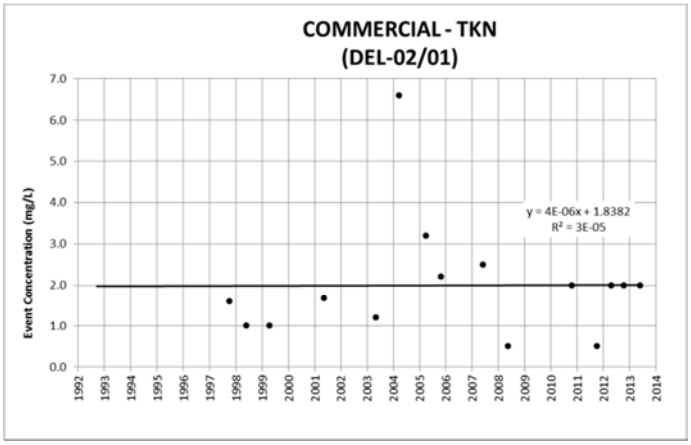

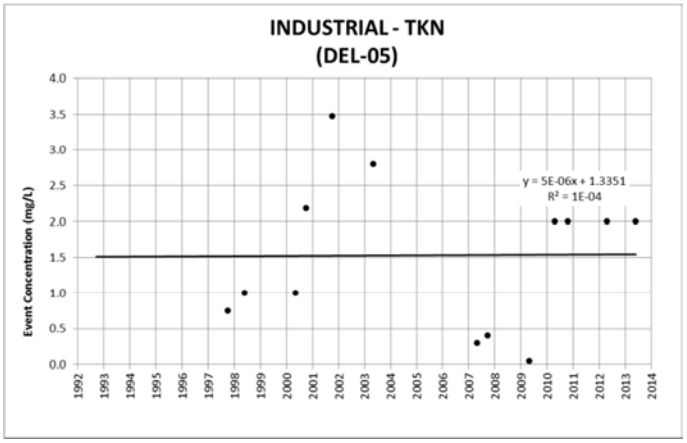

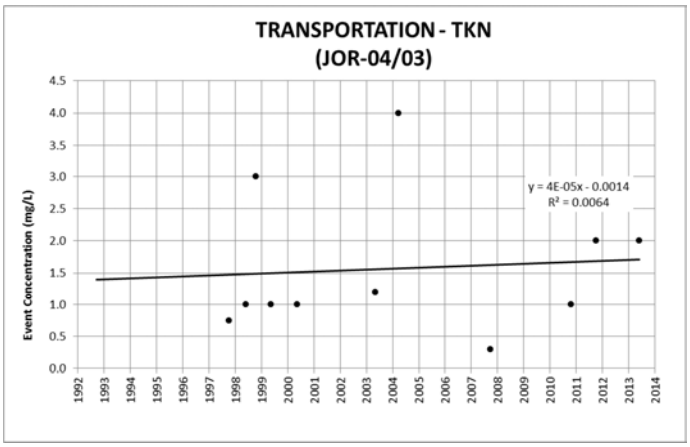

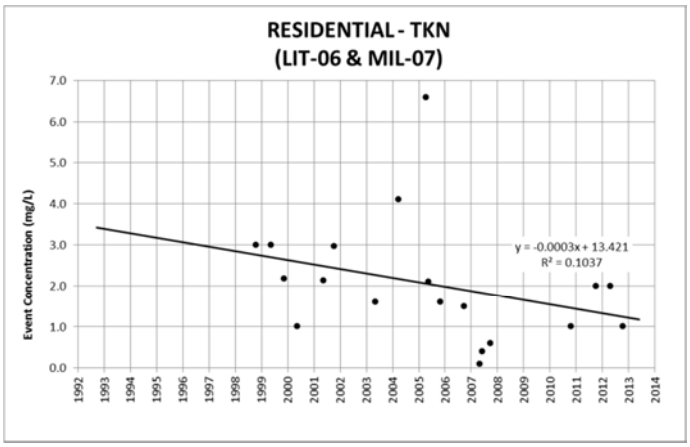

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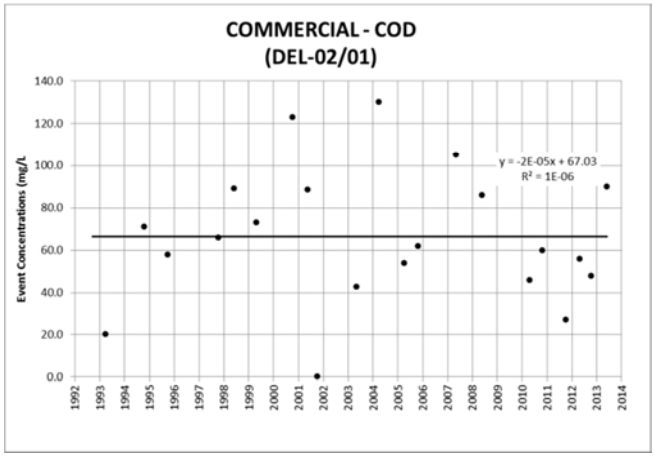

