# Survey of Storm Water Quality in an Urban Environment

by

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## ABSTRACT

A variety of contaminants are found in urban storm water runoff. Research was carried out on several catch basins around Youngstown State University in Youngstown, Ohio with the purpose of identifying areas of high contaminant concentration for future studies. The area has a variety of land uses, ranging from busy roadways to parking decks to maintained lawns. Different pollutants are recognized as characteristic of different runoff landscapes, i.e. nutrients, metals, solids, etc. Sampling devices were constructed and implemented in selected basins around Youngstown State campus.

Storm water quality sampling was performed to establish a baseline for storm water contaminant loading around Youngstown State University. Water quality parameters included: biochemical oxygen demand, total solids, total suspended solids, total volatile solids, Escherichia coli (E. coli), coliform, pH, conductivity, nitrate, ammonium, phosphorus, and soluble metals. Samples were collected during ten rain events between the months of October 2011 to May 2012.

Water quality analysis of the collected storm water samples testing results showed highly variable contaminant loading between basin types and between seasons. As a general trend, roadway basins proved to have heavier pollutant loading than grass or parking lot basins. Phase one of storm water characterization proved a success and this data will be used as the groundwork for future research.

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# CHAPTER 1

# INTRODUCTION

## 1.1 Storm Water Overview

Urbanization has changed the natural landscape by increasing impervious surfaces (concrete, asphalt, roofing) in the urban landscape. This boom in impervious surfaces has altered the way runoff from precipitation flows and has resulted in amplified runoff volumes and flow rates and decreased groundwater recharge. This results in more frequent flooding, higher flood peaks, and lower base flow in streams. If not managed properly, extreme rainfall on these surfaces has the potential cause flooding in urban areas resulting in expenditures on property damage. Increased storm water volumes from urban runoff can cause erosion of stream banks and change stream channel shape, damaging plant, fish, and invertebrate habitat. There is great concern for the large number of pollutants in storm water runoff as a result of human activity, such as trash, suspended solids, fecal coliform bacteria and nutrients. The combination of aquatic habitat loss, hydrological alteration, and decreased water quality results in a general loss of biological diversity of aquatic species (University of New Hampshire, 2007; Hvited-Jacobsen et al., 2010)

Section 208 of The Clean Water Act (CWA) of 1972 as amended November 27, 2002 requires every state to establish effective Best Management Practices (BMPs) to control nonpoint source pollution. Nonpoint sources such as parking lots or athletic fields may discharge water directly to groundwater or surface water, and in these cases runoff does not come from a pipe, ditch, or channel. Separately, storm water runoff may enter municipal conveyance systems such as storm sewers, creating a point source that empties into surface water bodies or waste water treatment plants. Urban storm water pollution occurs when rainwater and snowmelt wash over city streets, parking lots, and suburban lawns and pick up toxic chemicals, disease-causing organisms, sediment and trash. Studies show that storm water runoff from urban and industrial areas is a potentially significant source of pollution draining to either wastewater treatment plants or local surface water bodies.

Recent studies have found that urban storm water rivals, and in some cases exceeds, sewage treatment plants and large factories as a source of damaging pollutants to surface water systems (NRDC, 2000). The U.S. EPA identifies urban storm waters as the second largest source of water quality damage in estuaries and a significant contributor to the damage to lakes, rivers, and bays (US EPA, 1998).

**1.2 Storm Water Quality Overview**

Characterizing storm water quality can be challenging due to its highly variable nature. Rainfall intensity may fluctuate widely depending on storm size or season. These fluctuations affect dynamics such as runoff rate, pollutant washoff rate, pollutant transport, sediment deposition and re-suspension, and in-channel flow rate among others. These factors account for the variation of pollutant concentrations and other storm water characteristics at a given location from storm event to storm event (Geosyntec, 2009).

Urban sources such as roads and parking lots provide storm water runoff containing sediments and pollutants from vehicles such as hydrocarbons from lubrication fluids, heavy metals, and particulate polymers from tires, brakes, and engine wear (US EPA, 2006). Around areas of urban landscaping, storm water runoff may contain fertilizers from planted areas, sediment, leaf litter and mulch, as well as possible pesticides (US

EPA, 2012a). Common urban pollutants, their effects, and their likely sources are identified in Table 1.0. The Ohio Department of Transportation Storm Water Management Program (SWMP) acts in compliance with the United States Clean Water Act to reduce these pollutants in storm water discharges originating from road surfaces. Phase I of U.S. EPA regulations, issued in 1990, requires medium and large cities or certain counties with populations of 100,000 or more to obtain a National Pollution Discharge Elimination System (NPDES) permit coverage for their storm water discharges. Phase II, issued in 1999, requires regulated small Municipal Separate Storm Sewer Systems (MS4s) in urbanized areas, as well as small MS4s outside the urbanized areas that are designated by the permitting authority, to obtain NPDES permit coverage for their storm water discharges (US EPA 2012b).

Table 1.0: Common Urban Pollutants, Effects and Their Likely Sources (EPA Victoria, 2006)

| Pollutant | Effects | Urban Source |
|---|---|---|
| Sediment | Reduces the amount of light in the water available for plant growth and thereby reducing the supply of food for other organisms. Can clog and damage sensitive tissues such as the gills of fish. Can suffocate organisms which live on or in the bed of lakes and streams by forming thick deposits when this suspended material settles out. | Land surface erosion<br>Pavement and vehicle wear<br>Atmospheric deposition<br>Spillage/illegal discharge<br>Organic matter (e.g. leaf litter, grass)<br>Car washing<br>Weathering of buildings/structures |
| Nutrients | An increase of nutrients in water stimulates the growth of aquatic plants. This causes excessive growth of aquatic weeds and algae that may choke lakes and streams and lead to dramatic daily fluctuations in dissolved oxygen levels. | Organic matter<br>Fertilizer<br>Sewer overflows/septic tank leaks<br>Animal/bird feces<br>Detergents (car washing)<br>Atmospheric deposition<br>Spillage/illegal discharge |
| Oxygen Demanding Substances | Oxygen is used up more quickly than it can diffuse into the water from the atmosphere. The resulting drop in oxygen levels may then be sufficient to kill fish and other aquatic organisms. If all the oxygen in the water is used up, unpleasant odors can result. | Organic matter decay<br>Atmospheric deposition<br>Sewer overflows/septic tank leaks<br>Animal/bird feces<br>Spillage/illegal discharges |
| pH (acidity) | Increased acidity damages plants and animals | Atmospheric deposition<br>Spillage/illegal discharge<br>Organic matter decay<br>Erosion of roofing material |
| Toxic Organics | Can poison living organisms or damage their life processes. | Pesticides & Herbicides<br>Spillage/illegal discharge<br>Sewer overflows/septic tank leaks |
| Microorganisms | Contain very high numbers of bacteria and viruses. Some of these organisms can cause illnesses, including hepatitis and gastroenteritis. | Animal/bird feces<br>Sewer overflows/septic tank leaks<br>Organic matter decay |
| Heavy metals | Poison living organisms or damage their life processes in some other way. Persists in the environment for a long time. | Atmospheric deposition<br>Vehicle wear<br>Sewer overflows/septic tank leaks<br>Weathering of buildings/structures<br>Spillage/illegal discharges |
| Oils and surfactants | Highly toxic poison to fish and other aquatic life. | Asphalt pavements<br>Spillage/illegal discharges<br>Leaks from vehicles<br>Car washing<br>Organic matter |
| Gross pollutants (litter and debris) | Unsightly. Animals can eat and choke on this material. | Asphalt pavements<br>Spillage/illegal discharges<br>Leaks from vehicles<br>Car washing<br>Organic matter |

## 1.3 Statement of the Problem

The area surrounding Youngstown State University (YSU) in Youngstown, Ohio has many features common to urban settings, namely impervious surfaces in the form of roadways, parking decks, loading docks, etc. The university also features landscaping in the form of maintained lawns, mulched areas and flowerbeds. During periods of rainfall, runoff from these areas drains into catch basins and enters a combined sewer system. This runoff may contain a variety of pollutants from the urban environment, including but not limited to organic matter (leaf litter, grass), oil & grease from vehicle spills, pathogenic microorganisms, fertilizers, pesticides, gross solids, metals from vehicle and tire wear. These pollutants decrease water quality and degrade natural water systems.

## 1.4 Objective and Hypothesis

The goal of this project is to collect storm water across the Youngstown State University campus and analyze it for common water quality parameters as an effort to understand pollutant load in an urban landscape. This work is the first phase of a two phase project with the overall objective of determining the effectiveness of catch basin filtering devices. The data gathered during this project will lay the groundwork for further research into storm water at YSU. It is hypothesized that different drainage basins will have differing pollutant loading.

# CHAPTER 2

# LITERATURE REVIEW

## 2.1 Storm Water Monitoring

The United States Environmental Protection Agency (EPA) has established parameters to monitor for storm water quality. These parameters include nutrients (phosphate, nitrate and ammonia); bacterial contamination (fecal coliform and E. coli determination); organic material (biochemical oxygen demand), contaminants (metals, oil and grease); and various chemical parameters (conductivity, pH, chemical oxygen demand, solids) (US EPA, 2008). Each of these parameters can cause adverse effects in the environment depending on presence and concentration.

### 2.1.1 National Urban Runoff Program

The most comprehensive study of urban runoff was the National Urban Runoff Program (NURP), conducted by the US EPA between 1978 and 1983. NURP was conducted in order to examine the characteristics of urban runoff and to determine similarities or differences between urban land uses, the extent to which urban runoff is a significant contributor to water quality problems nationwide, and the performance characteristics and effectiveness of management practices to control pollution loads from urban runoff (US EPA, 1983). Sampling was conducted for 28 NURP projects which included 81 specific sites and more than 2,300 separate storm events. Parameters focused on included: total suspended solids (TSS), biochemical oxygen demand (BOD), chemical oxygen demand (COD), total phosphorus (TP), soluble phosphorus (SP), total Kjeldahl nitrogen (TKN), nitrate + nitrite (N), total copper (Cu), total lead (Pb), total zinc (Zn) (Table 2.0).

Table 2.0: Median Event Mean Concentrations for Urban Land Uses (US EPA, 1983)

| Pollutant | Units | Residential | | Mixed | | Commercial | | Open/ Non-Urban | |
|---|---|---|---|---|---|---|---|---|---|
| | | Median | COV | Median | COV | Median | COV | Median | COV |
| BOD | mg/l | 10 | 0.41 | 7.8 | 0.52 | 9.3 | 0.31 | -- | -- |
| COD | mg/l | 73 | 0.55 | 65 | 0.58 | 57 | 0.39 | 40 | 0.78 |
| TSS | mg/l | 101 | 0.96 | 67 | 1.14 | 69 | 0.85 | 70 | 2.92 |
| Total Lead | µg/l | 144 | 0.75 | 114 | 1.35 | 104 | 0.68 | 30 | 1.52 |
| Total Copper | µg/l | 33 | 0.99 | 27 | 1.32 | 29 | 0.81 | -- | -- |
| Total Zinc | µg/l | 135 | 0.84 | 154 | 0.78 | 226 | 1.07 | 195 | 0.66 |
| Total Kjeldahl Nitrogen | µg/l | 1900 | 0.73 | 1288 | 0.50 | 1179 | 0.43 | 965 | 1.00 |
| Nitrate + Nitrite | µg/l | 736 | 0.83 | 558 | 0.67 | 572 | 0.48 | 543 | 0.91 |
| Total Phosphorus | µg/l | 383 | 0.69 | 263 | 0.75 | 201 | 0.67 | 121 | 1.66 |
| Soluble Phosphorus | µg/l | 143 | 0.46 | 56 | 0.75 | 80 | 0.71 | 26 | 2.11 |

Results from NURP indicate that there is not a significant difference in pollutant concentrations in runoff from different urban land use categories. There is a significant difference, however, in pollutant concentrations in runoff from urban areas than that produced from nonurban areas (US EPA 1983).

### 2.1.2 University of Alberta

In 1995 an international literature search was conducted by the University of Alberta to identify all storm water research published in the 25 years prior that identified and quantified contaminant parameters. The literature search yielded 140 articles containing water quality analysis of storm water, primarily dealing with separate storm sewers but in some cases addressing combined sewer overflows. Some contaminants in these studies were only reported once (i.e. 2-chlorophenol) while others were cited in numerous studies (i.e. zinc). For each parameter the range of reported concentrations was stated and a general mean was generated from the average of all values. Parameters of interest for this study are included on Table 2.1. The primary purpose of this study was to present storm water quality information to water users, urban areas producing storm water, and regulators to determine the important contaminants that may negatively impact human and aquatic life (Makepeace et. al, 1995).

Table 2.1: Concentration Range and Range of Means of Parameters of Interest (Makepeace et. al, 1995)

| Parameter | Concentration Range | Range of Means |
|---|---|---|
| Total Solids | 76-36,200 mg/L | 481-1440 mg/L |
| Total Suspended Solids | 1.0-36,200 mg/L | 44-1223 mg/L |
| Aluminum | 0.1-16.0 mg/L | N/A |
| Arsenic | 0.001-0.21 mg/L | 0.024-0.21 mg/L |
| Beryllium | 0.066-0.087 mg/L | N/A |
| Cadmium | 0.00005-13.73 mg/L | 0.0003-0.011 mg/L |
| Chromium | 0.001-2.30 mg/L | 0.010-0.23 mg/L |
| Cobalt | 0.0013-0.0054 mg/L | N/A |
| Copper | 0.00006-1.41 mg/L | 0.0065-0.15 mg/L |
| Iron | 0.08-440.0 mg/L | 0.998-12.0 mg/L |
| Lead | 0.00057-26.00 mg/L | 0.0209-1.558 mg/L |
| Nickel | 0.001-49.0 mg/L | 0.006-0.15 mg/L |
| Nitrate | 0.01-12.00 mg/L | N/A |
| Ammonia | 0.01-4.30 | N/A |
| Selenium | 0.0005-0.077 mg/L | N/A |
| Silver | 0.0002-0.014 | N/A |
| Vanadium | 0.0072-0.0085 mg/L | N/A |
| Zinc | 0.0007-22.0 mg/L | 0.0166-0.58 mg/L |
| BOD | 1.0-7,700 mg/L | 9-31 mg/L |
| COD | 7.0-2200 mg/L | 7-224 mg/L |
| pH | 4.5-8.7 | N/A |
| Oil & Grease | 0.001-110.0 mg/L | N/A |
| Total Coliforms | 7.0-1.8 X 10^7 /100 mL | 9.8 X 10^1 - 2.2 X 10^6 /100 mL |
| Fecal Coliforms | 0.2-1.9 X 10^6 /100 mL | 1.6 X 10^2 - 2.5 X 10^5 /100 mL |
| E.Coli | 1.2 X 10^1 - 4.7 X 10^3 / 100 mL | N/A |

<u>2.1.3 University of Alabama</u>

The University of Alabama and the Center for Watershed Protection were awarded an EPA Office of Water 104(b)3 grant in 2001 to collect and evaluate storm water data from a representative number of NPDES (National Pollutant Discharge Elimination System) MS4 (municipal separate storm sewer system) storm water permit holders. This data was compiled into the Nation Stormwater Quality Database. Table 2.2 is a summary of the Phase 1 data collected and entered into the database as of mid-summer 2003. The data are separated into 11 land use categories: residential, commercial, industrial, institutional, freeways, and open space, plus mixtures of these land uses. Summaries are also shown for mixed land use areas (indicating the most prominent land use), and for the total data set combined (Pitt et. al, 2004).

Table 2.2: Median Values and EMCs for Selected Parameters in the NSDQ, Version 1.0 (Pitt et. al, 2004; Brown et al, 2004)

| Parameter | Overall | Residential | Commercial | Industrial | Freeways | Open Space |
|---|---|---|---|---|---|---|
| Area (acres) | 56 | 57.3 | 38.8 | 39 | 1.6 | 73.5 |
| % Imperv. | 54.3 | 37 | 83 | 75 | 80 | 2 |
| Precip. Depth (in) | 0.47 | 0.46 | 0.39 | 0.49 | 0.54 | 0.48 |
| TSS (mg/L) | 58 | 48 | 43 | 77 | 99 | 51 |
| BOD5 (mg/L) | 8.6 | 9 | 11.9 | 9 | 8 | 4.2 |
| COD (mg/L) | 53 | 55 | 63 | 60 | 100 | 21 |
| Fecal Coliform (mpn/100 mL) | 5081 | 7750 | 4500 | 2500 | 1700 | 3100 |
| NH3 (mg/L) | 0.44 | 0.31 | 0.5 | 0.5 | 1.07 | 0.3 |
| NO2+NO3 (mg/L) | 0.6 | 0.6 | 0.6 | 0.7 | 0.3 | 0.6 |
| Nitrogen, Total Kjeldahl (mg/L) | 1.4 | 1.4 | 1.6 | 1.4 | 2 | 0.6 |
| Phos., filtered (mg/L) | 0.12 | 0.17 | 0.11 | 0.11 | 0.2 | 0.08 |
| Phos., total (mg/L) | 0.27 | 0.3 | 0.22 | 0.26 | 0.25 | 0.25 |
| Cd, total (µS) | 1 | 0.5 | 0.9 | 2 | 1 | 0.5 |
| Cd, filtered (µS) | 0.5 | ND | 0.3 | 0.6 | 0.68 | ND |
| Cu, total (µS) | 16 | 12 | 17 | 22 | 35 | 5.3 |
| Cu, filtered (µS) | 8 | 7 | 7.6 | 8 | 10.9 | ND |
| Pb, total (µS) | 16 | 12 | 18 | 25 | 25 | 5 |
| Pb, filtered (µS) | 3 | 3 | 5 | 5 | 1.8 | ND |
| Ni, total (µS) | 8 | 5.4 | 7 | 16 | 9 | ND |
| Ni, filtered (µS) | 4 | 2 | 3 | 5 | 4 | ND |
| Zn, total (µS) | 116 | 73 | 150 | 210 | 200 | 39 |
| Zn, filtered (µS) | 52 | 33 | 59 | 112 | 51 | ND |

*ND = not detected, or insufficient data to present as a median value.*

A few observations of note exist for different major land use categories. Preliminary statistical analyses found significant differences among land use categories for all pollutants. This is notable because National Urban Runoff Program (NURP) findings showed no significant differences in urban runoff concentrations as a function of common urban land uses (US EPA, 1983). Freeway locations commonly had the highest median values, except for phosphorus, nitrates, fecal coliforms, and zinc. Industrial sites had the highest reported zinc concentrations. Open space areas had the lowest reported Total Kjeldahl Nitrogen (TKN), copper, lead, and zinc. Lead concentrations have dropped over the last 20 years, largely assumed to be the result of instituting unleaded gasoline regulation. Review of seasonal variations for residential data revealed few apparent seasonal trends, except that bacteria values appear to be lowest during the winter season and highest during the summer and fall (a similar finding was reported in NURP). Residential area data were also analyzed across the different EPA rain zones for the country. The wettest areas of the country (Southeast and Northwest) may have the lowest EMCs for some storm water pollutants, possibly due to the reduced inter-event times for pollutant buildup and greater runoff for dilution (Brown et al, 2004).

2.1.4 Chongju National College of Science and Technology

An investigation to determine the characteristics of pollutants overflow on storm events, relationships between pollutant load and runoff, and the first flush effect in urban areas was performed on nine watersheds in the cities of Taejon and Chongju, Korea. Selected watersheds with different characteristics were studied and sampled during the period from June 1995 to November 1997. The nine watersheds selected were given designations dependent on their use. Three of the watersheds (designated BBW, YMW, and MSW) are intensively developed as residential and commercial watersheds, and the percentages of impervious area are 75%, 68% and 62%, respectively. Two watersheds (GYW and YJW) are undeveloped watersheds. Four watersheds (CICW-1, CICW-2, CICW-3 and CICW-4) are totally industrial watersheds of 1606.2, 25.9, 14.8 and 3.7 acres, respectively. Of these, only CICW-1 has combined sewer. Runoff and quality parameters such as $BOD_5$, COD, suspended solids (SS), TKN, $NO_3$-N, $PO_4$-P, TP, Pb, Fe, and n-Hexane extracts were analyzed for the development of relationships between runoff and water quality (Table 2.3, Table 2.4) (Lee, Bang, 2000).

Table 2.3: Event Mean Concentrations (EMCs) for dry and wet weather events (Lee, Bang, 2000).

| | Residential | | | | Undeveloped | | | |
|---|---|---|---|---|---|---|---|---|
| Watershed | BBW | | YMW | | GYW | | YJW | |
| Weather | dry | wet | dry | wet | dry | wet | dry | wet |
| $BOD_5$ | 52.8 | 129.7 | 50.3 | 85.6 | 87.3 | 122.1 | 44.5 | 23.7 |
| COD | 190.6 | 368.7 | 142.5 | 163 | 233.7 | 278.4 | 44.8 | 50 |
| SS | 53.3 | 655.5 | 56.9 | 73.5 | 105.6 | 557.2 | 15.4 | 365.5 |
| $NO_3$-N | 0.14 | 2.85 | 0.07 | 0.5 | 0.32 | 0.56 | 0.4 | 6.05 |
| TKN | 11.3 | 13.8 | 23.9 | 11.6 | 4.7 | 12.3 | 2.5 | 1.4 |
| $PO_4$-P | 0.93 | 3.97 | 1.27 | 6.44 | 2.39 | 5.86 | 2 | 1.35 |
| TP | 5.6 | 8.3 | 5.7 | 7.8 | 2.7 | 10.2 | 4.4 | 5.5 |
| n-Hexane extracts | 26.2 | 216.2 | 91.2 | 228 | 150.3 | 470.3 | 28.2 | 224.1 |
| Pb | 0.22 | 0.09 | 0.23 | 0.01 | –[a] | 0.04 | 0.04 | 0.24 |
| Fe | – | 1.19 | 0.01 | 0.21 | – | 0.66 | 0.29 | 0.56 |
| [a]No data | | | | | | | | |

Table 2.4: Event Mean Concentrations (EMCs) for dry and wet weather events (cont.) (Lee, Bang, 2000).

| | Commercial | | Industrial | | | |
|---|---|---|---|---|---|---|
| Watershed | MSW | | CICW-1 | CICW-2 | CICW-3 | CICW-4 |
| Weather | dry | wet | wet | wet | wet | wet |
| $BOD_5$ | 75.3 | 77 | 97.2 | 39.3 | 81.5 | 33.7 |
| COD | 125 | 260.1 | 291.2 | 173.9 | 223.5 | 118.5 |
| SS | 49.1 | 1021.3 | 221 | 114.1 | 99 | 215.7 |
| $NO_3$-N | 0.64 | 0.9 | 1.38 | 2.09 | 0.69 | 1.15 |
| TKN | 14 | 8.8 | 9.2 | 3.7 | 3.4 | 2.4 |
| $PO_4$-P | 3.31 | 2.05 | 1.73 | 1.73 | 1.79 | 0.7 |
| TP | 7.8 | 7.7 | 5 | 4 | 3.9 | 1.2 |
| n-Hexane extracts | 51.6 | 346.7 | 233.6 | 153.5 | 108.1 | 84.7 |
| Pb | 0.15 | 0.49 | 0.15 | 0.08 | 0.26 | 0.22 |
| Fe | 1.28 | 12.78 | – | – | – | – |

The data revealed that the Event Mean Concentration (EMC) for residential watershed is generally higher than that of industrial watershed. The relative magnitude of EMC in wet weather is 2±20 times higher than in dry weather, especially for the constituents of suspended solids and n-Hexane extracts. In the storm event, the relative magnitude of the pollutants unit loading rate was in the following order; high density residential > low density residential > industrial > undeveloped watershed (Lee, Bang, 2000).

### 2.1.5 University of Paris

A separate study in France used the results of the Lee and Bang 2000 study as well as the University of Alabama's National Storm Water Quality Database in their assessment of storm water pollution in Paris and its suburbs from three separate storm sewers. A list of 88 substances was compiled and analyzed for (65 organic substances, 8 metals and 15 volatile organic compounds). Sampling points were located at the storm sewer outlet of each watershed prior to discharge into the receiving waters. These results show that the storm water had been contaminated by 55 chemical substances out of the 88 investigated. A few common pollutants are listed for in Table 2.5 (Zgheib et. al. 2012).

Table 2.5: Common Storm Water Quality Parameters with Inter-Study Comparisons (Minimum-Maximum [median]) (Zgheib et. al. 2012).

| Site | | SW for this study | A | B | C | D | NSQD |
|---|---|---|---|---|---|---|---|
| N | | 20 | 12 | 30 | 4 | 4 | 3765 |
| pH | pH | 6.99-7.87 [7.43] | N/A | N/A | 7.70-7.65 [7.58] | 7.55-7.85 [7.68] | [7.50] (1665) |
| Conductivity | µS | 166-1316 [350] | N/A | N/A | 989-1062 [1027] | 1056-1572 [1361] | [121] (685) |
| TS | mg/L | 11-430 [106] | 120-500 [220] | 12.9-874 [413] | 68-220 [111] | 180-420 [325] | [58] (3390) |
| COD | mg/L | 14-320 [89] | 117-367 [203] | 70-1455 [105] | 200-400 [305] | 380-910 [715] | [53] (2751) |
| TKN | mg/L | <2-16 [2.8] | 6.9-18.4 [8.95] | 6.6-23.1 [12.1] | 37-48 [42] | 46-101 [75.5] | [1.4] (3192) |
| $P_{tot}$ | mg/L | .3-3.52 [.87] | 1.21-3.7 [1.98] | 2.4-13.7 [7.6] | 4.50-6.00 [4.85] | 6.1-12.4 [9.23] | [0.27] (3285) |

N/A: data not available; SW: data for storm water from this study; A: data from the database of DSEA 94 for 12 storm water samples collected between November 2005 and April 2006; B: storm water collected from an urban area (ISC = 0.75) (Lee and Bang, 2000); C: wastewater collected from combined sewers in Paris during a dry weather period (Zgheib, 2009); D: wastewater collected from separate sewers in suburban Paris during a dry weather period (Zgheib, 2009); NSQD: national storm water quality database (data from Robert Pitt, Alex Maestre and Renee Morquecho); in brackets, the number of observations for the given parameter.

For most substances, particles from the three storm sewers were more heavily contaminated than dredged sediments and settleable particles from the Seine River. As a consequence of this finding, the release of untreated storm water discharges may impact the receiving waters and contribute to sediment contamination (Zgheib et. al. 2012).

### 2.1.6 Texas A&M University

Focusing specifically on fecal indicator bacteria in storm water runoff, a study performed at Texas A&M University analyzed the seasonal variations of inflow and outflow event mean concentrations of water quality data from the International Stormwater BMPs Database. Two sites were selected for *Enterococcus*, one for *E. coli*, one for fecal Streptococcus group bacteria, and seven for fecal coliform. All sites had both inflow and outflow EMC data with the exception of Barton Creek Square Shopping Center Pond in Austin TX, which only had inflow EMC data. Findings of analysis are presented in Table 2.6 (Pan, Jones, 2012).

Table 2.6: Statistical summary of EMC in BMPs across the USA (Pan, Jones, 2012).

| Location | | Number | Median | Mean |
|---|---|---|---|---|
| ***Enterococcus*** | | | | |
| El Dorado Detention Basin B504-03-00, Houston TX | Inflow | 15 | 10,100 | 12,572 |
| | Outflow | 15 | 2,000 | 15,422 |
| | % Removal | 15 | 48.9 | −18.9 |
| I-95 Plaza AbTech Ultra-Urban Filter, Dover DE | Inflow | 11 | 7,000 | 8,927 |
| | Outflow | 10 | 6,600 | 36,120 |
| | % Removal | 10 | −70.1 | −481.5 |
| ***Escherichia coli*** | | | | |
| El Dorado Detention Basin B504-03-00, Houston TX | Inflow | 13 | 30,800 | 43,817 |
| | Outflow | 13 | 600 | 5,246 |
| | % Removal | 13 | 95.3 | 79.8 |
| **Fecal *Streptococcus* group bacteria** | | | | |
| Alta Vista Planned Unit Development, Austin TX | Inflow | 19 | 92,000 | 29,395 |
| | Outflow | 19 | 63,000 | 168,263 |
| | % Removal | 19 | 33.3 | 19.8 |
| **Fecal coliform** | | | | |
| The Reserve at DeBary, DeBary FL | Inflow | 42 | 1,090 | 3010 |
| | Outflow | 48 | 23 | 724 |
| | % Removal | 7 | 98.3 | 97.1 |
| El Dorado Detention Basin B504-03-00, Houston TX | Inflow | 13 | 40,000 | 61,076 |
| | Outflow | 13 | 6,000 | 28,238 |
| | % Removal | 13 | 91.3 | 4.2 |
| Alta Vista Planned Unit Development, Austin TX | Inflow | 18 | 63,500 | 203,594 |
| | Outflow | 19 | 31,000 | 115,196 |
| | % Removal | 18 | −4.7 | −41.85 |
| Barton Creek Square Shopping Center Pond, Austin TX | Inflow | 22 | 42,000 | 207,662 |
| | Outflow | | | |
| | % Removal | | | |
| Hal Marshall Bioretention Cell, Charlotte NC | Inflow | 19 | 2,700 | 14,686 |
| | Outflow | 19 | 100 | 4,553 |
| | % Removal | 19 | 90.9 | 65.6 |

The results of this study show that all the inflow EMC of fecal indicator bacteria in storm water runoff are above water quality criteria, demonstrating that bacteria in storm water is a major concern and requires effective BMP designs. Significant seasonal differences of fecal *Streptococcus* group bacteria and fecal coliform were found, and a potential increase in bacteria EMC exists in summer, especially when comparing spring and summer concentration (Pan, Jones, 2012).

## 2.2 Strengths of Studies and Comparison to Youngstown

These studies reveal some interesting trends in data, namely ranges in pollutant concentration, significant pollutant concentration differences among land use categories, and seasonal variations. However, they are not without their shortcomings when compared to Youngstown, Ohio. None of the studies above took place in the state of Ohio. The NSQD separates Ohio into two regions based on EPA Rain Zone, but no samples were taken from Ohio in either region. The University of Alberta study was a compilation of data from past studies, each with varying collection methods, watershed areas, seasons, landuse, and runoff amount. This makes it difficult to get a sense of not only what local results may be, but also what methods would provide consistent results.

The City of Youngstown has a combined sewer system, which means storm water drains into the sanitary sewer lines. The original sanitary sewer for the city of Youngstown was constructed in the late 1800's, but the wastewater treatment plant was not built until 1963. As a result, Youngstown has had several points that may still discharge into the Mahoning River during any high flow events (due to storm water) in order to avoid flooding of the pump stations/ residential/ industrial areas that feed into that line.

The area surrounding Youngstown State campus has not had storm water sampled in the past, therefore no data for the area is available for comparison. Due to the fact that storm water in Youngstown enters a combined sewer system, no storm water may reach surrounding surface water bodies.

# CHAPTER 3

# MATERIALS AND METHODS

## 3.1 Selection of YSU Campus

The Youngstown State University campus was chosen for the study for several reasons. First, it is a convenient and safe location to conduct the research. The campus location reduces travel time and expense and provides a controlled site to collect samples (for example, access will be assured and campus grounds keeping and security can help provide an orderly working environment). In addition, collected storm water samples from catch basins can be immediately taken to the laboratory for analysis or proper storage. Furthermore, the campus has a variety of land uses that are representative of an urban environment with parking lots, parking garages, various traffic load roadways, service drives, delivery zones, and lawn areas within a compact area. These conditions allow for easy adaptation of the results to a broad array of storm water catchment settings in northeast Ohio. The perimeter roadways include Fifth Avenue, Lincoln Avenue, and Wick Avenue and the service road along the northern edge of campus with the inclusion of selected parking lots (Figure 3.0). Characteristics of this urban environment include major parking lots and parking decks, four lane roadways, sidewalks and other impervious surfaces. The campus features newly constructed buildings and structures alongside older buildings. The area proposed for study measures 432,000 sq meters or 107 acres. Youngstown State also has an extensive landscape of rather-hilly terrain and a variety of trees and plant life. This park-like atmosphere creates differing drainage patterns around campus.

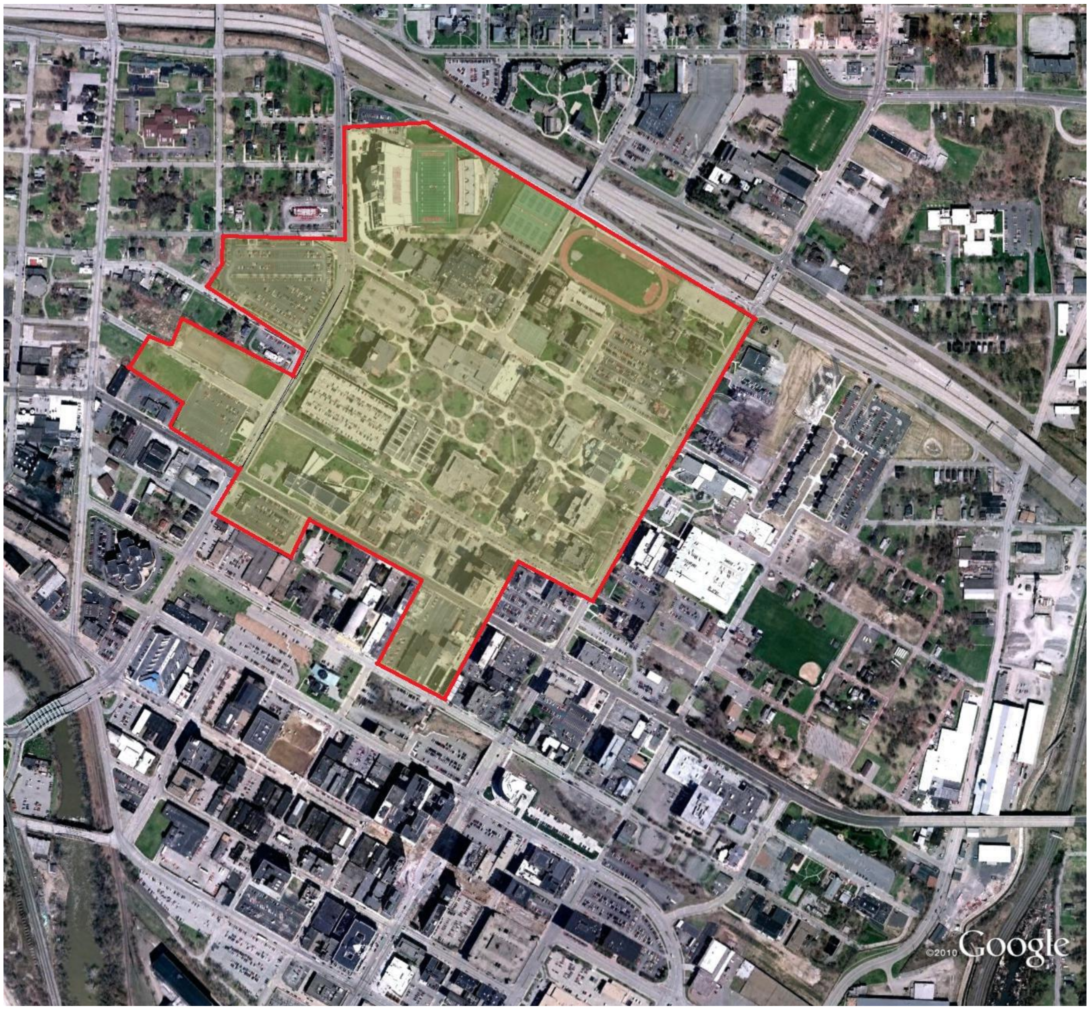

Figure 3.0: Google Earth image of YSU Campus Proposal Area (Highlighted) (Google, 2012).

### 3.2 Catch Basin Location

In the summer months of 2011, storm water catch basins were located around the YSU campus and coordinates were determined using a Garmin eTrex Venture HC handheld GPS receiver. These basins and drainage structures were noted alpha-numerically based on location on the campus map (Figure 3.1). Recorded were the type of basin structure, surrounding land characteristics, and contents of the basin itself. Photographs of each basin were taken for reference (Appendix A).

Zone A consisted of the area of campus bounded by Armed Forces Boulevard, Fifth Avenue, Elm Street, and the YSU Service Road. Zone B included the region of campus bordered by Wick Avenue, YSU's Service Road, Elm Street, and University Plaza. Zone C is comprised of the area of campus surrounded by Fifth Avenue, Lincoln Avenue, Spring Street, and extending to the area where the Kilcawly Center meets Kilcawly House. Zone D extends from Kilcawly House to Wick Avenue, Lincoln Avenue, and University Plaza. Zone E consists of the parking lot located next to the Roman Catholic Diocese of Youngstown. Zone F includes the M-24 Lot on corner of Fifth Avenue & Grant Street. Zone G covers the parking lot next to Beeghly Hall on W. Rayen Avenue and Fifth Avenue.

Over 261 different drainage structures were located using GPS coordinates and mapped in ArcGIS 10. Information collected (runoff direction, amount, impervious surfaces) served as the initial selection criteria. Later, surrounding land usage, basin type, and accessibility to basins were considered in final basin selection. Table 3.0 lists the selected catch basins as well as their characteristics. Figure 3.2 illustrates the basin locations.

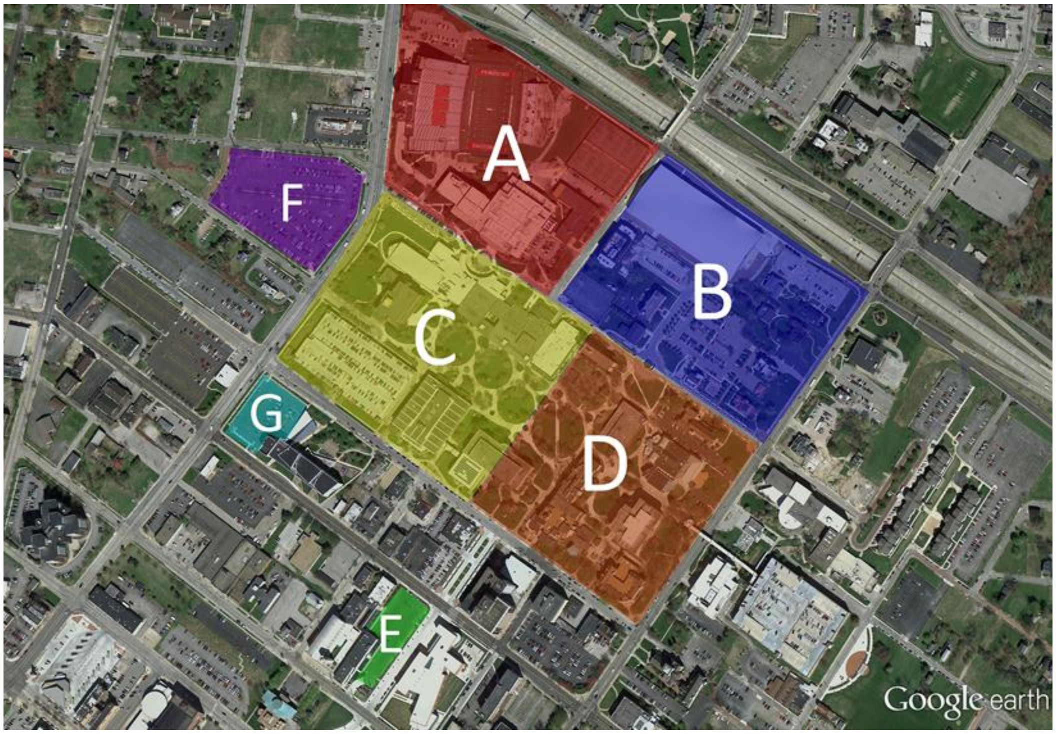

Figure 3.1: Campus Sections Designated by Letter and Highlighted (Google, 2012).

Figure 3.2: Google Earth Image of Selected Basin Locations (Google, 2012).

Table 3.0: Selected Basin Characteristics

| Basin | Type | Estimated Drainage Area | GPS Location | Land Usage |
|---|---|---|---|---|
| A-28 | Type 3 Rectangle Grate | 14,923 sq. ft. (1,200 sq. ft. grass, rest impervious) | N 41°06.481 W 080°38.993 | Roadway |
| B-24 | Type 3 Rectangle Grate | 7,233 sq. ft. (800 sq. ft. grass, rest impervious) | N 41°06.414 W 080°38.792 | Roadway |
| C-1 | Type 3 Rectangle Grate | 9,689 sq. ft. (all impervious) | N 41°06.425 W 080.38.849 | Roadway, Sidewalk |
| C-20 | Type 3 – Half Moon | 18,150 sq. ft. (1,550 sq. ft. grass) | N 41°06.463 W 080°39.067 | Roadway |
| C-31 | 2X3 Round Frame & Grate | 5,840 sq. ft. (3,859 sq. ft. impervious, 1,981 sq. ft. grass) | N 41°06.320 W 080°38.927 | Loading Dock |
| C-46 | Type 3 Round Frame & Grate | 35,882 sq. ft. total (6,041 sq. ft. impervious) | N 41°06.320 W 080°38.927 | Grass, Landscaping |
| C-47 | 2-2 B Square Grate | 12,611 sq. ft. (11,101 sq. ft. impervious, 1,510 sq. ft. grass) | N 41°06.410 W 080°39.038 | Roadway |
| D-9 | Type 3 – Half Moon | 8,050 sq. ft. total (300 sq. ft. grass | N 41°06.237 W 080°38.784 | Roadway |
| D-10 | Type 3 – Half Moon | 9,596 sq. ft. (all impervious) | N 41°06.265 W 080°38.867 | Roadway |
| D-27 | Type 3 Round Frame & Grate | 5,327 sq. ft. (1,665 sq. ft. impervious, 3,662 sq. ft. grass) | N 41°06.366 W 080°38.836 | Landscaping, Sidewalk |
| F-4 | Type 3 Curb Box Frame & Grate | 34,843 sq. ft. (all impervious) | N 41°06.496 W 080°39.144 | Parking Lot |
| G-2 | 2-2 Square Grate | 13,000 sq. ft. (all impervious) | N 41°06.331 W 080°39.134 | Parking Lot |

### 3.3 Collector Design and Implementation

Sample collectors were constructed of three inch Schedule 40 polyvinyl chloride (PVC) pipe cut to a length of 18 inches to provide the necessary volume of 2 liters of sample. A PVC drainage grate with a screwtop was attached to the main pipe to provide an opening that allowed storm water to flow in while keeping larger solids (garbage, cigarette butts, etc.) out. The sampler composition of PVC was chosen due to its relative low cost, durability, and ability to be mass produced (Figure 3.3, Figure 3.4). A metal wire was fitted into the top of the drainage grate to facilitate attachment on the basin grate. Samplers were acid washed prior use in dilute ACS Reagent Grade HCl. This ensured no PVC glue residue was in the sampler as well as cleanliness for precision chemical testing.

Figure 3.3: Storm Water Samplers and PVC Adhesive to Attach Lid.

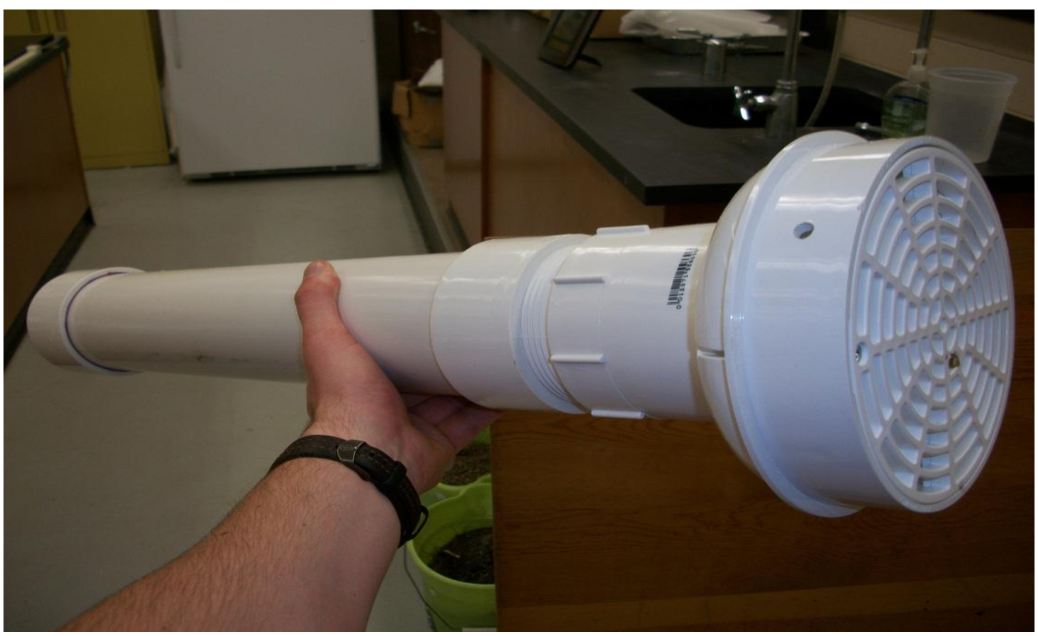

Figure 3.4: Completed Storm Water Sampler.