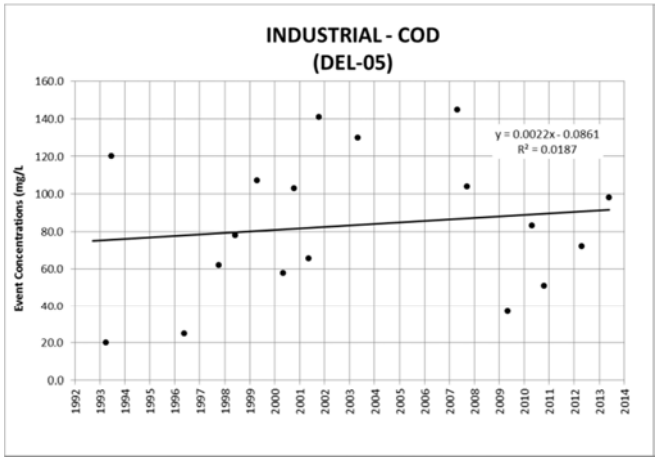

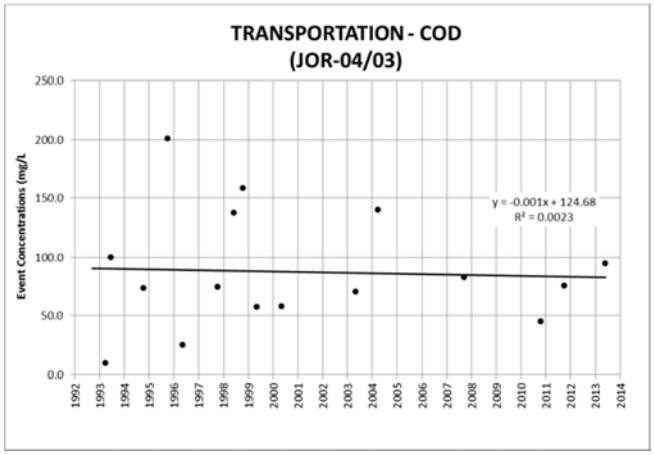

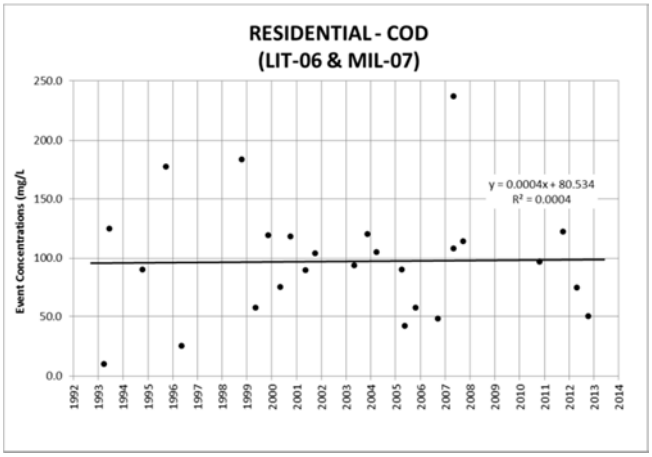

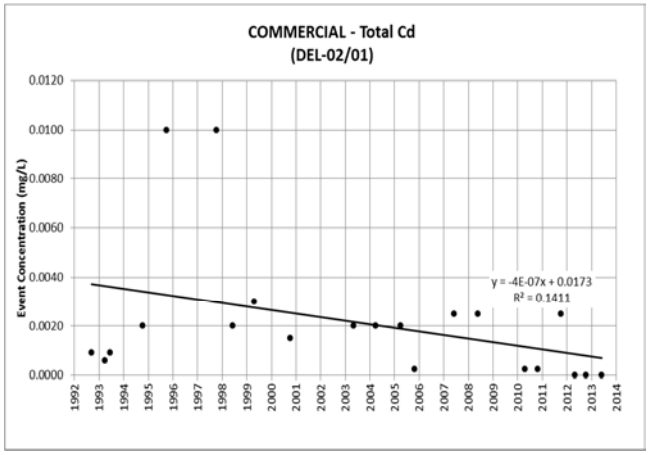

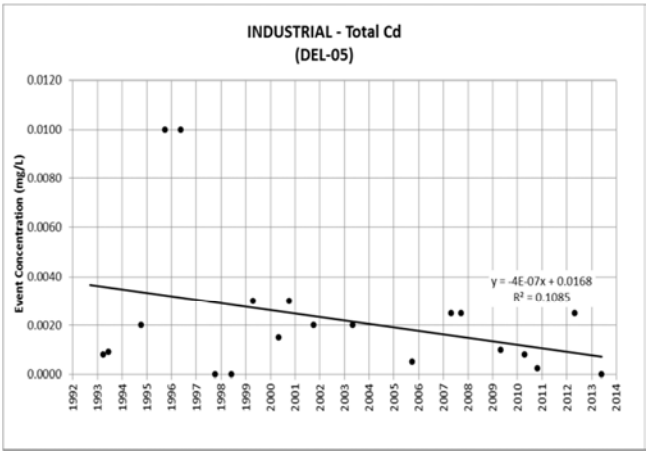

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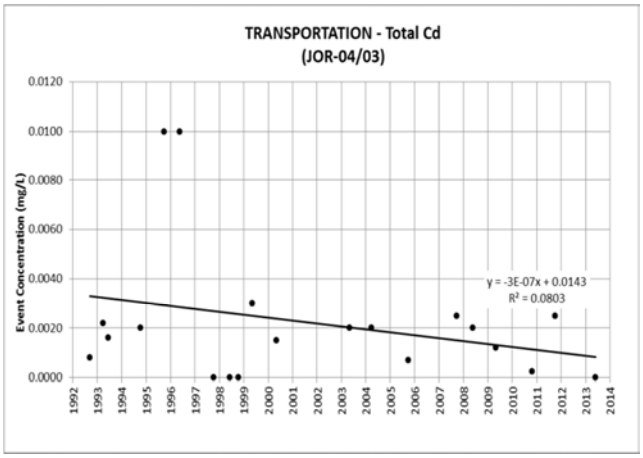

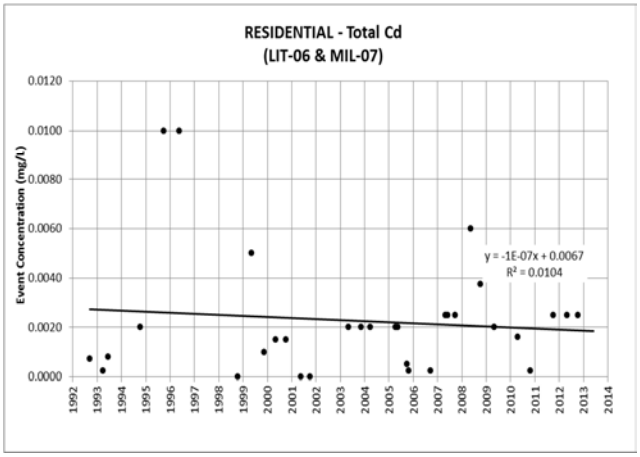

APPENDIX D

Unincorporated Salt Lake County Stormwater EMCs

Unincorporated Salt Lake County Stormwater EMCs

	Constituent	2009 EMC (mg/L)	2010 EMC (mg/L)	2011 EMC (mg/L)	2012 EMC (mg/L)	2013 EMC (mg/L)
Solids	Total Suspended Solids	126	144	139	137	137
	Total Dissolved Solids	150	158	165	161	162
	Hardness	90	90	93	91	91
Nutrients	Total Phosphorus	0.6	0.61	0.59	0.56	0.53
	Ortho Phosphorus	0.157	0.155	0.150	0.139	0.129
	Total Nitrogen	3.07	2.86	2.85	2.74	2.74
	Ammonia	0.518	0.507	0.479	0.471	0.444
	TKN	2.38	2.45	2.55	2.42	2.26
Oxygen	BOD_5	14.5	14.5	14.6	14.7	14.7
	COD	86.3	86.8	96.8	95.0	98.3
Total Metals	Cadmium	0.0027	0.0027	0.0027	0.0027	0.0026
	Copper	0.0415	0.0443	0.0435	0.0427	0.0427
	Lead	0.038	0.0405	0.0396	0.039	0.0390
	Zinc	0.1546	0.1678	0.1622	0.1593	0.1596

APPENDIX E

Municipal Comparison

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APPENDIX E

Review of permit monitoring requirements and monitoring conducted by other municipalities

- Ada County (Boise) - Permit issued by EPA
  A wet-weather monitoring program must be developed to assess effectiveness of control measures, estimate loadings and EMCs, and identify water quality improvements or degradation. A minimum of three storm events at five outfalls per year must be sampled. Grab samples and flow-weighted composites are collected. Samples are analyzed for 24 constituents including solids, nutrients, metals, pesticides and bacteria. In addition, analysis of organics must be conducted twice/year during the 2nd and 4th years of the permit. A sediment analysis collected from at least three catch basins representing landuses must be collected and analyzed for solids, nutrients, hydrocarbons, VOCs, bacteria and metals. A floatable monitoring program is also required at least twice/year. The amount of material collected is to be estimated in cubic yards.