Figure 3.5: Dr. Jeffrey Dick assisting Mr. Harry Bircher in Sampler Implementation.


Figure 3.6: Storm Water Sampler Attached to Basin C-31.

Prior to predicted storm events, samplers were placed at basin locations in areas of observed drainage flow (Figure 3.5, Figure 3.6). Rain samples were also collected for analytical comparison. Basin samplers were retrieved after each rain event. Screwtops were removed and storm water was transferred to either Fisherbrand Graduated Square HDPE 64 oz. bottles or 1 L Nalgene bottles (or equivalent). Bottles were labeled and dated after sample transfer. Samples remained in refrigerated storage for no more than 24 hours while time sensitive experiments were run (BOD, bacteria, conductivity, pH). For longer storage, samples were acidified to a pH of 2.00 using trace metal grade HCl.

**3.4 Laboratory Procedures**

Water quality parameters analyzed include:

- pH
- Conductivity
- Total Solids
- Total Suspended Solids
- Total Volatile Solids
- Total Coliform Bacteria
- Soluble Reactive Phosphorus
- Soluble Nitrate
- Soluble Ammonium
- BOD
- COD
- Soluble Metals
- Oil & Grease
- Floating Solids

3.4.1 pH and Conductivity

pH affects processes both biological and chemical in water. Different aquatic organisms flourish within different ranges of pH. Most aquatic animals prefer a range of 6.5-8.0. pH outside this range stresses the physiological systems of most organisms and can have a negative effect on reproduction, thus reducing diversity in the stream. Low pH can also allow toxic elements and compounds to become mobile and "available" for uptake by aquatic plants and animals, resulting in conditions that may prove toxic to certain sensitive species of aquatic life. Changes in pH can be caused by atmospheric deposition (acid rain), surrounding rock, and certain wastewater discharges (US EPA 2012c).

Conductivity of water is affected by the presence of inorganic dissolved solids like chloride, nitrate, sulfate, and phosphate anions or sodium, magnesium, calcium, iron, and aluminum cations. Certain organic compounds such as oil, phenol, alcohol, and sugar do not conduct electrical current very well and therefore have a low conductivity when in water. Conductivity is also affected by temperature: the warmer the water, the higher the conductivity. Conductivity is useful as a general measure of surface water quality. Surface water tends to have a relatively constant range of conductivity that, once established, can be used as a baseline for comparison with regular conductivity measurements. Significant changes in conductivity could then be an indicator of pollutant discharge (US EPA, 2012d).

Conductivity and pH were both measured immediately after sample collection. The pH of each sample was measured using a Fisher Scientific accumet ® AP71 handheld pH meter. The meter was calibrated using standard pH buffer solution of 4, 7, and 10 before use. Conductivity was measured using a Hach sensION5 handheld conductivity meter. It should be noted that electrical conductivity is dependent on temperature, and variation might exist due to measuring conductivity in the laboratory rather than in the field.

3.4.2 Total Solids

Solids refer to matter suspended or dissolved in water. In surface water, dissolved solids consist of calcium, chlorides, nitrate, phosphorus, iron, sulfur, and other particles that will pass through a filter with mesh around 2 microns in size. Suspended solids include silt and clay particles, plankton, algae, fine organic debris, and other particulate matter which are larger than 2 microns. A high concentration of total solids will make drinking water unpalatable and also affect water clarity. High solids slow photosynthesis in aquatic plants by decreasing the passage of light through water. Water high in solids will absorb more heat and hold heat longer, which in turn might adversely affect aquatic life that has adapted to a lower temperature regime. Levels of total solids that are too high or too low can also reduce the efficiency of waste water treatment plants, as well as the operation of industrial processes that use raw water. Sources of total solids include industrial discharges, sewage, fertilizers, road runoff, and soil erosion (US EPA, 2012e).

Testing for total solids was performed using method 2540 B- Total Solids Dried at 103-105°C (Standard Methods et al., 1998). Samples were pipeted into preweighed porcelain evaporating dishes of 25 and 50 mL sample volumes. Samples were evaporated to dryness at 105°C in a Fisher Isotemp® 500 series heater for no less than one hour and then allowed to cool in a desiccator (Figure 3.7). Weight of the dish with sample residue was measured using a Fisher Scientific accu-124 balance and the difference before and after sample addition/heating was calculated using:

$$\text{mg total solids/L} = \frac{(A - B) \times 1000}{\text{sample volume, mL}}$$

where:

$A$ = weight of dried reside + dish, mg
$B$ = weight of dish, mg

Figure 3.7: Total solids evaporating.

3.4.3 Total Suspended Solids

Higher concentrations of suspended solids can serve as carriers of toxics and bacteria, which readily cling to suspended particles. This is particularly a concern where pesticides are being used on irrigated crops. Where solids are high, pesticide concentrations may increase well beyond those of the original application as the irrigation water travels down irrigation ditches. Higher levels of solids can also clog irrigation devices and might become so high that irrigated plant roots will lose water rather than gain it (US EPA, 2012e).

Total suspended solids in the samples were determined using method 2540 D-Total Suspended Solids Dried (Standard Methods et al., 1998). Storm water samples of 10 and 25 mLs were vacuum filtered through ProWeigh® preweighed 47mm 1.5 micron filters using a vacuum filtration manifold. After initial filtration a rinse of 20 mL deionized water was added to ensure no solids were left on the filtration container. The filters were then placed on corresponding aluminum weighing dishes and evaporated to dryness at 105°C in a Fisher Isotemp® 500 series heater for 24 hours and then allowed to cool in a desiccator. Filters were weighed and compared to ProWeigh initial weights. The following equation was used to calculate total suspended solids:

$$\text{mg total suspended solids/L} = \frac{(A - B) \times 1000}{\text{sample volume, mL}}$$

where:

$A$ = weight of filter + dried residue, mg
$B$ = weight of filter, mg

3.4.4 Total Volatile Solids

The total solids are composed of two components, volatile and fixed solids. The fixed solids are materials such as sand, gravel, and salt. The volatile solids are organic compounds of animal or plant origin, which biological processes can treat.

Volatile solids analysis was performed using method 2540 E- Fixed and Volatile Solids (Standard Methods et al., 1998). The residue from total solids analysis was ignited to constant weight at 550°C using a Thermolyne 1400 furnace for one hour. Samples were cooled in a desiccator and then weighed. Difference before and after ignition was calculated using:

$$\text{mg volatile solids/L} = \frac{(A - B) \times 1000}{\text{sample volume, mL}}$$

where:

$A$ = weight of residue + dish before ignition, mg
$B$ = weight of residue + dish after ignition, mg

3.4.5 Floating Solids

Floating solids were noted by visual recognition and recorded. Such solids include leaves, flowering buds, dead insects, etc.

3.4.6 Soluble Reactive Phosphorus

Phosphorus is an essential nutrient for the plants and animals that comprise the aquatic food web. Being that phosphorus is a limited nutrient in most fresh waters, a small increase in phosphorus has the potential to induce undesirable events in a stream including accelerated plant growth, algae blooms, low dissolved oxygen, and the death of certain fish, invertebrates, and other aquatic animals. Sources of phosphorus include natural occurrence in soil and rocks, wastewater treatment plants, runoff from fertilized lawns and cropland, failing septic systems, runoff from animal manure storage areas, disturbed land areas, drained wetlands, water treatment, and commercial cleaning products (US EPA, 2012g). Sources of phosphorus in urban environments include fertilized lawns, animal waste, vegetation/leaves, and hydrocarbons and lubricants.

Testing for soluble reactive phosphorus was performed using method 4500-P E. Ascorbic Acid Method (Standard Methods et al., 1998). Storm water samples of 50 mL were pipeted into 125 mL Erlenmeyer flasks. One drop of phenolphthalein indicator is added. Then 8 mL of combined reagent (50 mL 5N $H_2SO_4$, 5 mL potassium antimonyl tartate solution, 15 mL ammonium molybdate solution, and 30 mL ascorbic acid solution) is added and mixed thoroughly. After 10 minutes but no less than 30 minutes the absorbance of each sample is measured at 880 nm using a Basch and Lomb Spectronic 1001. A calibration curve was prepared with known standards then sample phosphorus concentrations were determine with best fit line from the standard curve (Appendix G). Standards used include 0.05, 0.1, 0.5, 1.25, and 2.5 mg/L.

3.4.7 Soluble Ammonium

"Ammonia-nitrogen" includes the ionized form (ammonium, $NH_4$+) and the un-ionized form (ammonia, $NH_3$), both of which are in chemical equilibrium when in solution. Ammonium is produced when microorganisms decompose organic nitrogen products such as urea and proteins in manure. When ammonia is oxidized, it consumes dissolved oxygen, thus having a direct biochemical oxygen demand on the receiving water. Decrease in dissolved oxygen may have results as moderate as reduction of species diversity or as severe as fish kills. Additionally, ammonia can lead to eutrophication of surface waters sometimes resulting in deadly algal blooms (US EPA, 2012i).

Testing for ammonia was performed using method 4500-$NH_3$ D. Ammonia-Selective Electrode Method (Standard Methods et al., 1998). A Mettler Toledo Ammonium Ion Selective electrode was used in conjunction with Fisher Scientific accumet AP71 meter to record millivolt readings of the samples. Fifty milliliters of each sample were pipeted into separate beakers but no ammonia suppressor was used in the samples. A calibration curve was prepared with known standards of 10, 100, 250, and 500 mg/L. Sample ammonium concentrations were determined with best fit line from the standard curve (Appendix H).

3.4.8 Soluble Nitrate

Nitrates are nitrogen compounds which are found in several different forms in terrestrial and aquatic ecosystems. These forms include ammonia ($NH_3$), nitrates ($NO_3$), and nitrites ($NO_2$). Though essential plant nutrients, excess amounts of nitrates can cause significant water quality problems. Together with phosphorus, nitrates in excess amounts can accelerate eutrophication and, in turn, affect dissolved oxygen, temperature, and other indicators. The natural level of ammonia or nitrate in surface water is typically low (less than 1 mg/L); in the effluent of waste water treatment plants, it can range up to 30 mg/L (US EPA, 2012h). Nitrate sources in urban environments include fertilizers, animal wastes, and atmospheric deposition of vehicle exhaust and other forms of fossil fuel combustion.

Nitrate was determined using method 4500-$NO_3^-$ D. Nitrate Electrode Method (Standard Methods et al., 1998). A Fisher Scientific accumet Nitrate Combination electrode was used in conjunction with an Oakton 11 series meter to record millivolt readings of the samples. Fifty milliliters of each sample were pipeted into separate beakers and one mL of $NO_3$ interferant suppressor was added. A calibration curve was prepared with known standards then sample nitrate concentrations were determine with best fit line from the standard curve (Appendix I).

3.4.9 Chemical Oxygen Demand

Chemical oxygen demand (COD) is similar to the biochemical oxygen demand test in that it is a variation on analysis of oxygen, however it does not differentiate between biologically available and inert organic matter. COD is a measure of the total quantity of oxygen required to oxidize all organic material into carbon dioxide and water (Northeast Georgia Regional Development Center, 2001). Most applications of COD analysis determine the amount of organic pollutants found in surface water. A high COD value corresponds to high organic matter content in the water, therefore less pure and clean.

Testing for chemical oxygen demand was performed using method 5220 D. Closed Reflux, Colorimetric Method (Standard Methods et al., 1998). Storm water samples were inverted several times and allowed to sit for one hour. This was done to homogenize each sample while ensuring an excess of solid material did not enter the reaction vials. Storm water samples were diluted to one-half with deionized water and were digested in HACH Digestion Solution vials for COD 0-150 ppm Range using a HACH brand COD reactor at 150° C for two hours (Figure 3.9). Absorbance of each sample was read on a Thermo Spectronic Genesys 20 Spectrophotometer at a wavelength of 620 nm and recorded. Samples were compared to a blank of deionized water and compared to a calibration curve of the absorbance of prepared standards (Appendix E). Samples that surpassed the highest calibration standard were digested a second time using CHEMetrics 0-1500 mg/L COD vials and absorbances compared to a second set of higher range calibration standards.

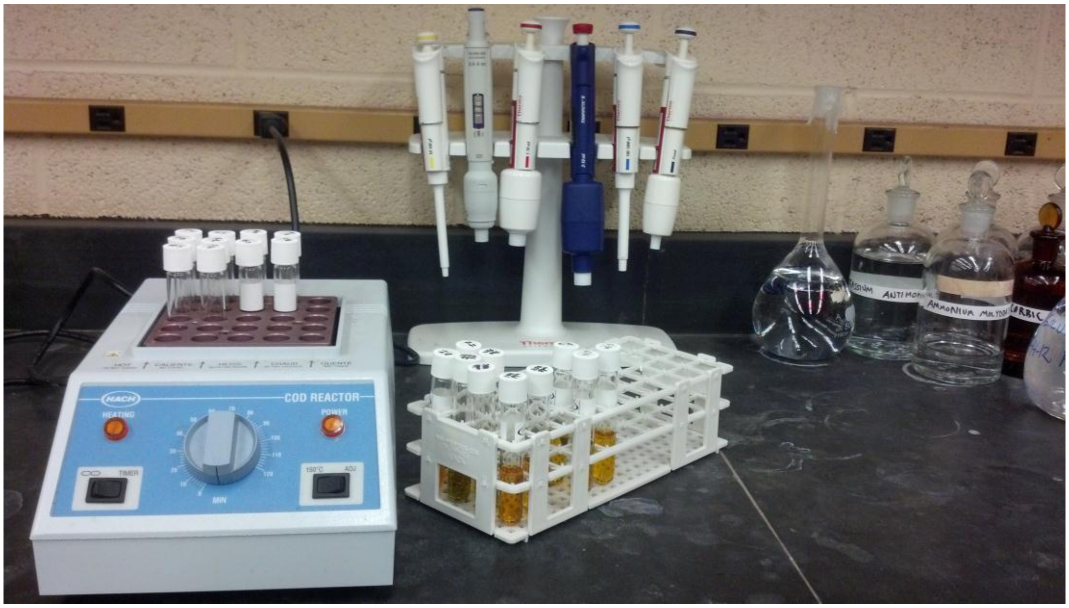


Figure 3.8: COD Vials and Reactor.

3.4.10 Oil & Grease

The presence of oil and oil byproducts in water is of concern because these materials are known to contain harmful constituents such as metals and polycylic aromatic hydrocarbons. Motor oil from engine sources may be recycled, combusted or leaked as a result of use. Improper disposal of used oil down storm drains, into lakes or rivers, or with garbage may also occur. Used oil that is leaked, spilled or improperly disposed of can be carried in storm water runoff, eventually entering and threatening the environmental health of receiving water bodies (California Environmental Protection Agency, 2006).

Testing for oil & grease was performed using American Society for Testing and Materials (ASTM) Method D7066-04 Standard Test Method for dimer/trimer of chlorotrifluoroethylene (S-316) Recoverable Oil and Grease and Nonpolar Material by Infrared Determination. A sample of 150 mLs was pipeted into a glass sample bottle and 15 mL of Tetrachloroethylene was added. The solution was shaken and the solvent layer was left to separate. The solvent was extracted using a syringe and filtered through Whatman 40 filter paper containing 1 g sodium sulfate. The filtered solvent was placed in a cuvette and analyzed using an InfraCal Model CVH TOG/TPH analyzer (Figure 3.10). Samples were compared to a calibration curve of the absorbance of prepared standards (Appendix F). Standards used were 10, 25, 50, 100, 150, 200 mg/L.

Figure 3.9: Analysis of Total Oil & Grease using Wilks InfraCal TOG/TPH Analyzer

3.4.11 Soluble Metals

The effects of metals in water range from beneficial through troublesome to dangerously toxic, often depending on concentration. The primary mechanism for toxicity to organisms that live in the water column is by absorption to or uptake across the gills, a physiological process requiring metal to be in a dissolved form. The "heavy metals" which are most toxic to aquatic organisms include copper, iron, cadmium, zinc, mercury, and lead. Some water quality characteristics which affect metal toxicity include temperature, pH, hardness, alkalinity, suspended solids, redox potential and dissolved organic carbon (Missouri Department of Natural Resources, 2012). Urban sources of metals may include cadmium, copper, cobalt, iron, nickel, lead and zinc from vehicle exhaust, brake linings, and tire and engine wear.

Soluble metal concentrations were determined using method 3120 B. Inductively Coupled Plasma (ICP) Method (Standard Methods et al., 1998). A sample of 50 mL was filtered using 0.45μm FilterMate™ positive displacement filtration devices by Environmental Express. After filtration samples were analyzed using a Thermo Scientific iCAP 6000 Series ICP Spectrometer in conjunction with iTEVA Control Center software. A NESLAB ThermoFlex 900 recirculating chiller was used for continuous refrigeration of the unit. A CETAC ASX-520 autosampler was used as well as a peristaltic pump in order to regulate sample flow to the nebulizer. Deionized water blanks as well as multi-element standards from CPI International in acidified deionized water were used for calibration. A quality control check composed of CPI International 50mg/L standard in acidified deionized water was performed every 20 samples. A 2 ppm spike was also used on several samples over the course of analysis procedures for quality assurance purposes. Soluble metals tested for include: Ag, Al, As, Be, Cd, Co, Cr, Cu, Fe, Ni, Pb, Se, V, Zn, and Mo.

### 3.4.12 Five-Day Biochemical Oxygen Demand

Biochemical oxygen demand (BOD) measures the amount of oxygen consumed by microorganisms in decomposing organic matter in surface water. Variables that affect the rate of oxygen consumption in surface water include: temperature, pH, the presence of certain kinds of microorganisms, and the type of organic and inorganic material in the water. BOD directly affects the amount of dissolved oxygen in rivers and streams, with a high BOD resulting in rapid oxygen depletion and less oxygen available for aquatic life. High BOD effects are the same as those for low dissolved oxygen: aquatic organisms become stressed, suffocate, and die. Sources of BOD in surface water bodies include leaves and woody debris; dead plants and animals; animal manure; effluents from pulp and paper mills, wastewater treatment plants, feedlots, and food-processing plants; failing septic systems; and urban storm water runoff (US EPA, 2012j). Urban sources of oxygen demanding wastes include simple grass clippings, leaves and animal waste.

Biochemical oxygen demand (BOD) was determined using method 5210 B. 5-Day BOD Test (Standard Methods et al., 1998). Ten milliliters to 200 mL of storm water samples were diluted using dilution water consisting of 1 mL phosphate buffer (54.3 g $K_2HPO_4$ dissolved in 700 mL distilled water, pH adjusted to 7.2 with 30% NaOH, diluted to 1 L), $MgSO_4$, $CaCl_2$, and $FeCl_3$ solutions/L of water. Desired volumes of sample water were pipeted directly into 300 mL glass stoppered bottles. Three milliliters of live microorganisms, or “seed”, from the Youngstown Wastewater Treatment Plant were added to the individual BOD bottles. Bottles were then filled to volume with dilution water so that the insertion of glass stopper would displace all air leaving no bubbles. Initial dissolved oxygen concentration was measured using a YSI 5010 BOD Probe attached to a YSI 5100 Dissolved Oxygen Meter. Blanks of dilution water with and without seed were prepared and measured. A 6 mL glucose-glutamic acid check (30 mg of glucose, 30 mg of glutamic acid dissolved in 200 mL deionized water) was also prepared and measured as a check for seed effectiveness. After initial dissolved oxygen readings, sample bottles were water-sealed and wrapped in Parafilm to prevent evaporation. Bottles were incubated at 20°C in a Fisher Scientific Low Temperature Incubator for five days (Figure 3.8). Final dissolved oxygen readings were recorded and $BOD_5$ was calculated using:

$$\mathrm{BOD_5,\ mg/L} = \frac{(D_1 - D_2) - (B_1 - B_2)f}{P}$$

where:

$D_1$ = DO of diluted sample immediately after preparation, mg/L
$D_2$ = DO of diluted sample after 5 d incubation at 20°C, mg/L
$P$ = decimal volumetric fraction of sample used
$B_1$ = DO of seed control before incubation, mg/L
$B_2$ = DO of seed control after incubation, mg/L
$f$ = (volume of seed in diluted sample)/(volume of seed in seed control)

Only dissolved oxygen readings that had greater than a 1 mg/mL change but with at least 1 mg/mL dissolved oxygen were used for BOD calculations.

Figure 3.10: BOD Bottles Incubating.

3.4.13 Total Coliform Bacteria

Members of two bacteria groups, coliforms and fecal streptococci, are used as indicators of possible sewage contamination because they are commonly found in human and animal feces. Although they are generally not harmful themselves, they indicate the possible presence of disease-causing bacteria, viruses, and protozoans that also live in human and animal digestive systems. Hence, their presence in large numbers in surface water suggests that pathogenic microorganisms might also be present and that swimming and consuming aquatic life might pose a health risk. Bacteria may cause cloudy water, unpleasant odors, and a decrease in dissolved oxygen. Sources of fecal contamination to surface waters include wastewater treatment plants, on-site septic systems, domestic and wild animal manure, and storm runoff (US EPA, 2012f). Common sources of fecal bacteria in the urban environment include fecal matter of animals such as birds, squirrels, chipmunks, cats, and dogs.

Two methods of bacterial analysis were implemented. A membrane filter technique was used to enumerate total coliform and IDEXX Colilert indicator tubes were used as a positive indicator for total coliform and presence of *E. coliform*.

Colilert tubes- require ten milliliters of sample pipeted into each tube, then mixed, and incubated for 24 hours at 35°C in a Quincy Lab Model 12-140 incubator. A yellow change in color and fluorescence under UV light was noted as indication of total coliforms and *E. coli*, respectively.

Total coliform counts were determined using method 9222 B- Standard Total Coliform Membrane Filter Procedure (Standard Methods et al., 1998). Storm water samples were vacuum filtered through Fisherbrand 47mm 0.45 micron water testing membrane filters using a vacuum filtration manifold. All sensitive equipment was sterilized using a Millipore 5 amp U.V. Sterilizer. A rinse of deionized water was used to ensure no sample remained on the filtration container. Filters were then transferred to a culture dish and incubated for 24 hours at 35°C in a Vista Corporation heater block incubator. Numbers of resulting colonies were determined using:

$$\text{(Total) coliforms/100 mL} = \frac{\text{coliform colonies counted} \times 100}{\text{mL sample filtered}}$$

Initial testing used a culture medium of Difco™ m FC agar with rosalic acid solution additive as the base medium for membrane filter technique. This medium produced unsatisfactory results including amoeboid cultures of a fuzzy or furry composition. Tests beginning in 2012 used Difco™ m Endo Agar LES as the base medium for remainder of analysis.

# CHAPTER 4

# RESULTS AND DISCUSSION

## 4.1 Water Quality Data and Basin Comparison

Samples were analyzed twice for each water quality parameter. Averages for replication of analysis for each parameter are discussed here, with complete data and standard deviations found in the appendices. The results of water quality analysis were grouped by basin type in order to recognize similarities or dissimilarities in contaminant loading between different land usages. Though the data collected can be looked at in a variety of ways (e.g. compare contaminant loading with amount of rainfall), contaminant comparisons were viewed over time to see any change in pollutants due to seasonal changes.

### 4.1.1 pH

Typically, the average pH of storm water ranged between 6 and 8 for all basin types, a desirable range for water quality (Figure 4.0). Overall averages ranged from 7.67 at basin C-1 to 6.80 at basin F-4 (Table 4.0). Individual storm water pH readings ranged from 8.87 at basin D-10 to 5.94 at basin C-31 (Appendix B). Of the fourteen times the pH exceeded 8, twelve of those times occurred in the months of January and February. This trend in pH increase during winter months could be due to seasonal de-icers ending up in storm water, as well as an increased runoff from snowmelt.

### 4.1.2 Conductivity

Conductivity ranged widely depending on drainage types and season (Figure 4.1). Overall averages ranged from 5,177 µS at basin C-31 to 113.59 µS at basin G-2 (Table 4.0). Conductivity readings individually ranged from 33,400 µS at basin C-31 to 40.4 µS at basin G-2 (Appendix C). For both roadway basins and parking lot basins the highest readings occurred in January during our snowmelt sampling. These high readings are thought to be the direct result of ice-melt (e.g. NaCl, CaCl, MgCl) used on roadways in the area, containing an abundance of ions such as sodium and chloride. The grass basins however seemed to show a slow increase in conductivity into the spring months, which could be due to an increase in inorganic dissolved solids like nitrate through fertilizers.

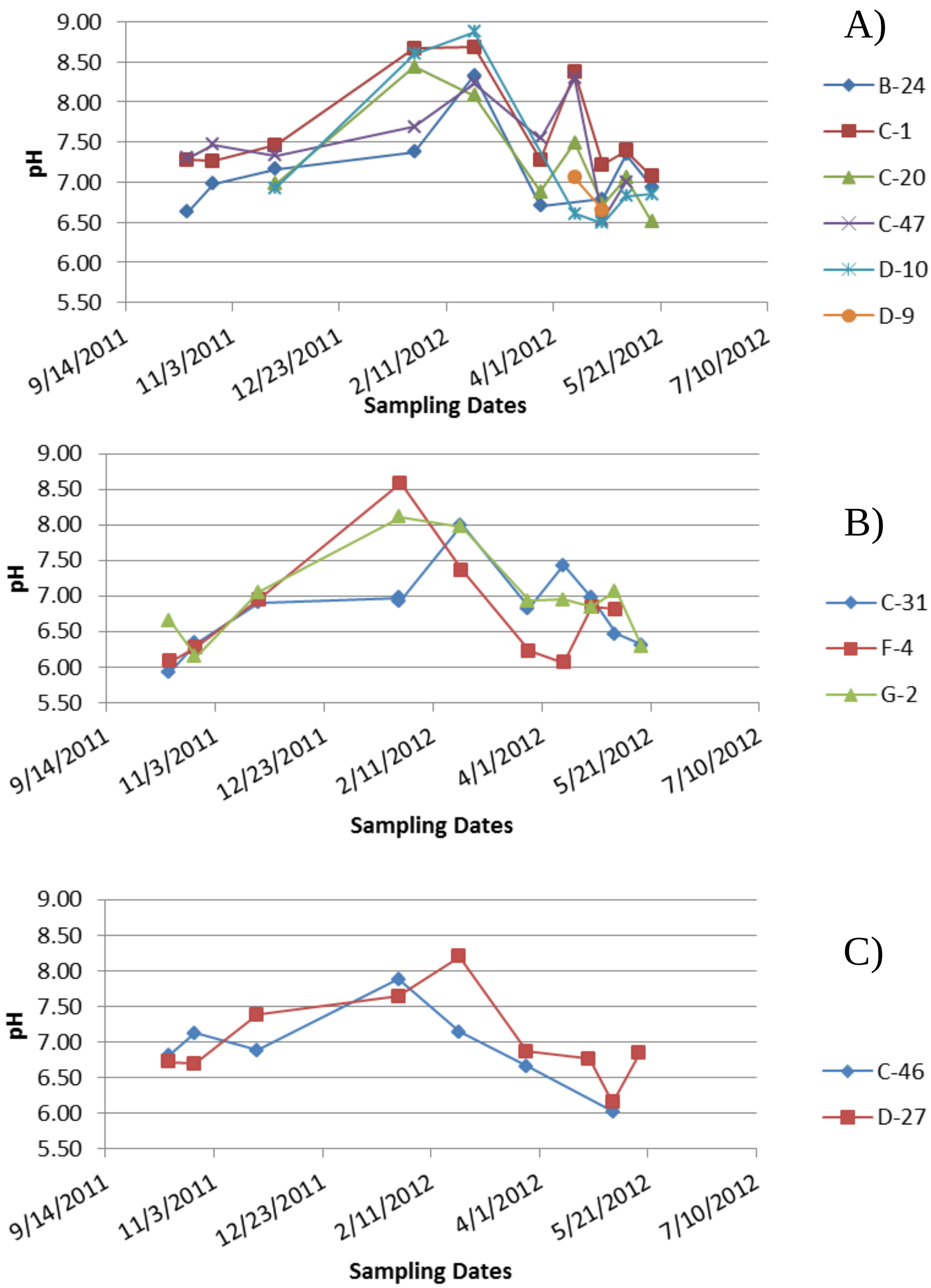


Figure 4.0: pH over time with respect to drainage type, where A) roadways, B) parking lots, C) grassed areas.

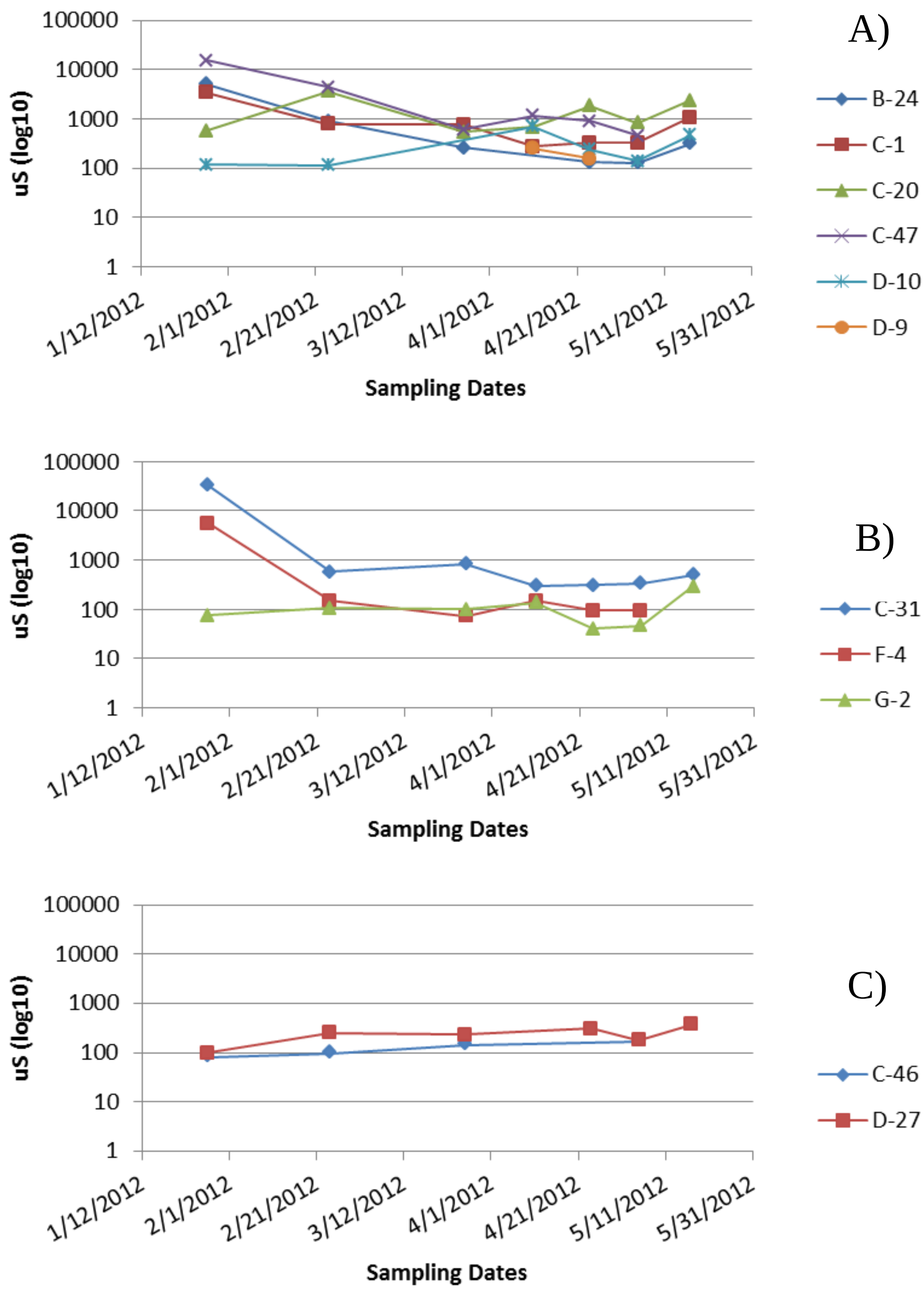


Figure 4.1: Conductivity over time with respect to drainage type, where A) roadways, B) parking lots, C) grassed areas.

4.1.3 Total Solids

Total solids distribution can be seen in Figure 4.2, with roadway basins having some of the highest concentrations. Overall averages ranged from 337 mg/L at basin G-2 to 4,195 mg/L at basin C-31 (Table 4.0). Total solids readings individually ranged from 36 mg/L t basin G-2 to 28,629 mg/L at basin C-31 (Appendix D). The two highest readings occurred in January, suggesting an increase in solids in runoff during the winter months. A general trend in all basin types is a large increase in total solids in the month through January, a large drop afterwards and then a slow increase into the spring months. The months with highest amounts of solids also correspond to the largest rain volumes. The large contaminant loading for this parameter could be due to the amount of runoff.

4.1.4 Total Suspended Solids

Total suspended solids basin distribution can be seen in Figure 4.3, with roadway settings having some of the largest pollutant loading. Overall averages ranged from 59 mg/L at basin D-9 to 1,302 mg/L at basin C-47 (Table 4.0). However, it should be noted that D-9's sample analysis is only based off of two sampling dates. The next lowest overall average is 84 mg/L at basin G-2. Total suspended solids readings individually ranged from G-2's 6 mg/L at basin G-2 to 4,638 mg/L at basin C-47 (Appendix E). This highest reading came in May, while the months of February, March, and April had no suspended solids readings that reached four figures. All basin types exhibit the same kind of overall trend seen in total solids, namely a high point in December/January/February, a large drop and then an increase towards the end of spring.

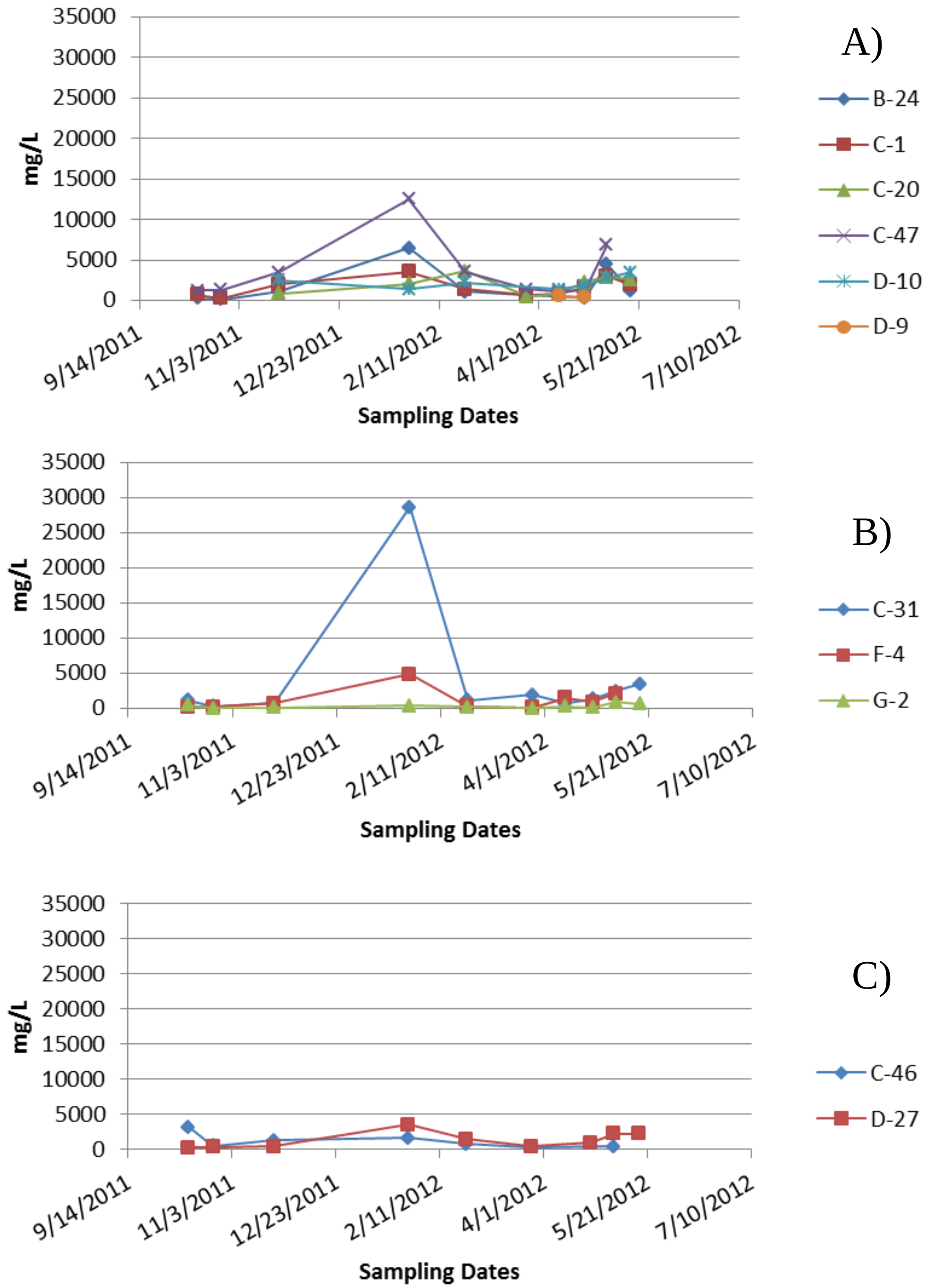


Figure 4.2: Total solids over time with respect to drainage type, where A) roadways, B) parking lots, C) grassed areas.

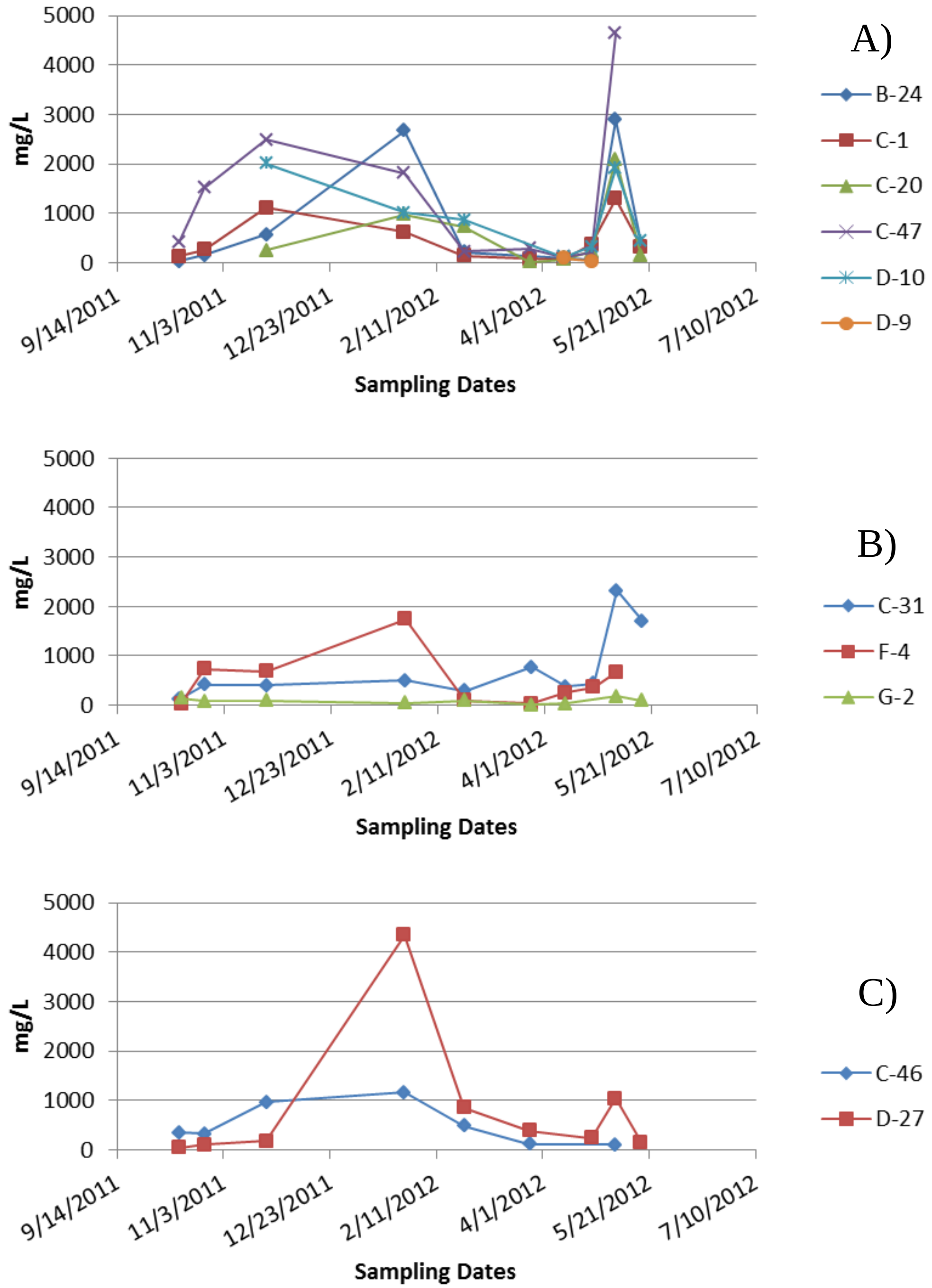


Figure 4.3: Total suspended solids over time with respect to drainage type, where A) roadways, B) parking lots, C) grassed areas.

4.1.5 Total Volatile Solids

Basin distribution for total volatile solids can be seen in Figure 4.4, with roadway basins again taking average highest concentration of pollutant. Overall averages ranged from 196 mg/L at basin G-2 to 894 mg/L at basin D-10 (Table 4.0). Total volatile solids readings individually ranged from 25 mg/L at basin G-2 to 1,805 mg/L at basin C-31 (Appendix F). G-2 is a newly constructed parking lot with very little surrounding trees or vegetation, while D-10 and C-31 both have tree life nearby. These surroundings provide plenty of organic matter that may be volatilized when incinerated. For roadway basins a typical trend emerges of high values in the fall, a recession in the winter, and increase in spring. Peaks in fall and spring could be due to first leaf litter during autumn and later dropped flowering buds in the spring.

4.1.6 Floating Solids

Floating solids in most abundance were grass clippings and leaf buds in the springtime, which were recorded at each basin at least once. This is significant due to the fact that each land usage had similar floating solid results. Other solids seen include twigs, bark fragments, and insects. One piece of trash (gum wrapper) was found at basin D-9, a roadway basin. Floating solids data was recorded and is included in Appendix L.

4.1.7 Soluble Reactive Phosphorus

Basin distribution for soluble reactive phosphorus is seen in Figure 4.6. Overall averages ranged from 0.41 mg/L at basin C-20 to 2.27 mg/L at basin C-47 (Table 4.0). Phosphorus readings individually ranged from 0.01 mg/L at basin C-46 to 8.62 mg/L at basin C-47 (Appendix G). Highest values for roadway and parking lot basins occurred in the month of October, were almost reduced to zero in February, and then slightly increased into the spring months. This could be due to leaf litter and flowering buds during each respective season. On the other hand, grass basin D-27 has a highly variable pattern which might suggest intermittent application of fertilizers or pesticides.