  Stormwater Monitoring Program
  Event mean concentrations are calculated for each storm event. Annual loading estimates are calculated for each storm event, as well as annual loading rates for each waterbody. Statistical analyses are conducted to determine seasonal differences, yearly differences, and the interaction between yearly and seasonal effects.

  The Ada County Highway District (ACHD), as a co-permittee, also conducts bioretention facility monitoring through monitoring wells, to determine the effectiveness of the BMP. The ACHD also conducts sediment particle size analyses on detention basin inlets and outlets, as well as on sand and grease traps.

- Dallas – Permit issued by Texas Commission on Environmental Quality
  Permit requires representative storm event sampling on representative outfalls, internal sampling stations, and instream locations. Grab and composite samples are collected at five outfall locations, and are analyzed for 20 constituents (including diazinon) twice/year. The permittee is given the option of conducting rapid bioassessments that includes at least two receiving waterbodies and one reference site. The permittee may also participate in the Dallas-Fort Worth Regional Wet Weather Characterization Program. Seasonal loadings and event mean concentrations must be estimated. Finally, the permittee is required to maintain two monitoring locations for removal of floatable material. Floatable material is to be collected at least twice/year; estimates of weight or volume are to be reported in the annual report.

  Stormwater Monitoring Program

Wet weather sampling includes sampling at two outfalls at least twice/year. In addition, Dallas sampled five outfalls as part of a Regional Wet Weather Program. Samples are analyzed for 14 parameters. In addition, a rapid bioassessment program is conducted on two waterbodies that receive stormwater discharges.

- Denver (City and County) - Permit issued the Colorado Department of Public Health and Environment
  Monitoring is required to assess wet weather condition and stormwater effects. The permit requires sampling in accordance with a Stormwater Quality Monitoring Plan that was incorporated in 1997. In addition, E. Coli dry weather monitoring is required due to a TDML on the South Platte River.

  Stormwater Monitoring Program
  Instream sampling is conducted by the USGS at 5 stations for Lakewood, Aurora and Denver. Samples are time-weighted, and are analyzed for total solids, organic carbon, hardness, nutrients and metals.

- Las Vegas - Permit issued by Nevada Bureau of Water Pollution Control
  A stormwater monitoring plan must be developed and submitted each year. The plan must evaluate how monitoring may assist in making decisions about program compliance, the appropriateness of identified BMPs, and progress toward achieving goals.

  Stormwater Monitoring Program
  Wet weather sampling is conducted at two instream locations with automated samplers. The objective is to sample up to 10 stormwater/year from each site. Grab and composite samples are collected. The first samples are analyzed for the full suite of constituents; a shorter list of subsequent storms. Samples are analyzed for 72 constituents, including solids, metals, nutrients, bacteria, organics and bacteria. In addition, Las Vegas conducts detention basin monitoring from the inflows and outflows of three basins, during three storms/year. Automated samplers are utilized; both grab and composite samples are collected. Samples are analyzed for solids, nutrients, metals and bacteria, for a total of 14 analytes.

- Phoenix - Permit issued by Arizona Department of Environmental Quality
  The new stormwater discharge permit (March 10, 2009) requires monitoring to evaluate the effectiveness of BMPs and the stormwater management plan, and to estimate pollutant loading to waters of the U.S. Stormwater samples are to be collected at least twice/year at seven locations. Samples are analyzed for 133 constituents, including solids, metals, nutrients, volatiles and pesticides. Pollutant loading estimates and event mean concentrations are to be calculated.

  Stormwater Monitoring Program

Monitoring is conducted at 10 stations; 7 outfalls and 3 instream locations. Grab and composite samples are collected from the outfall stations; results are used to estimate annual pollutant loads. Grab samples are collected from the instream stations.

- San Jose – Permit issued to Santa Clara Valley by the Water Quality Board
  San Jose is one of 15 co-permittees. Monitoring is conducted to demonstrate the effectiveness of the management plan and demonstrate compliance with the permit.

  Stormwater Monitoring Program
  A comprehensive monitoring program includes the San Francisco Bay Area; encompassing three watersheds. The program entails a joint effort of several organizations, including the permittees, and stipulates sampling of water, sediment, bivalves, and fish. Examples of monitoring activities include water quality sampling, sediment coring and toxicity, bird egg monitoring, PCB and mercury testing. Part of this monitoring program includes sampling by the City of San Jose at 10 locations in the Lower South San Francisco Bay, and at two stream sites. Sampling is conducted monthly for two metals. The co-permittees also conduct trash characterization and management activities.