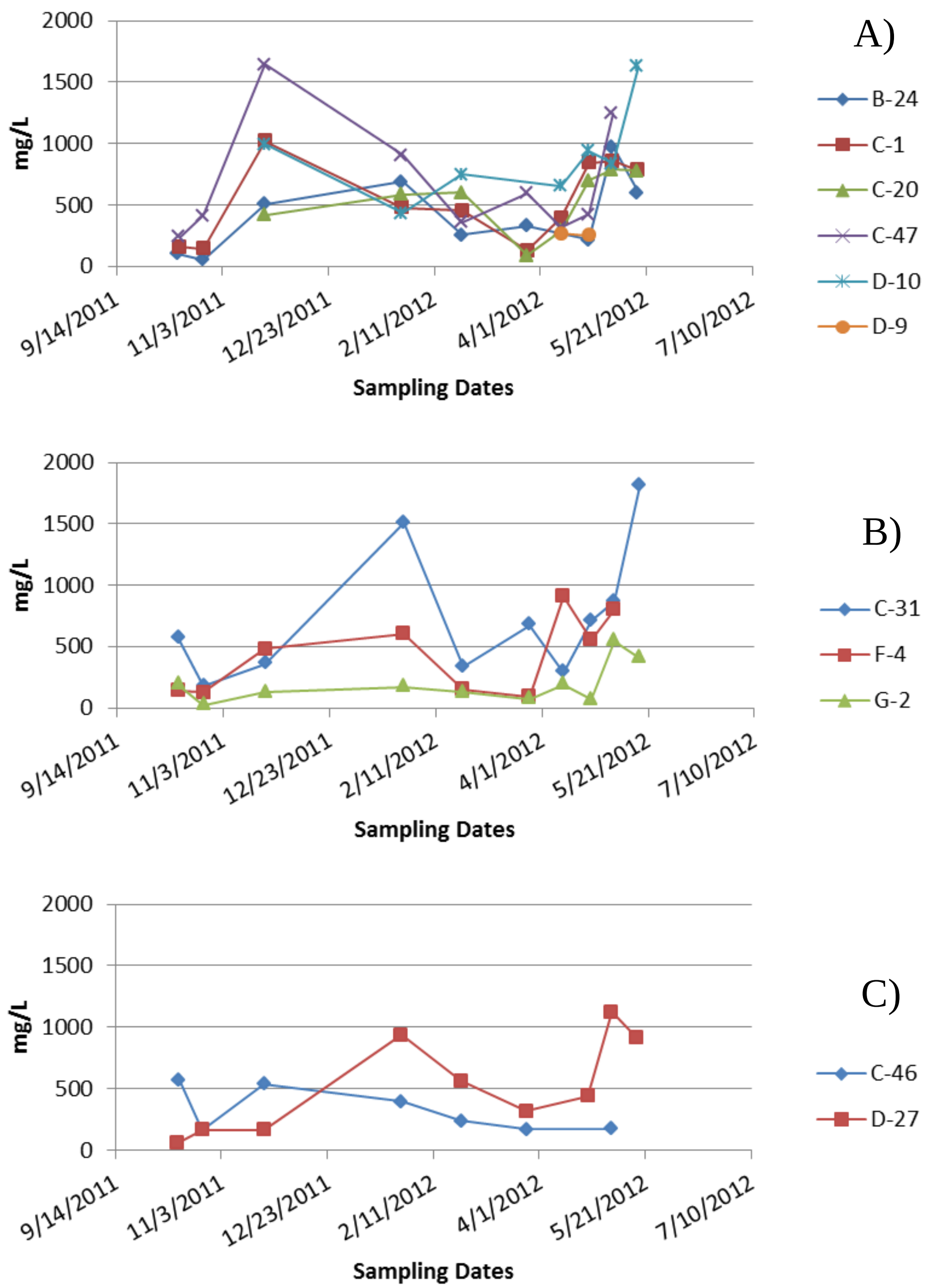


Figure 4.4: Total volatile solids over time with respect to drainage type, where A) roadways, B) parking lots, C) grassed areas.

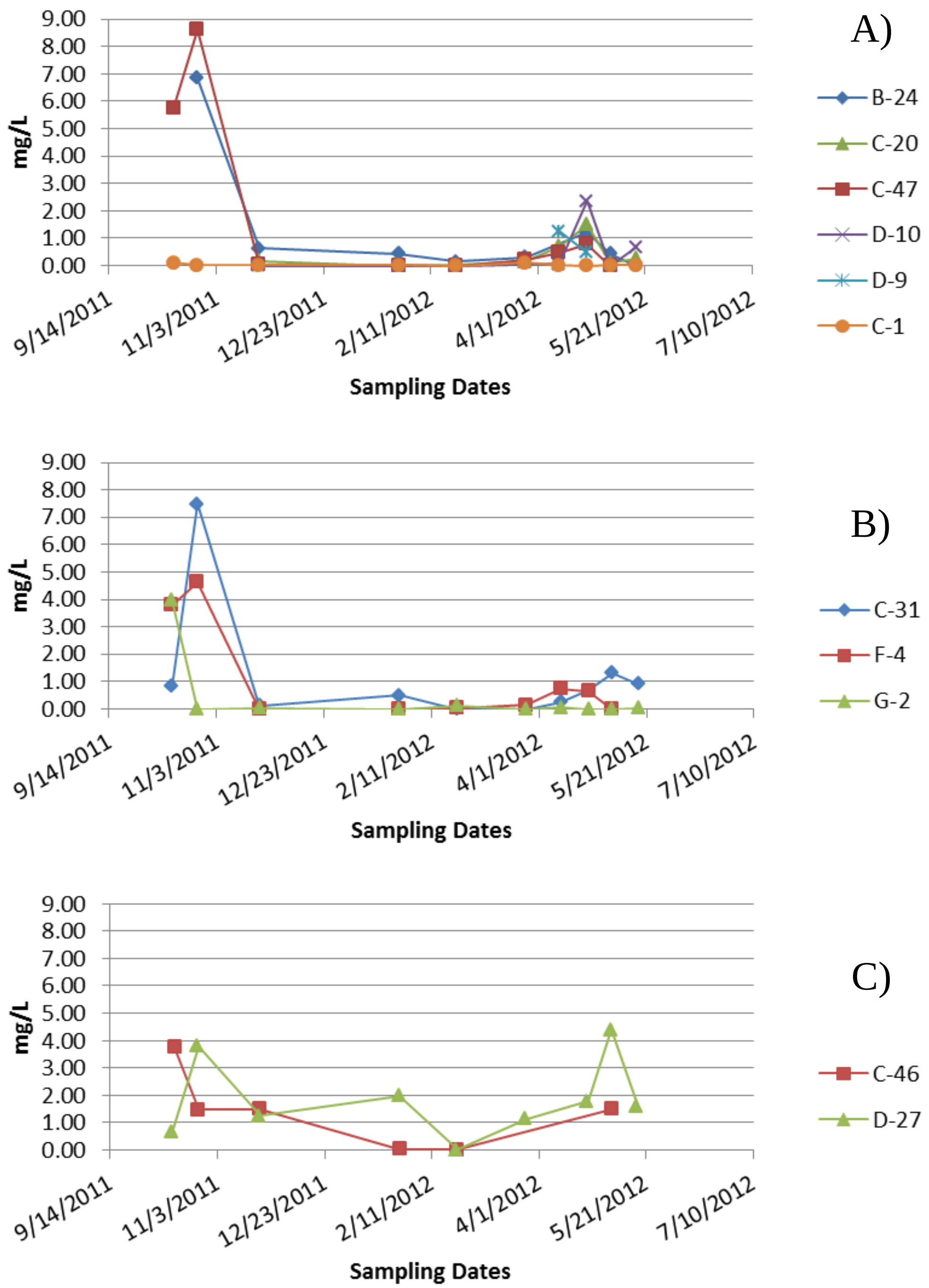


Figure 4.5: Phosphorus over time with respect to drainage type, where A) roadways, B) parking lots, C) grassed areas.

4.1.8 Soluble Ammonium

Basin distribution is seen in Figure 4.6, with grass basins having some of the highest readings during sampling. Overall averages ranged from 6.60 mg/L at basin D-10 to 23.97 mg/L at basin C-46 (Table 4.0). Ammonium readings individually ranged from 0.06 mg/L at basin D-10 to 86.27 mg/L at basin D-27 (Appendix H). As a general trend for all basin types, it could be seen that ammonium readings started relatively high in October/November, were at their lowest in the winter months, and gradually increased into late spring. This trend could be due to decaying leaf litter in fall months and dropped flowering buds in the spring. Grass basin D-27 had a large spike in the spring months. This could be due to application of lawn fertilizers.

4.1.9 Soluble Nitrate

Soluble nitrate readings by basin type can be seen in Figure 4.7. Overall averages ranged from 6.58 mg/L at basin D-9 to 24.96 mg/L at basin C-31 (Table 4.0). However, it should be noted that D-9's sample analysis is only based off of two sampling dates. The next lowest overall average is 6.74 mg/L at basin D-10. Nitrate readings individually ranged from 2.86 mg/L at basin C-46 to 108.95 mg/L at basin C-31 (Appendix I). As seen in the roadway and parking lot samples there is a gradual drop in nitrate from the initial October samples that leads into an apparent spike in the January sampling date. This spike quickly recedes into the spring months, with only a small increase in late spring. The most apparent example of this is loading dock C-31, with a large increase in nitrate during snow melt sampling. This could be due to an unknown human activity during the sampling date. This overall trend is not the case for the grass basins, possibly due to nutrient uptake from nearby plant life. Highest readings for these basins start in the October sampling dates and gradually decrease since that point.

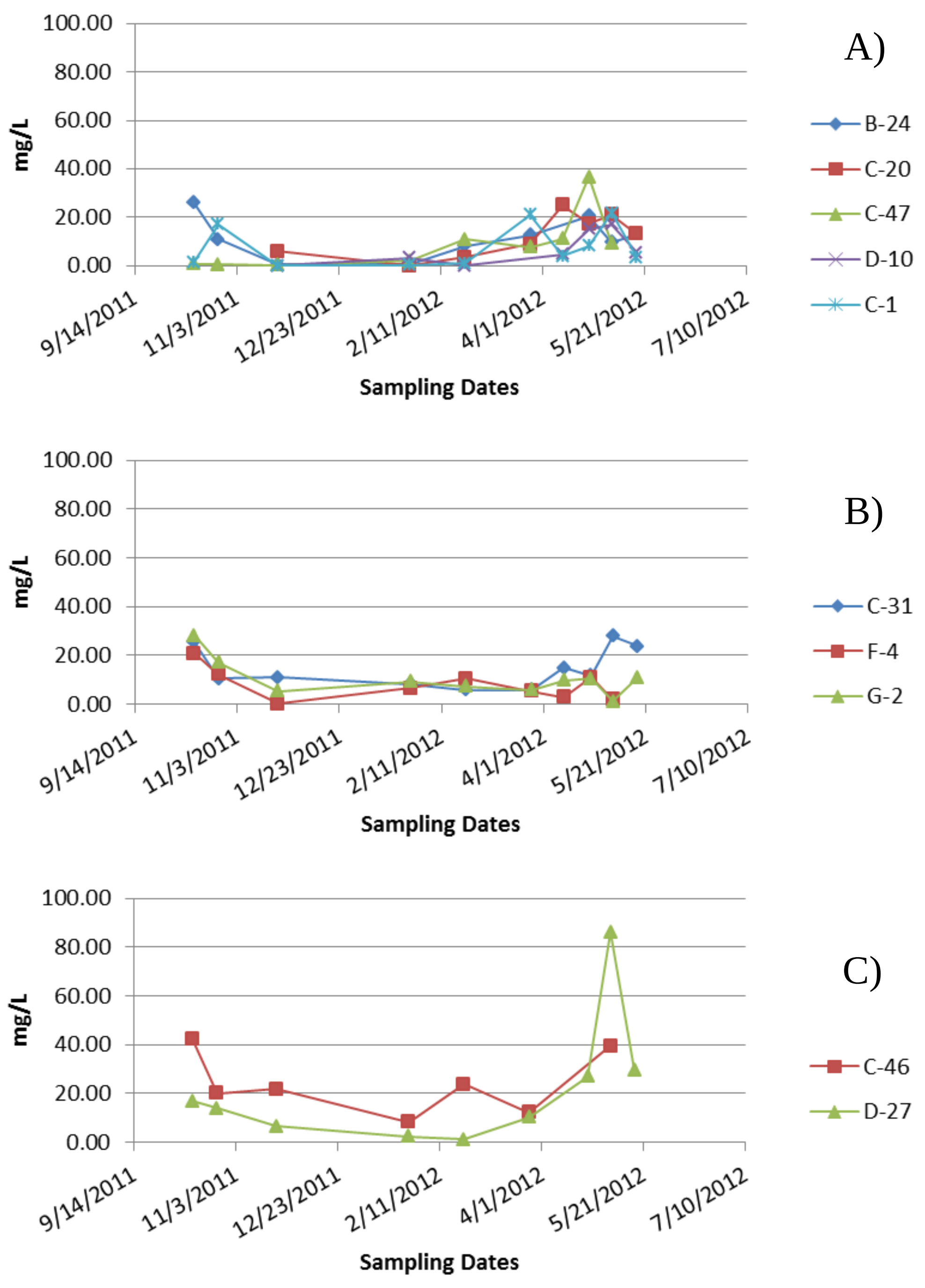


Figure 4.6: Ammonium over time with respect to drainage type, where A) roadways, B) parking lots, C) grassed areas.

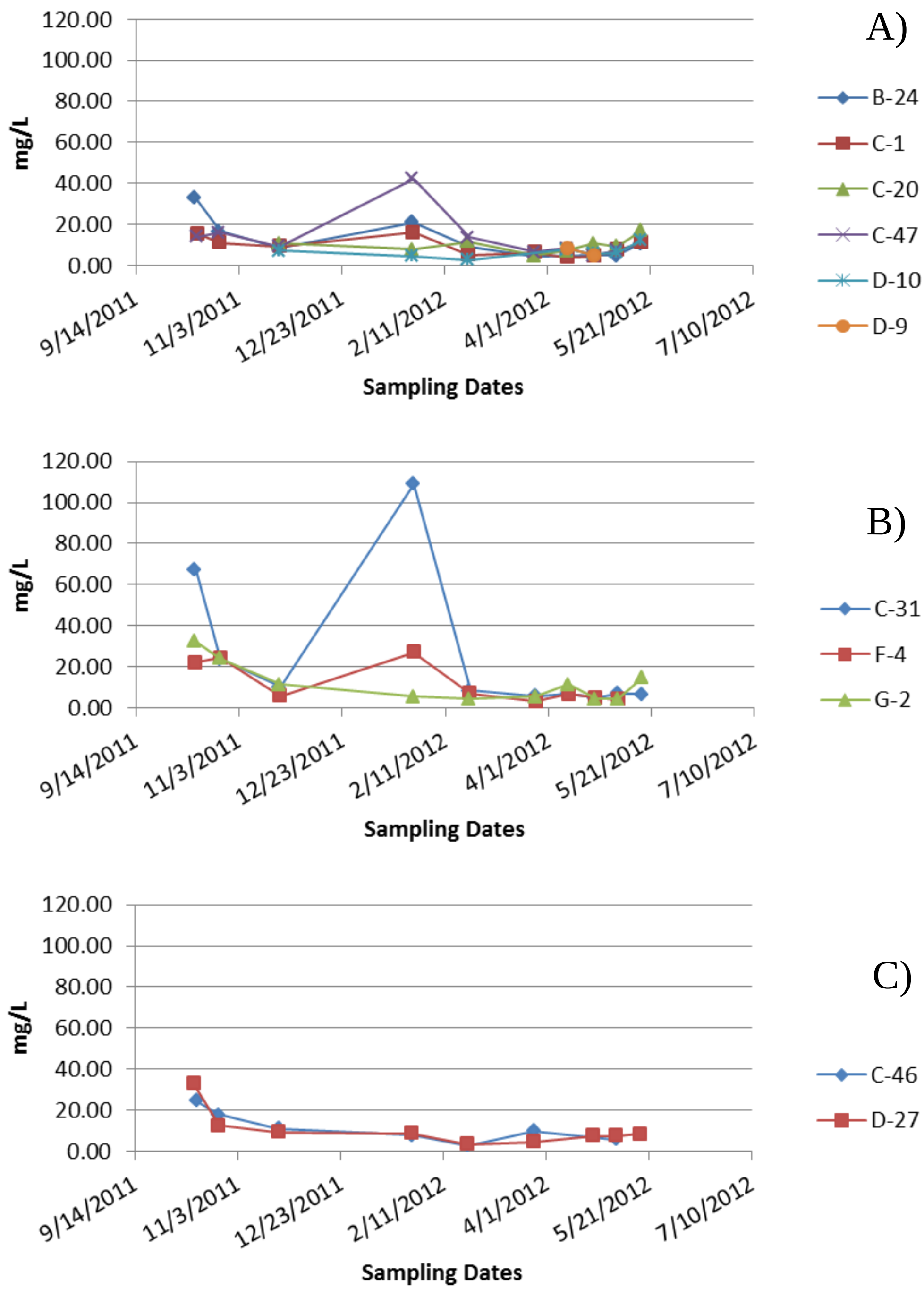


Figure 4.7: Nitrate over time with respect to drainage type, where A) roadways, B) parking lots, C) grassed areas.

4.1.10 Chemical Oxygen Demand

Basin distribution for COD can be seen in Figure 4.8, with all basin types typically following the same trend for seasonal contaminant loading. Overall averages ranged from 80.78 mg/L at basin B-24 to 603.95 mg/L at basin C-31 (Table 4.0). COD readings individually ranged from 12.50 mg/L at basin C-46 to 1,875 mg/L at basin C-31 (Appendix J). For almost all basins, we notice a low plateau in COD readings until the months of April and May, where COD readings increase. The one basin that deviates from this pattern is C-31, a loading dock basin. The readings at basin C-31 are variable with jumps within seasons of fall, winter, and spring. The highest recorded COD comes in February. This might indicate an intermittent source of biologically available and inert organic matter, possible for an area that sees a good amount of traffic. These readings could also be due to human interferences in this area.

4.1.11 Oil & Grease

Basin distribution is seen in Figure 4.9, with basins of each type having similar results. Overall averages ranged from 0.00 mg/L at basin D-9 to 0.19 mg/L at basin B-24 and A-28 (Table 4.0). However, it should be noted that the basin D-9 sample analysis is only based off of two sampling dates. The next lowest overall average is 0.11 mg/L recorded at basins G-2 and C-1. Oil & grease readings individually ranged from basin 0.00 mg/L (at all sites at least once) to 0.57 mg/L at basins C-1, C-47, D-27, and F-4 (Appendix K). All readings recorded were less than 1 mg/L. Highest readings for oil & grease were recorded in the month of January. Oil & grease samples were collected in plastic containers rather than glass, so the possibility that some oil and grease absorbed into the containers exists. This data can therefore been seen as values that at least amount exist.

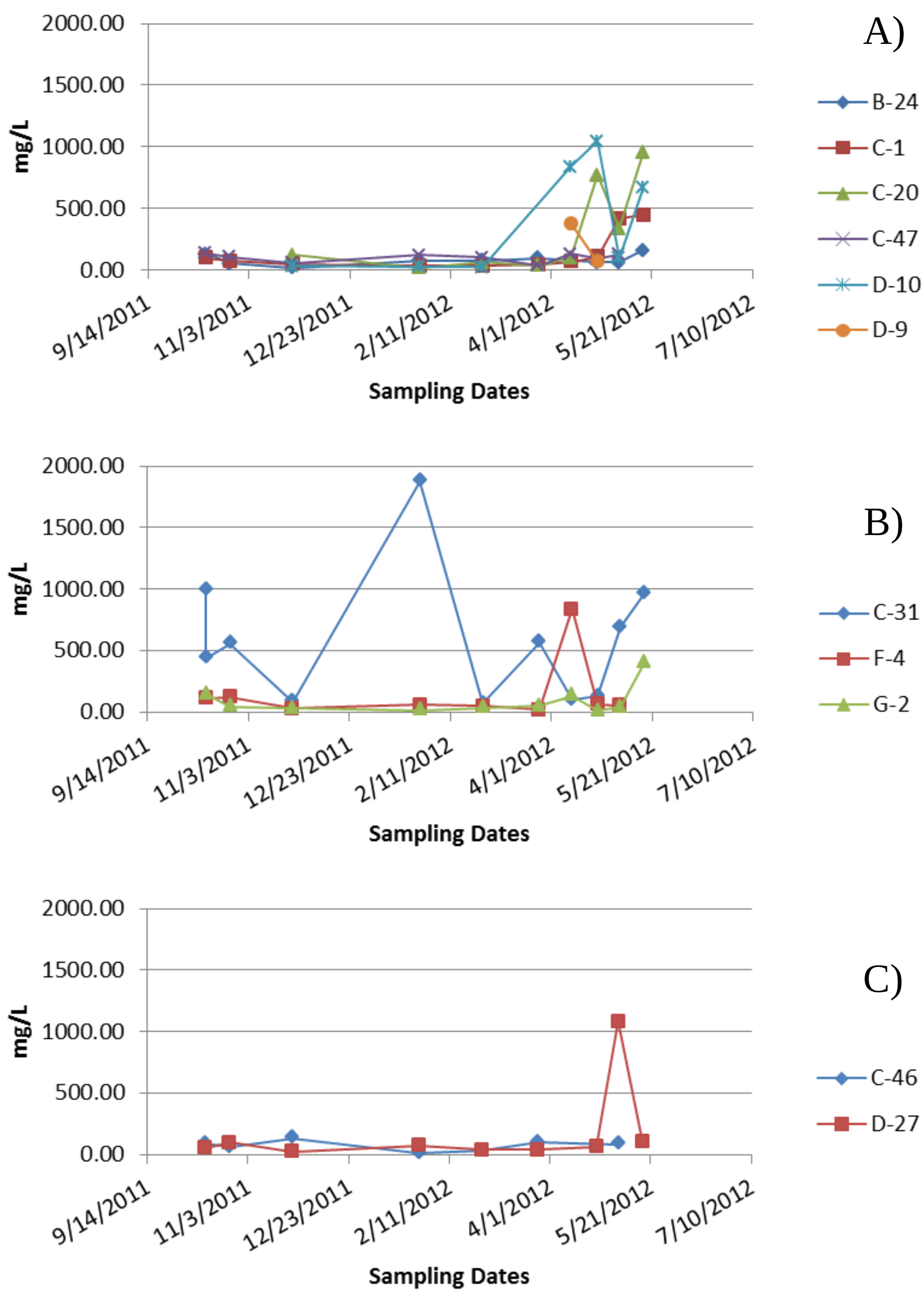


Figure 4.8: COD over time with respect to drainage type, where A) roadways, B) parking lots, C) grassed areas.

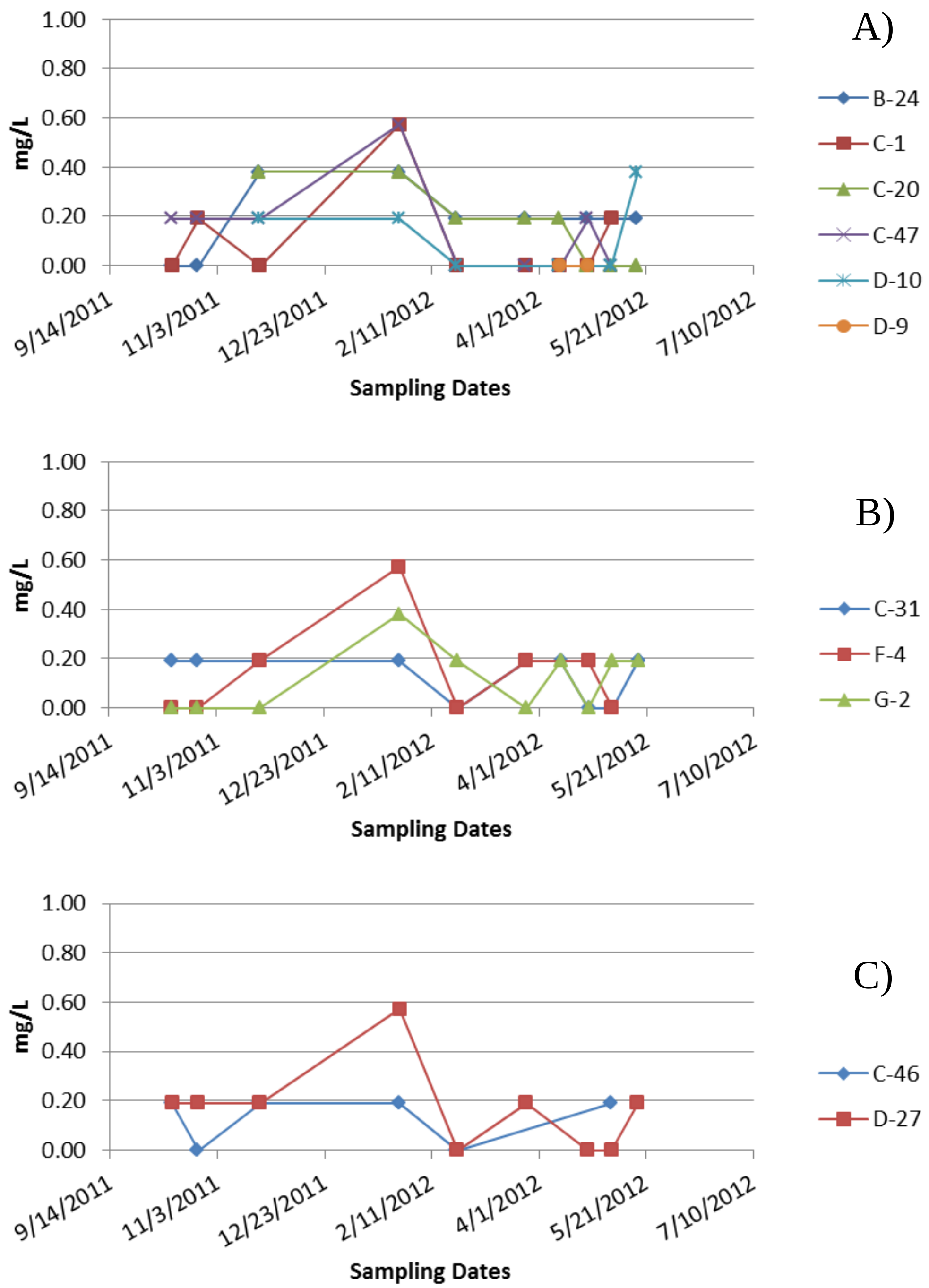


Figure 4.9: Oil & grease over time with respect to drainage type, where A) roadways, B) parking lots, C) grassed areas.

4.1.12 Soluble Metals

Of the soluble metals tested for include (Ag, Al, As, Be, Cd, Co, Cr, Cu, Fe, Ni, Pb, Se, V, Zn, and Mo), the only elements that averaged over 1 mg/L were iron and aluminum, with zinc being next highest in average concentration. Basin distribution is seen in Figure 4.10 for aluminum, Figure 4.11 for iron, and Figure 4.12 for zinc. Individual readings are seen in Appendix M. Parking lot G-2 had relatively high aluminum and zinc content in autumn months when compared to other land uses that might be commonly associated with high metal concentrations, namely roadways. G-2 is a new parking lot with relatively low automobile volume when compared to a larger lot like F-4. Grass basins C-46 and D-27 also had seemingly uncharacteristic levels of metals in their water samples. These levels may be due to the amount of soil around these landscaped areas. Due to the fact that the storm water samples were never digested, metals analysis can only be performed for soluble metals. However, different metals have different properties of solubility. The solubility of a metal will depend on the chemical form of the metal, the fluid used to extract the metal, and the conditions under which the extraction occurs (e.g., temperature, volume, time). A background level of iron may occur for some basins in relation to the iron content of the drainage grates samplers were affixed to.

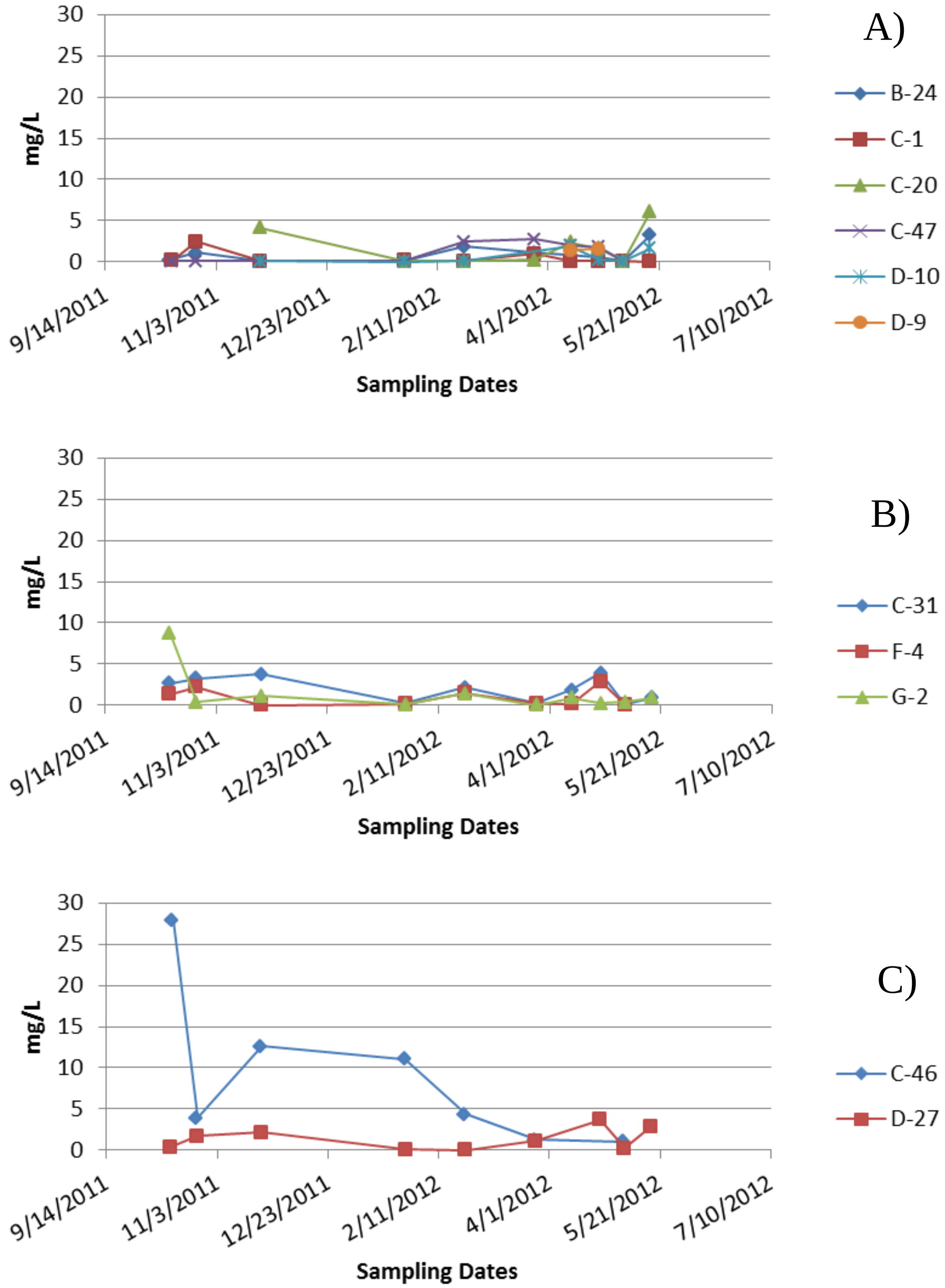


Figure 4.10: Aluminum over time with respect to drainage type, where A) roadways, B) parking lots, C) grassed areas.

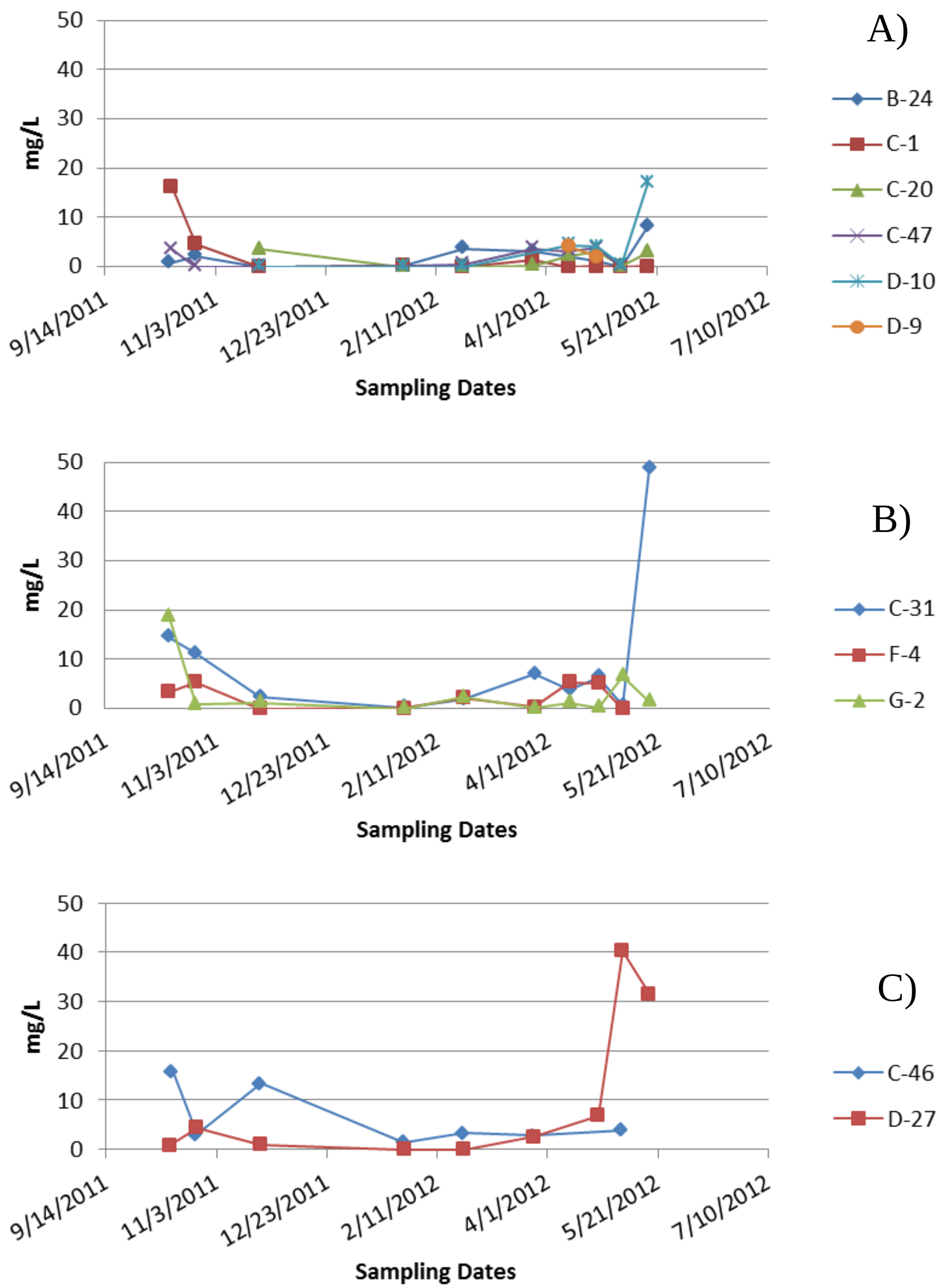


Figure 4.11: Iron over time with respect to drainage type, where A) roadways, B) parking lots, C) grassed areas.

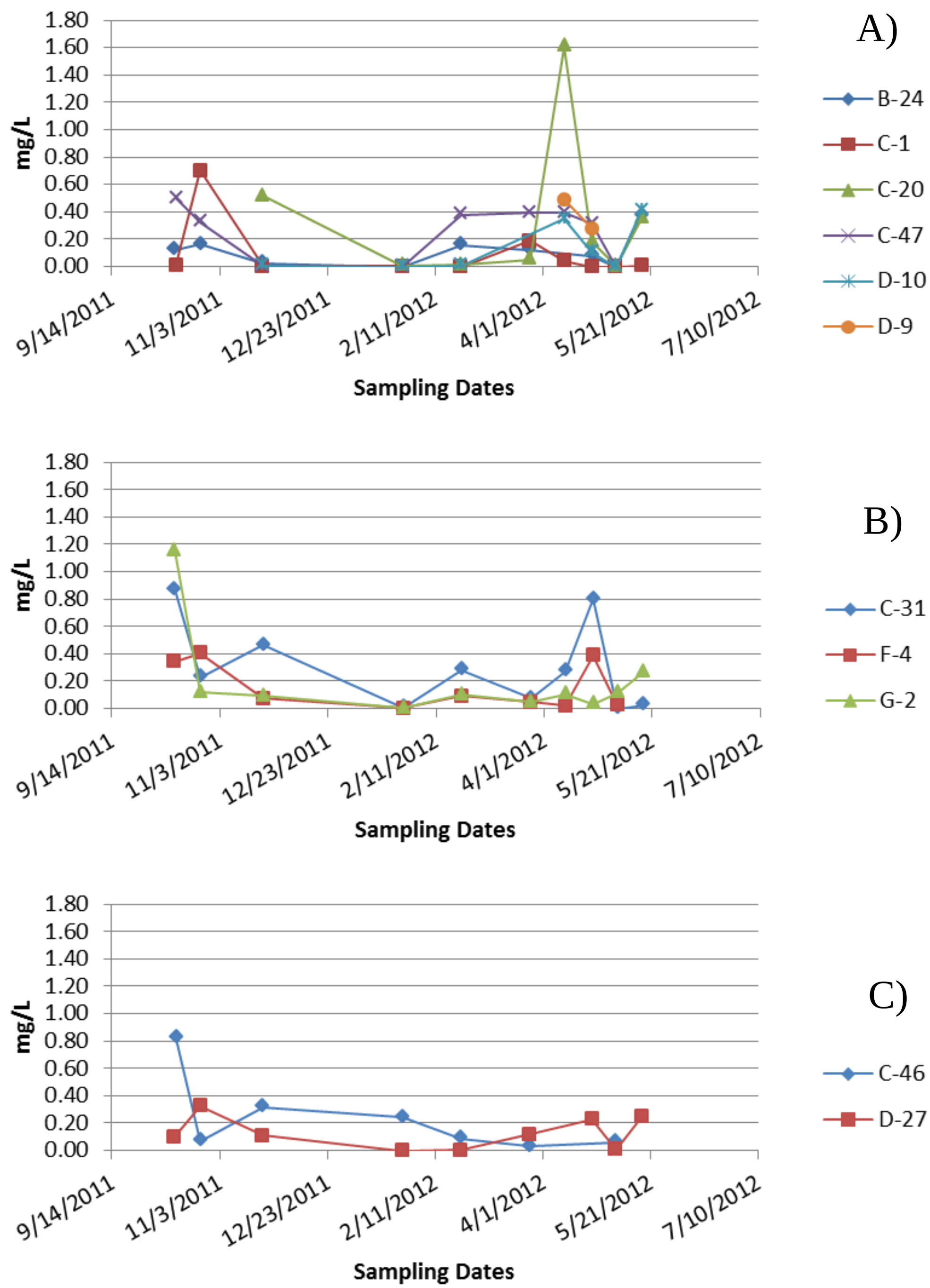


Figure 4.12: Zinc over time with respect to drainage type, where A) roadways, B) parking lots, C) grassed areas.

4.1.13 Total Coliform Bacteria

Total coliform testing took place using colony plates and colilert indicator tubes. Bacteria readings from colony plates include determined average and estimated averages (Table 4.2). Individual results are included in Appendix N. Colilert indicator tube results are presented in Appendix O. Bacterial results were highly variable between all basin types. This could be due to the variable nature of bacteria, with dependence on land activity, season, and intermittent factors like presence of animals waste. Using the colilert indicator tubes, all samples tested positive for total coliforms and *E. coli* at least once. A greater instance of positive results occurred in the spring months rather than the fall months. Several issues arose during bacterial testing. Initial bacterial testing using the DifcoTM m FC Agar yielded bacterial results that were either consistently too numerous to count or did not have well defined colonies (amoeboid or fuzzy). Later, when implementing the DifcoTM m Endo Agar LES, trouble arose in finding the correct amount of storm water to test without receiving results too numerous to count.

4.1.14 Biochemical Oxygen Demand

BOD readings include determined average and estimated averages (Table 4.3). Individual results are included in Appendix P. BOD readings were highly variable between all basin types. High BOD results occurred in late spring. These results could be due to fertilizer application as well as dropped flowering buds from neighboring plant life. The lowest recorded average was 1.94 mg/L at basin G-2 to 148.80 mg/L at basin D-10. Complications arose during BOD analysis in attempting to find a suitable range for sample volumes. BOD ranged widely, often causing some analysis to produce either decreases too large or too small to be considered viable.

4.1.15 Rainfall Data

Rainfall was sampled and compared to storm water results. Rain water had a much lower contaminant level for all parameters except for nitrate and ammonium, where it was on par with or even rivaled some basins (Table 4.0). This could be due to naturally occurring background levels, or anthropogenic sources. The rainfall pH was found to be slightly acidic, which could be due to industrial emissions of sulfur dioxide and nitrogen oxides. Amount of rainfall sampled is listed in Figure 4.13. Total rain event data is seen in Appendix V. Greatest individual rainfall event occurred on 11/23/2011 and greatest sampled date set was the sampling in November. Total daily rainfall is located in Appendix Q. Rain collection proved inconsistent and often did not provide sufficient volume for analysis. Insects and tree buds often fell into the rain gauges, interfering with tests such as total solids. Placement of rain gauges around campus was also an issue. On February 23rd, a rain gauge went missing and was never recovered. During one sample date, a rain gauge had a foreign liquid in it, believed to be coffee.

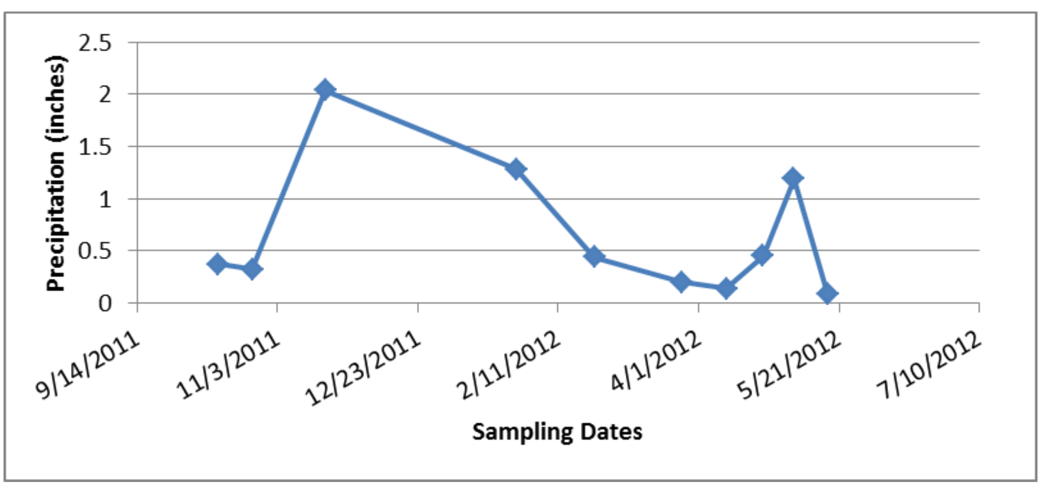


Figure 4.13: Total Rainfall Recorded for Each Sampling Date (Weather Underground, 2012).

Table 4.0: Total Averages of Storm Water Parameters.

| Total Averages | pH | CONDUCTIVITY (µS/cm) | TOTAL SOLIDS (mg/L) | TOTAL SUSPENDED SOLIDS (mg/L) | VOLATILE SOLIDS (mg/L) | NITRATE (mg/L) | AMMONIUM (mg/L) | PO4 (mg/L) | COD (mg/L) | Oil & Grease (mg/L) |
|---|---|---|---|---|---|---|---|---|---|---|
| **A-28** | 6.87 | N/A | 1087.33 | 364.33 | 433.00 | 16.81 | 8.00 | 1.05 | 82.50 | 0.19 |
| **B-24** | 7.14 | 1139.00 | 1721.78 | 789.89 | 418.33 | 12.70 | 11.43 | 1.38 | 80.78 | 0.19 |
| **C-1** | 7.67 | 994.50 | 1580.50 | 440.50 | 527.50 | 9.11 | 7.87 | 0.50 | 135.35 | 0.11 |
| **C-20** | 7.27 | 1491.71 | 1932.38 | 564.75 | 533.25 | 9.95 | 11.91 | 0.41 | 299.69 | 0.17 |
| **C-31** | 6.81 | 5177.00 | 4195.10 | 734.30 | 731.60 | 24.96 | 14.53 | 1.51 | 603.95 | 0.13 |
| **C-46** | 6.98 | 124.03 | 1125.86 | 500.71 | 322.71 | 11.42 | 23.97 | 1.37 | 74.29 | 0.13 |
| **C-47** | 7.45 | 3821.58 | 3268.90 | 1302.22 | 684.33 | 13.65 | 8.84 | 2.27 | 100.95 | 0.15 |
| **D-9** | 6.85 | 204.30 | 472.50 | 59.50 | 261.50 | 6.58 | 12.80 | 0.86 | 222.75 | 0.00 |
| **D-10** | 7.31 | 297.65 | 2208.29 | 955.86 | 893.71 | 6.74 | 6.60 | 1.03 | 389.79 | 0.13 |
| **D-27** | 7.03 | 210.96 | 1286.67 | 813.78 | 520.11 | 10.61 | 21.50 | 1.85 | 178.56 | 0.17 |
| **F-4** | 6.80 | 1001.75 | 1213.78 | 510.89 | 432.78 | 11.64 | 7.94 | 1.67 | 152.95 | 0.14 |
| **G-2** | 7.00 | 113.59 | 337.70 | 83.56 | 196.00 | 11.78 | 10.52 | 0.85 | 93.20 | 0.11 |
| **Rain** | 5.15 | 28.93 | 5.71 | 13.71 | 20.43 | 10.18 | 20.57 | 0.32 | 17.5 | 0.06 |

Table 4.1: Average Soluble Metals for Aluminum, Zinc, and Iron. (mg/L).

| | Aluminum | | | Iron | | | Zinc | | |
|---|---|---|---|---|---|---|---|---|---|
| | High | Low | Average | High | Low | Average | High | Low | Average |
| A-28 | 5.244 | 0.0498 | 2.068 | 25.32 | BDL | 17.585 | 0.4937 | 0.0207 | 0.267 |
| B-24 | 4.084 | 0.0749 | 1.093 | 11.81 | BDL | 2.643 | 0.3815 | BDL | 0.331 |
| C-1 | 2.461 | 0.0208 | 0.422 | 16.48 | BDL | 3.232 | 0.7135 | BDL | 0.137 |
| C-20 | 6.071 | 0.0585 | 1.853 | 3.591 | BDL | 1.963 | 0.519 | BDL | 0.159 |
| C-31 | 4.422 | 0.1075 | 1.92 | 48.81 | 0.1402 | 9.629 | 0.9158 | BDL | 0.334 |
| C-46 | 28.2 | 1.063 | 8.883 | 16.06 | 0.5465 | 6.181 | 0.822 | 0.0278 | 0.232 |
| C-47 | 2.452 | 0.0611 | 0.905 | 4.777 | BDL | 2.285 | 0.5835 | BDL | 0.277 |
| D-9 | 1.589 | 1.291 | 1.488 | 4.331 | 2.069 | 3.115 | 0.6268 | 0.2768 | 0.384 |
| D-10 | 2.877 | 0.0398 | 0.592 | 18 | BDL | 6.449 | 0.8222 | BDL | 0.175 |
| D-27 | 5.053 | 0.041 | 1.376 | 57.98 | BDL | 12.481 | 0.3369 | BDL | 0.141 |
| F-4 | 2.869 | 0.0239 | 0.96 | 5.582 | BDL | 3.09 | 0.4637 | BDL | 0.155 |
| G-2 | 10.56 | 0.0135 | 1.425 | 21.75 | BDL | 3.607 | 1.419 | 0.0021 | 0.203 |
| Rain | 0.1405 | 0.0218 | 0.06172 | 0.4423 | BDL | 0.09965 | 0.0555 | 0.0062 | 0.03193 |
| BDL = Below Detection Limit | | | | | | | | | |

Table 4.2: Average Bacteria Counts (per 100 mL). Asterisks (*) indicate estimated value. TNTC indicates "too numerous to count".

| **Total Averages** | **10/13/2011** | **10/25/2011** | **11/23/2011** | **1/27/2012** | **2/24/2012** | **3/26/2012** | **4/11/2012** | **4/24/2012** | **5/5/2012** | **5/17/2012** |
|---|---|---|---|---|---|---|---|---|---|---|
| **A-28** | 30000 | *1500 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| **B-24** | *95000 | 162 | N/A | N/A | *1700 | *12000 | N/A | 6100 | 47000 | 2730 |
| **C-1** | TNTC | 2500 | N/A | N/A | *100 | 26000 | *1500 | 281 | 24250 | 153725 |
| **C-20** | N/A | N/A | N/A | N/A | *1600 | 30850 | 6100 | 25680 | 92000 | 2400 |
| **C-31** | TNTC | TNTC | N/A | N/A | 90 | 56000 | 2300 | TNTC | 18611 | 750000 |
| **C-46** | 19750 | *1800 | N/A | N/A | 49000 | 8823 | N/A | N/A | *88000 | N/A |
| **C-47** | 15000 | 2500 | N/A | N/A | 580 | 27737 | *3000 | 24050 | 45000 | N/A |
| **D-9** | N/A | N/A | N/A | N/A | N/A | N/A | 2600 | 15800 | N/A | N/A |
| **D-10** | N/A | N/A | N/A | N/A | 260 | N/A | 7500 | 26100 | 16921 | 21000 |
| **D-27** | 3493 | 34000 | N/A | N/A | 3400 | 420 | N/A | 67000 | 15800 | 77000 |
| **F-4** | 20150 | 49 | N/A | N/A | *20 | 10745 | 2900 | 8862 | 5700 | N/A |
| **G-2** | 8000 | 5921 | N/A | N/A | *12 | 1287 | 270 | *1000 | 410 | 25250 |
| **Rain** | 0 | TNTC | N/A | N/A | 0 | 2800 | 0 | 1970 | TNTC | N/A |
| N/A = Water not collected | | | | | | | | | | |

Table 4.3: Average Biochemical Oxygen Demand (mg/L). Great than/less than value indicate estimates.

| **Total Averages** | **10/13/ 2011** | **10/25/ 2011** | **11/23/ 2011** | **1/27/ 2012** | **2/24/ 2012** | **3/26/ 2012** | **4/11/ 2012** | **4/24/ 2012** | **5/5/ 2012** | **5/17/ 2012** |
|---|---|---|---|---|---|---|---|---|---|---|
| **A-28** | N/A | 5.61 | 8.59 | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| **B-24** | N/A | 3.74 | 4.73 | 4.41 | 12.02 | > 38.04 | N/A | 10.66 | 15.93 | 55.32 |
| **C-1** | N/A | 14.18 | 42.30 | 9.51 | 21.91 | > 35.94 | 46.80 | 16.80 | 29.34 | 131.40 |
| **C-20** | N/A | N/A | > 44.64 | <4.17 | 19.35 | 14.53 | > 56.64 | > 33.54 | > 38.58 | 120.30 |
| **C-31** | N/A | > 40.02 | 18.93 | > 48.72 | 16.44 | > 39.36 | > 57.48 | > 35.7 | > 38.94 | > 179.1 |
| **C-46** | N/A | 13.29 | 14.22 | 4.44 | 9.83 | 18.07 | N/A | N/A | > 39.78 | N/A |
| **C-47** | N/A | > 40.38 | 19.92 | 15.01 | 23.45 | 6.76 | 35.83 | > 33.96 | > 40.92 | N/A |
| **D-9** | N/A | N/A | N/A | N/A | N/A | N/A | > 57.72 | 28.56 | N/A | N/A |
| **D-10** | N/A | N/A | 12.71 | < 2.73 | < 4.53 | N/A | > 50.52 | > 36.9 | 26.88 | 148.80 |
| **D-27** | N/A | > 41.82 | 14.27 | 4.77 | 7.16 | 10.53 | N/A | > 33.54 | > 38.22 | 39.18 |
| **F-4** | N/A | > 38.76 | 5.51 | 9.78 | 9.05 | 7.48 | 22.98 | 8.17 | 15.25 | N/A |
| **G-2** | N/A | 6.60 | 3.08 | < 1.53 | 5.79 | 5.05 | 28.19 | 1.94 | 5.84 | 84.00 |
| **Rain** | N/A | 36.96 | 16.90 | 14.25 | 9.075 | 16.27 | N/A | 20.50 | 16.97 | N/A |

### 4.2 Comparison to Previous Research

During this first year of study, a few different contrasts can be made to previous research. When compared to the data from the National Urban Runoff Program, average values for all parameters analyzed exceeded expected values, even for different land uses whether they be residential, commercial, or industrial. When compared to the University of Alberta's literature review, all results were within the expected range of concentrations. Values also often coincided with the range of means for the parameters studied. Again, it should be noted that this was a compilation of past studies, with a wide variety of storm water values considered with various land uses, rainfall, type of sample collections and watershed area. When compared to the National Storm Water Database, data from this study often rivaled or exceeded parameter values no matter the land usage. The data from the Storm Water Database also covered a greater area than our Youngstown study (several acres as opposed to a few hundred square meters) and yet had lower values. These studies often took samples over a period of several years, whereas our study was done over the course of 8 months. As stated before, none of the sampling for these studies took place in Ohio, and each study has variations depending on season, runoff amount, percent impervious surface cover, etc. The comparison to prior studies should only be used to understand typical pollutant loading ranges.

### 4.3 Categorical Rankings of Basins

Basins were given pollutant rankings depending on solids, nutrients, conductivity, and COD (Table 4.5). This was done to determine both which land usage type presented most pollution overall as well as identify basins of potential interest for phase two of

YSU's storm water study. Based on these water quality criteria, the top five most polluted basins include:

1. C-31 (loading dock)
2. C-47 (roadway)
3. D-10 (roadway)
4. C-20 (roadway)
5. D-27 (landscape, sidewalk)

A few relationships can be seen given these categorical rankings. First, the parking lot basins G-2 and F-4 consistently ranked towards the bottom meaning they had comparatively low pollutant loading. By contrast, C-31, a loading dock grouped with the parking lots, ranked highest in many of the pollutant categories. When looking at individual trends for each parameter, C-31 exhibited many of the same trends of roadway basins (e.g. total solids and nitrate) and samples taken at the basin had the highest individual readings for volatile solids, COD, and iron. The Moser Hall loading dock receives a large amount of traffic and has surrounding land features such as landscaped hillside and trees. A dumpster in the loading dock within the drainage area of the basin also exists. These features may make it more likely to exhibit results typical of roadways. In the future it may be advisable to reclassify basin C-31 as a roadway basin rather than a parking lot basin based on these attributes.

Among the grassed basins, C-46 was frequently one of the last ranked basins in terms of pollutants except for its high ammonium readings. This high ammonium reading was second only to another grass basin, D-27, possibly due to fertilizer. Roadway basins rounded out the rest of the rankings with variable standings for each parameter.

Table 4.5: Categorical rankings of basins based on total averages. Basins included sampled at least 5 times. Ranking of 1 indicates most pollutant, 10 = least.

| Rankings | Land Usage | CONDUCTIVITY (μS/cm) | TOTAL SOLIDS (mg/L) | TOTAL SUSPENDED SOLIDS (mg/L) | VOLATILE SOLIDS (mg/L) | NITRATE (mg/L) | AMMONIUM (mg/L) | PO4 (mg/L) | COD (mg/L) |
|---|---|---|---|---|---|---|---|---|---|
| **B-24** | Roadway | 4 | 5 | 4 | 8 | 3 | 5 | 5 | 9 |
| **C-1** | Roadway, Sidewalk | 6 | 6 | 9 | 5 | 9 | 9 | 9 | 6 |
| **C-20** | Roadway | 3 | 4 | 6 | 4 | 8 | 4 | 10 | 3 |
| **C-31** | Loading Dock | 1 | 1 | 5 | 2 | 1 | 3 | 4 | 1 |
| **C-46** | Grass, Landscaping | 9 | 9 | 8 | 9 | 7 | 2 | 6 | 10 |
| **C-47** | Roadway | 2 | 2 | 1 | 3 | 2 | 7 | 1 | 7 |
| **D-10** | Roadway | 7 | 3 | 2 | 1 | 10 | 10 | 7 | 2 |
| **D-27** | Landscaping, Sidewalk | 8 | 7 | 3 | 6 | 6 | 1 | 2 | 4 |
| **F-4** | Parking Lot | 5 | 8 | 7 | 7 | 5 | 8 | 3 | 5 |
| **G-2** | Parking Lot | 10 | 10 | 10 | 10 | 4 | 6 | 8 | 8 |

### 4.4 Troubleshooting

The weather patterns for months sampled were surprisingly mild and most of the expected weather patterns were not typically seen. Previous years have demonstrated much more snow in the winter months, and as a result only one snowmelt sample was obtained.

Sampling strategy was not necessarily ideal. Rain samples were taken whenever possible and sampling was limited due to the amount of time necessary for lab procedures. Also, only fall, winter and spring seasons were sampled over a period of eight months. Future testing may consider a sampling regimen during a longer period of time including the summer as well as an increase in amount of samples taken.

The storm water samplers were composed of PVC, this lead to oil and grease analysis is unreliable. Samples should ideally be collected in glass containers, as oil and grease absorbs into the plastic and interferes with determining total oil and grease. The open-mouthed design of each sampler also allows floating parameters such as oil and grease as well as floating solids to flow out of the sampler should the unit overflow. The storage bottles for each sample were also comprised of plastic, and much of the oil and grease in the samples absorbed into the bottles. Oil and grease results therefore are a minimum value and should only be viewed as comparative results between each basin.

Sampling at basin A-28 was discontinued after the November 23rd sampling date due to the relative difficulty in moving the catch basin grate. Collection devices at basin D-9, while implemented later in the sampling period, capsized into the basin at least once (invalidating the sample within), went missing once after deployment, and was later retrieved only to be found missing again after a subsequent deployment.

A difference also exists between field measurements and laboratory measurements. Due to the fact that water samples were transported to a laboratory, field conditions may have parameters different that indoors. Future testing may consider taking field measurements for simpler parameters (pH, conductivity, etc.)

Some of the holding times and preservation techniques occasionally did not meet EPA regulation standards. For example, sample containers for oil & grease analysis are recommended to be glass (Table 4.6). All samples collected were placed in polyethylene bottles. Holding times were occasionally exceeded, especially in the case of nutrients and COD.

Table 4.6: Required Containers, Preservation Techniques, and Holding Times (US EPA, 1992)

| **Measurement** | **Container**[1] | **Preservative**[2] | **Holding Time**[3] |
|---|---|---|---|
| **Bacterial Tests** | | | |
| Coliform, fecal and total | P,G | Cool, 4°C | 6 hours |
| **Inorganic Tests** | | | |
| Ammonia | P, G | Cool, 4°C $H_2SO_4$ to pH <2 | 28 days |
| Biochemical oxygen demand | P, G | Cool, 4°C | 48 hours |
| Chemical oxygen demand | P, G | Cool, 4°C $H_2SO_4$ to pH <2 | 28 days |
| Hydrogen ion (pH) | P, G | None required | Analyze immediately |
| Kjeldahl and organic nitrogen | P, G | Cool, 4°C $H_2SO_4$ to pH <2 | 28 days |
| **Metals** | | | |
| Chromium VI | P, G | Cool, 4°C | 28 hours |
| Metals, except above | P, G | $HNO_3$ to pH <2 | 6 months |
| Nitrate | P, G | Cool, 4°C | 48 hours |
| Nitrate-nitrite | P, G | Cool, 4°C $H_2SO_4$ to pH <2 | 28 days |
| Nitrite | P, G | Cool, 4°C | 48 hours |
| Oil & Grease | G | Cool, 4°C HCl or $H_2SO_4$ to pH <2 | 28 days |
| Phosphorus (elemental) | G | Cool, 4°C | 48 hours |
| Phosphorus, total | P, G | Cool, 4°C $H_2SO_4$ to pH <2 | 28 days |
| Residue, total | P, G | Cool, 4°C | 7 days |
| Residue, filterable | P, G | Cool, 4°C | 7 days |
| Residue, nonfilterable (TSS) | P, G | Cool, 4°C | 7 days |
| Residue, settleable | P, G | Cool, 4°C | 48 hours |
| Residue, volatile | P, G | Cool, 4°C | 7 days |
| Specific conductance | P, G | Cool, 4°C | 28 days |
| *1. Polyethylene (P) or Glass (G).* | | | |
| *2. Sample preservation should be performed immediately upon sample collection. For composite chemical samples each aliquot should be preserved at the time of collection. When use of an automated sampler makes it impossible to preserve each aliquot, then chemical samples may be preserved by maintaining at 4°C until compositing and sample splitting is completed.* | | | |
| *3. Samples should be analyzed as soon as possible after collection. The times listed are the maximum times that samples may be held before analysis and still be considered valid.* | | | |

# CHAPTER 5

# CONCLUSION AND RECOMMENDATIONS

## 5.1 Conclusion

The data collected over this experiment was intended to be a pilot study of storm water quality in the Youngstown State area. As a general trend, roadway basins proved to have heavier pollutant loading than grass or parking lot basins for parameters such as conductivity, total solids, suspended solids, volatile solids, and chemical oxygen demand. The intention was to characterize water quality of the urban environment surrounding YSU's campus. Analysis of water showed differences between land usage and season. These results are the prerequisite data for phase two of YSU's treatment of storm water project. This project is a first for the Geological & Environmental Sciences department. Many complications arose over the course of this experiment, often leading to delays in testing or implementations. This phase of testing is hopefully the first of many with design, implementation, and testing to be improved on in future years.

## 5.2 Recommendations

The following recommendations are made to improve the efficiency of storm water sampling and to further monitor storm water quality around Youngstown State University:

- Continued testing at selected basins for a period of several years varying seasons
- Expansion of sampling to other basins diversifying land usage types
- Obey US EPA required containers, preservation techniques, and holding times
- Expansion of parameters to be tested, possibly to include fertilizers and pesticides
- Consider field testing rather than laboratory testing for simpler parameters

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# APPENDIX A

Reference photographs of selected basins.

**A-28**


**B-24**


DUMP NO WASTE!
DRAINS TO WATERWAYS
EAST JORDAN IRON WORKS
MADE IN USA

**C-1**


**C-20**


**C-31**

**C-46**

**C-47**

**D-9**

**D-10**

**D-27**

**F-4**

**G-2**

# APPENDIX B

Raw data calculations for pH.

| Date | Sample | Type of Drain | Reading 1 | Reading 2 (if applicable) | Average |
|---|---|---|---|---|---|
| 10/13/2011 | A-28 | | 6.8 | 6.92 | 6.86 |
| 10/25/2011 | A-28 | | 6.94 | | 6.94 |
| 11/23/2011 | A-28 | | 6.81 | | 6.81 |
| 10/13/2011 | B-24 | Roadway | 6.59 | 6.67 | 6.63 |
| 10/25/2011 | B-24 | Roadway | 6.96 | 7 | 6.98 |
| 11/23/2011 | B-24 | Roadway | 7.16 | | 7.16 |
| 1/27/2012 | B-24 | Roadway | 7.38 | | 7.38 |
| 2/24/2012 | B-24 | Roadway | 8.33 | | 8.33 |
| 3/26/2012 | B-24 | Roadway | 6.71 | 6.7 | 6.71 |
| 4/24/2012 | B-24 | Roadway | 6.79 | | 6.79 |
| 5/5/2012 | B-24 | Roadway | 7.35 | | 7.35 |
| 5/17/2012 | B-24 | Roadway | 6.97 | 6.92 | 6.95 |
| 10/13/2011 | C-1 | Roadway, Sidewalk | 7.28 | | 7.28 |
| 10/25/2011 | C-1 | Roadway, Sidewalk | 7.26 | | 7.26 |
| 11/23/2011 | C-1 | Roadway, Sidewalk | 7.46 | | 7.46 |
| 1/27/2012 | C-1 | Roadway, Sidewalk | 8.67 | 8.67 | 8.67 |
| 2/24/2012 | C-1 | Roadway, Sidewalk | 8.68 | | 8.68 |
| 3/26/2012 | C-1 | Roadway, Sidewalk | 7.3 | 7.25 | 7.28 |
| 4/11/2012 | C-1 | Roadway, Sidewalk | 8.37 | | 8.37 |
| 4/24/2012 | C-1 | Roadway, Sidewalk | 7.22 | | 7.22 |
| 5/5/2012 | C-1 | Roadway, Sidewalk | 7.39 | | 7.39 |
| 5/17/2012 | C-1 | Roadway, Sidewalk | 7.07 | | 7.07 |
| 11/23/2011 | C-20 | Roadway | 6.98 | | 6.98 |
| 1/27/2012 | C-20 | Roadway | 8.44 | | 8.44 |
| 2/24/2012 | C-20 | Roadway | 8.08 | | 8.08 |
| 3/26/2012 | C-20 | Roadway | 6.88 | | 6.88 |
| 4/11/2012 | C-20 | Roadway | 7.49 | | 7.49 |
| 4/24/2012 | C-20 | Roadway | 6.72 | | 6.72 |
| 5/5/2012 | C-20 | Roadway | 7.06 | | 7.06 |
| 5/17/2012 | C-20 | Roadway | 6.51 | | 6.51 |
| 10/13/2011 | C-31 | Loading Dock | 5.92 | 5.95 | 5.94 |
| 10/25/2011 | C-31 | Loading Dock | 6.44 | 6.24 | 6.34 |
| 11/23/2011 | C-31 | Loading Dock | 6.91 | | 6.91 |
| 1/27/2012 | C-31 | Loading Dock | 6.98 | | 6.98 |
| 1/27/2012 | C-31 | Loading Dock | 6.93 | | 6.93 |
| 2/24/2012 | C-31 | Loading Dock | 8 | | 8 |
| 3/26/2012 | C-31 | Loading Dock | 6.83 | | 6.83 |

| Date | Sample | Type of Drain | Reading 1 | Reading 2 (if applicable) | Average |
|---|---|---|---|---|---|
| 4/11/2012 | C-31 | Loading Dock | 7.43 | | 7.43 |
| 4/24/2012 | C-31 | Loading Dock | 6.98 | | 6.98 |
| 5/5/2012 | C-31 | Loading Dock | 6.47 | | 6.47 |
| 5/17/2012 | C-31 | Loading Dock | 6.31 | | 6.31 |
| 10/13/2011 | C-46 | Grass, Landscaping | 6.8 | | 6.8 |
| 10/25/2011 | C-46 | Grass, Landscaping | 7.12 | | 7.12 |
| 11/23/2011 | C-46 | Grass, Landscaping | 6.88 | | 6.88 |
| 1/27/2012 | C-46 | Grass, Landscaping | 7.88 | | 7.88 |
| 2/24/2012 | C-46 | Grass, Landscaping | 7.14 | | 7.14 |
| 3/26/2012 | C-46 | Grass, Landscaping | 6.66 | | 6.66 |
| 5/5/2012 | C-46 | Grass, Landscaping | 6.02 | | 6.02 |
| 10/13/2011 | C-47 | Roadway | 7.3 | | 7.3 |
| 10/25/2011 | C-47 | Roadway | 7.47 | | 7.47 |
| 11/23/2011 | C-47 | Roadway | 7.33 | | 7.33 |
| 1/27/2012 | C-47 | Roadway | 7.69 | | 7.69 |
| 2/24/2012 | C-47 | Roadway | 8.23 | | 8.23 |
| 3/26/2012 | C-47 | Roadway | 7.65 | 7.44 | 7.55 |
| 4/11/2012 | C-47 | Roadway | 8.29 | | 8.29 |
| 4/24/2012 | C-47 | Roadway | 6.53 | | 6.53 |
| 5/5/2012 | C-47 | Roadway | 7 | | 7 |
| 11/23/2011 | D-10 | Roadway | 6.93 | | 6.93 |
| 1/27/2012 | D-10 | Roadway | 8.6 | | 8.6 |
| 2/24/2012 | D-10 | Roadway | 8.87 | | 8.87 |
| 4/11/2012 | D-10 | Roadway | 6.61 | | 6.61 |
| 4/24/2012 | D-10 | Roadway | 6.49 | | 6.49 |
| 5/5/2012 | D-10 | Roadway | 6.83 | | 6.83 |
| 5/17/2012 | D-10 | Roadway | 6.84 | 6.86 | 6.85 |
| 10/13/2011 | D-27 | Landscaping, Sidewalk | 6.75 | 6.68 | 6.72 |
| 10/25/2011 | D-27 | Landscaping, Sidewalk | 6.69 | | 6.69 |
| 11/23/2011 | D-27 | Landscaping, Sidewalk | 7.38 | | 7.38 |
| 1/27/2012 | D-27 | Landscaping, Sidewalk | 7.89 | 7.39 | 7.64 |
| 2/24/2012 | D-27 | Landscaping, Sidewalk | 8.2 | | 8.2 |
| 3/26/2012 | D-27 | Landscaping, Sidewalk | 6.87 | 6.86 | 6.87 |
| 4/24/2012 | D-27 | Landscaping, Sidewalk | 6.76 | | 6.76 |
| 5/5/2012 | D-27 | Landscaping, Sidewalk | 6.15 | | 6.15 |

| Date | Sample | Type of Drain | Reading 1 | Reading 2 (if applicable) | Average |
|---|---|---|---|---|---|
| 5/17/2012 | D-27 | Landscaping, Sidewalk | 6.88 | 6.8 | 6.84 |
| 4/11/2012 | D-9 | Roadway | 7.18 | 6.93 | 7.06 |
| 4/24/2012 | D-9 | Roadway | 6.65 | | 6.65 |
| 10/13/2011 | F-4 | Parking Lot | 6.06 | 6.1 | 6.08 |
| 10/25/2011 | F-4 | Parking Lot | 6.34 | 6.22 | 6.28 |
| 11/23/2011 | F-4 | Parking Lot | 6.95 | | 6.95 |
| 1/27/2012 | F-4 | Parking Lot | 8.54 | 8.63 | 8.59 |
| 2/24/2012 | F-4 | Parking Lot | 7.36 | | 7.36 |
| 3/26/2012 | F-4 | Parking Lot | 6.23 | | 6.23 |
| 4/11/2012 | F-4 | Parking Lot | 6.06 | | 6.06 |
| 4/24/2012 | F-4 | Parking Lot | 6.85 | | 6.85 |
| 5/5/2012 | F-4 | Parking Lot | 6.81 | | 6.81 |
| 10/13/2011 | G-2 | Parking Lot | 6.66 | 6.63 | 6.65 |
| 10/25/2011 | G-2 | Parking Lot | 6.15 | | 6.15 |
| 11/23/2011 | G-2 | Parking Lot | 7.05 | | 7.05 |
| 1/27/2012 | G-2 | Parking Lot | 8.11 | | 8.11 |
| 2/24/2012 | G-2 | Parking Lot | 7.97 | | 7.97 |
| 3/26/2012 | G-2 | Parking Lot | 6.93 | | 6.93 |
| 4/11/2012 | G-2 | Parking Lot | 6.95 | | 6.95 |
| 4/24/2012 | G-2 | Parking Lot | 6.85 | | 6.85 |
| 5/5/2012 | G-2 | Parking Lot | 7.07 | | 7.07 |
| 5/17/2012 | G-2 | Parking Lot | 6.29 | | 6.29 |
| 10/13/2011 | Rain | | 4.07 | | 4.07 |
| 10/13/2011 | Rain | | 4.19 | | 4.19 |
| 10/25/2011 | Rain | | 3.03 | | 3.03 |
| 11/23/2011 | Rain | | 5.63 | | 5.63 |
| 1/27/2012 | Rain | | 4.09 | 3.9 | 4.00 |
| 2/24/2012 | Rain | | 5.4 | | 5.4 |
| 3/26/2012 | Rain | | 4.53 | | 4.53 |
| 4/11/2012 | Rain | | 6.46 | | 6.46 |
| 4/24/2012 | Rain | | 6.54 | | 6.54 |
| 5/5/2012 | Rain | | 6.55 | | 6.55 |
| 10/13/2011 | D.I. | | 7.71 | | 7.71 |
| 1/27/2012 | D.I. | | 5.23 | | 5.23 |
| 2/24/2012 | D.I. | | 5.68 | | 5.68 |
| 3/26/2012 | D.I. | | 4.91 | | 4.91 |
| 4/11/2012 | D.I. | | 7.33 | | 7.33 |
| 4/24/2012 | D.I. | | 6.07 | | 6.07 |
| 5/5/2012 | D.I. | | 8.09 | | 8.09 |

| Date | Sample | Type of Drain | Reading 1 | Reading 2 (if applicable) | Average |
|---|---|---|---|---|---|
| 5/17/2012 | D.I. | | 6.79 | | 6.79 |

## APPENDIX C

Raw data calculations for conductivity.

| Date | Sample | Type of Drain | Reading | Reading 2 (if Applicable) | Average (in µS) |
|---|---|---|---|---|---|
| 1/27/2012 | B-24 | Roadway | 5.10 mS | | 5100 |
| 2/24/2012 | B-24 | Roadway | 900 µS | | 900 |
| 3/26/2012 | B-24 | Roadway | 268 µS | 255 µS | 261.5 |
| 4/24/2012 | B-24 | Roadway | 130.4 µS | | 130.4 |
| 5/5/2012 | B-24 | Roadway | 128.1 µS | | 128.1 |
| 5/17/2012 | B-24 | Roadway | 314 µS | 314 µS | 314 |
| 1/27/2012 | C-1 | Roadway, Sidewalk | 3.32 mS | 3.5 mS | 3410 |
| 2/24/2012 | C-1 | Roadway, Sidewalk | 784 µS | | 784 |
| 3/26/2012 | C-1 | Roadway, Sidewalk | 828 µS | 705 µS | 766.5 |
| 4/11/2012 | C-1 | Roadway, Sidewalk | 279 µS | | 279 |
| 4/24/2012 | C-1 | Roadway, Sidewalk | 323 µS | | 323 |
| 5/5/2012 | C-1 | Roadway, Sidewalk | 324 µS | | 324 |
| 5/17/2012 | C-1 | Roadway, Sidewalk | 1075 µS | | 1075 |
| 1/27/2012 | C-20 | Roadway | 576 µS | | 576 |
| 2/24/2012 | C-20 | Roadway | 3.61 mS | | 3610 |
| 3/26/2012 | C-20 | Roadway | 548 µS | | 548 |
| 4/11/2012 | C-20 | Roadway | 690 µS | | 690 |
| 4/24/2012 | C-20 | Roadway | 1835 µS | | 1835 |
| 5/5/2012 | C-20 | Roadway | 833 µS | | 833 |
| 5/17/2012 | C-20 | Roadway | 2.35 mS | | 2350 |
| 1/27/2012 | C-31 | Loading Dock | 33.4 mS | | 33400 |
| 2/24/2012 | C-31 | Loading Dock | 571 µS | | 571 |
| 3/26/2012 | C-31 | Loading Dock | 825 µS | | 825 |
| 4/11/2012 | C-31 | Loading Dock | 303 µS | | 303 |
| 4/24/2012 | C-31 | Loading Dock | 308 µS | | 308 |
| 5/5/2012 | C-31 | Loading Dock | 338 µS | | 338 |
| 5/17/2012 | C-31 | Loading Dock | 494 µS | | 494 |
| 1/27/2012 | C-46 | Grass, Landscaping | 81.8 µS | 81.8 µS | 81.8 |
| 2/24/2012 | C-46 | Grass, Landscaping | 96.6 µS | | 96.6 |
| 3/26/2012 | C-46 | Grass, Landscaping | 145.1 µS | | 145.1 |
| 5/5/2012 | C-46 | Grass, Landscaping | 172.6 µS | | 172.6 |
| 1/27/2012 | C-47 | Roadway | 15.37 mS | | 15370 |
| 2/24/2012 | C-47 | Roadway | 4.42 mS | | 4420 |
| 3/26/2012 | C-47 | Roadway | 500 µS | 715 µS | 607.5 |
| 4/11/2012 | C-47 | Roadway | 1164 µS | | 1164 |
| 4/24/2012 | C-47 | Roadway | 913 µS | | 913 |
| 5/5/2012 | C-47 | Roadway | 455 µS | | 455 |
| 1/27/2012 | D-10 | Roadway | 118.4 µS | | 118.4 |

| Date | Sample | Type of Drain | Reading | Reading 2 (if Applicable) | Average (in µS) |
|---|---|---|---|---|---|
| 2/24/2012 | D-10 | Roadway | 116.1 µS | | 116.1 |
| 4/11/2012 | D-10 | Roadway | 707 µS | | 707 |
| 4/24/2012 | D-10 | Roadway | 236 µS | | 236 |
| 5/5/2012 | D-10 | Roadway | 138.4 µS | | 138.4 |
| 5/17/2012 | D-10 | Roadway | 469 µS | 471 µS | 470 |
| 1/27/2012 | D-27 | Landscaping, Sidewalk | 100.2 µS | 97.3 µS | 98.75 |
| 2/24/2012 | D-27 | Landscaping, Sidewalk | 250 µS | | 250 |
| 3/26/2012 | D-27 | Landscaping, Sidewalk | 231 µS | 234 µS | 232.5 |
| 4/24/2012 | D-27 | Landscaping, Sidewalk | 310 µS | | 310 |
| 5/5/2012 | D-27 | Landscaping, Sidewalk | 179 µS | | 179 |
| 5/17/2012 | D-27 | Landscaping, Sidewalk | 382 µS | 367 µS | 374.5 |
| 4/11/2012 | D-9 | Roadway | 253 µS | | 253 |
| 4/24/2012 | D-9 | Roadway | 155.6 µS | | 155.6 |
| 1/27/2012 | F-4 | Parking Lot | 5.75 mS | 5.22 mS | 5485 |
| 2/24/2012 | F-4 | Parking Lot | 149.3 µS | | 149.3 |
| 3/26/2012 | F-4 | Parking Lot | 72 µS | | 72 |
| 4/11/2012 | F-4 | Parking Lot | 147.8 µS | | 147.8 |
| 4/24/2012 | F-4 | Parking Lot | 93 µS | | 93 |
| 5/5/2012 | F-4 | Parking Lot | 93 µS | | 93 |
| 1/27/2012 | G-2 | Parking Lot | 75.7 µS | | 75.7 |
| 2/24/2012 | G-2 | Parking Lot | 106.5 µS | | 106.5 |
| 3/26/2012 | G-2 | Parking Lot | 98.3 µS | | 98.3 |
| 4/11/2012 | G-2 | Parking Lot | 136.3 µS | | 136.3 |
| 4/24/2012 | G-2 | Parking Lot | 40.4 µS | | 40.4 |
| 5/5/2012 | G-2 | Parking Lot | 45.9 µS | | 45.9 |
| 5/17/2012 | G-2 | Parking Lot | 292 µS | | 292 |
| 1/27/2012 | Rain | | 13.2 µS | 16.52 µS | |
| 2/24/2012 | Rain | | 17.32 µS | | |
| 3/26/2012 | Rain | | 23 µS | | |
| 4/11/2012 | Rain | | 53 µS | | |
| 4/24/2012 | Rain | | 25 µS | | |
| 5/5/2012 | Rain | | 40.4 µS | | |
| 1/27/2012 | D.I. | | 2.18 µS | | 2.18 |
| 2/24/2012 | D.I. | | 1.1 µS | | 1.1 |
| 3/26/2012 | D.I. | | 1.14 µS | | 1.14 |
| 4/11/2012 | D.I. | | 0.94 µS | | 0.94 |
| 4/24/2012 | D.I. | | 1.05 µS | | 1.05 |
| 5/5/2012 | D.I. | | 1.03 µS | | 1.03 |
| 5/17/2012 | D.I. | | .99 µS | | 0.99 |

# APPENDIX D

Raw data calculations for total solids.

| Date | Sample | Type of Drain | Volume of Water Used (mL) | Weight of Dish (g) | Weight of Residue + Dish (g) | Final (g) | mgTS /L | Average | StDEV |
|---|---|---|---|---|---|---|---|---|---|
| 10/13/2011 | A-28 | | 25 | 24.5211 | 24.5559 | 0.0348 | 1392 | 2048 | 927.7 |
| 10/13/2011 | A-28 | | 50 | 48.2626 | 48.3978 | 0.1352 | 2704 | | |
| 10/25/2011 | A-28 | | 25 | 24.5248 | 24.5311 | 0.0063 | 252 | 234 | 25.5 |
| 10/25/2011 | A-28 | | 50 | 48.2659 | 48.2767 | 0.0108 | 216 | | |
| 11/23/2011 | A-28 | | 25 | 26.4944 | 26.5173 | 0.0229 | 916 | 980 | 90.5 |
| 11/23/2011 | A-28 | | 50 | 48.2642 | 48.3164 | 0.0522 | 1044 | | |
| 10/13/2011 | B-24 | Roadway | 25 | 23.9576 | 23.9631 | 0.0055 | 220 | 228 | 11.3 |
| 10/13/2011 | B-24 | Roadway | 50 | 46.4255 | 46.4373 | 0.0118 | 236 | | |
| 10/25/2011 | B-24 | Roadway | 25 | 23.957 | 23.9602 | 0.0032 | 128 | 124 | 5.7 |
| 10/25/2011 | B-24 | Roadway | 50 | 46.4249 | 46.4309 | 0.006 | 120 | | |
| 11/23/2011 | B-24 | Roadway | 25 | 26.7436 | 26.77 | 0.0264 | 1056 | 1037 | 26.9 |
| 11/23/2011 | B-24 | Roadway | 50 | 42.965 | 43.0159 | 0.0509 | 1018 | | |
| 1/27/2012 | B-24 | Roadway | 25 | 38.8467 | 39.0176 | 0.1709 | 6836 | 6428 | 577.0 |
| 1/27/2012 | B-24 | Roadway | 50 | 68.2451 | 68.5461 | 0.301 | 6020 | | |
| 2/24/2012 | B-24 | Roadway | 25 | 40.9988 | 41.0258 | 0.027 | 1080 | 1087 | 9.9 |
| 2/24/2012 | B-24 | Roadway | 50 | 66.3483 | 66.403 | 0.0547 | 1094 | | |
| 3/26/2012 | B-24 | Roadway | 50 | 64.2079 | 64.2451 | 0.0372 | 744 | 612 | 186.7 |
| 3/26/2012 | B-24 | Roadway | 25 | 37.3933 | 37.4053 | 0.012 | 480 | | |
| 4/24/2012 | B-24 | Roadway | 25 | 40.9983 | 41.0064 | 0.0081 | 324 | 361 | 52.3 |
| 4/24/2012 | B-24 | Roadway | 50 | 63.9525 | 63.9724 | 0.0199 | 398 | | |
| 5/5/2012 | B-24 | Roadway | 25 | 40.9984 | 41.0743 | 0.0759 | 3036 | 4405 | 1936.1 |
| 5/5/2012 | B-24 | Roadway | 50 | 63.9523 | 64.241 | 0.2887 | 5774 | | |
| 5/17/2012 | B-24 | Roadway | 25 | 40.9971 | 41.0276 | 0.0305 | 1220 | 1214 | 8.5 |
| 5/17/2012 | B-24 | Roadway | 50 | 63.951 | 64.0114 | 0.0604 | 1208 | | |
| 10/13/2011 | C-1 | Roadway, Sidewalk | 25 | 24.7312 | 24.7469 | 0.0157 | 628 | 723 | 134.4 |
| 10/13/2011 | C-1 | Roadway, Sidewalk | 50 | 70.7556 | 70.7965 | 0.0409 | 818 | | |
| 10/25/2011 | C-1 | Roadway, Sidewalk | 25 | 24.7311 | 24.7367 | 0.0056 | 224 | 222 | 2.8 |
| 10/25/2011 | C-1 | Roadway, Sidewalk | 50 | 70.7535 | 70.7645 | 0.011 | 220 | | |
| 11/23/2011 | C-1 | Roadway, Sidewalk | 25 | 26.5648 | 26.6142 | 0.0494 | 1976 | 1948 | 39.6 |
| 11/23/2011 | C-1 | Roadway, Sidewalk | 50 | 70.7516 | 70.8476 | 0.096 | 1920 | | |
| 1/27/2012 | C-1 | Roadway, Sidewalk | 25 | 41.5402 | 41.6328 | 0.0926 | 3704 | 3553 | 213.5 |
| 1/27/2012 | C-1 | Roadway, Sidewalk | 50 | 64.9062 | 65.0763 | 0.1701 | 3402 | | |
| 2/24/2012 | C-1 | Roadway, Sidewalk | 25 | 35.4702 | 35.5026 | 0.0324 | 1296 | 1387 | 128.7 |
| 2/24/2012 | C-1 | Roadway, Sidewalk | 50 | 63.9534 | 64.0273 | 0.0739 | 1478 | | |
| 3/26/2012 | C-1 | Roadway, Sidewalk | 50 | 67.4235 | 67.4589 | 0.0354 | 708 | 688 | 28.3 |

| Date | Sample | Type of Drain | Volume of Water Used (mL) | Weight of Dish (g) | Weight of Residue + Dish (g) | Final (g) | mgTS /L | Average | StDEV |
|---|---|---|---|---|---|---|---|---|---|
| 3/26/2012 | C-1 | Roadway, Sidewalk | 25 | 38.3555 | 38.3722 | 0.0167 | 668 | | |
| 4/11/2012 | C-1 | Roadway, Sidewalk | 25 | 38.043 | 38.0597 | 0.0167 | 668 | 740 | 101.8 |
| 4/11/2012 | C-1 | Roadway, Sidewalk | 50 | 73.6419 | 73.6825 | 0.0406 | 812 | | |
| 4/24/2012 | C-1 | Roadway, Sidewalk | 25 | 38.042 | 38.0807 | 0.0387 | 1548 | 1604 | 79.2 |
| 4/24/2012 | C-1 | Roadway, Sidewalk | 50 | 73.6416 | 73.7246 | 0.083 | 1660 | | |
| 5/5/2012 | C-1 | Roadway, Sidewalk | 25 | 38.041 | 38.1072 | 0.0662 | 2648 | 3017 | 521.8 |
| 5/5/2012 | C-1 | Roadway, Sidewalk | 50 | 73.6392 | 73.8085 | 0.1693 | 3386 | | |
| 5/17/2012 | C-1 | Roadway, Sidewalk | 25 | 38.0398 | 38.086 | 0.0462 | 1848 | 1923 | 106.1 |
| 5/17/2012 | C-1 | Roadway, Sidewalk | 50 | 73.6369 | 73.7368 | 0.0999 | 1998 | | |
| 11/23/2011 | C-20 | Roadway | 25 | 28.6308 | 28.6498 | 0.019 | 760 | 831 | 100.4 |
| 11/23/2011 | C-20 | Roadway | 50 | 48.264 | 48.3091 | 0.0451 | 902 | | |
| 1/27/2012 | C-20 | Roadway | 25 | 40.3601 | 40.4121 | 0.052 | 2080 | 2021 | 83.4 |
| 1/27/2012 | C-20 | Roadway | 50 | 70.3035 | 70.4016 | 0.0981 | 1962 | | |
| 2/24/2012 | C-20 | Roadway | 25 | 37.1553 | 37.2443 | 0.089 | 3560 | 3646 | 121.6 |
| 2/24/2012 | C-20 | Roadway | 50 | 64.209 | 64.3956 | 0.1866 | 3732 | | |
| 3/26/2012 | C-20 | Roadway | 50 | 66.347 | 66.3693 | 0.0223 | 446 | 451 | 7.1 |
| 3/26/2012 | C-20 | Roadway | 25 | 33.9846 | 33.996 | 0.0114 | 456 | | |
| 4/11/2012 | C-20 | Roadway | 25 | 37.1561 | 37.1748 | 0.0187 | 748 | 810 | 87.7 |
| 4/11/2012 | C-20 | Roadway | 50 | 70.3025 | 70.3461 | 0.0436 | 872 | | |
| 4/24/2012 | C-20 | Roadway | 25 | 37.1553 | 37.2106 | 0.0553 | 2212 | 2242 | 42.4 |
| 4/24/2012 | C-20 | Roadway | 50 | 70.303 | 70.4166 | 0.1136 | 2272 | | |
| 5/5/2012 | C-20 | Roadway | 25 | 37.1554 | 37.2135 | 0.0581 | 2324 | 2873 | 776.4 |
| 5/5/2012 | C-20 | Roadway | 50 | 70.3022 | 70.4733 | 0.1711 | 3422 | | |
| 5/17/2012 | C-20 | Roadway | 25 | 39.6473 | 39.7119 | 0.0646 | 2584 | 2585 | 1.4 |
| 5/17/2012 | C-20 | Roadway | 50 | 70.3016 | 70.4309 | 0.1293 | 2586 | | |
| 10/13/2011 | C-31 | Loading Dock | 25 | 24.3675 | 24.3946 | 0.0271 | 1084 | 1160 | 107.5 |
| 10/13/2011 | C-31 | Loading Dock | 50 | 42.9702 | 43.032 | 0.0618 | 1236 | | |
| 10/25/2011 | C-31 | Loading Dock | 25 | 24.3667 | 24.3734 | 0.0067 | 268 | 275 | 9.9 |
| 10/25/2011 | C-31 | Loading Dock | 50 | 42.9662 | 42.9803 | 0.0141 | 282 | | |
| 11/23/2011 | C-31 | Loading Dock | 25 | 26.0651 | 26.0846 | 0.0195 | 780 | 752 | 39.6 |
| 11/23/2011 | C-31 | Loading Dock | 50 | 47.3407 | 47.3769 | 0.0362 | 724 | | |
| 1/27/2012 | C-31 | Loading Dock | 25 | 36.9436 | 37.6661 | 0.7225 | 28900 | 28629 | 383.3 |
| 1/27/2012 | C-31 | Loading Dock | 50 | 64.2885 | 65.7064 | 1.4179 | 28358 | | |
| 2/24/2012 | C-31 | Loading Dock | 25 | 41.6792 | 41.7078 | 0.0286 | 1144 | 1190 | 65.1 |
| 2/24/2012 | C-31 | Loading Dock | 50 | 62.8058 | 62.8676 | 0.0618 | 1236 | | |

| Date | Sample | Type of Drain | Volume of Water Used (mL) | Weight of Dish (g) | Weight of Residue + Dish (g) | Final (g) | mgTS /L | Average | StDEV |
|---|---|---|---|---|---|---|---|---|---|
| 3/26/2012 | C-31 | Loading Dock | 50 | 64.7904 | 64.8814 | 0.091 | 1820 | 1902 | 116.0 |
| 3/26/2012 | C-31 | Loading Dock | 25 | 36.9436 | 36.9932 | 0.0496 | 1984 | | |
| 4/11/2012 | C-31 | Loading Dock | 25 | 41.6789 | 41.6956 | 0.0167 | 668 | 710 | 59.4 |
| 4/11/2012 | C-31 | Loading Dock | 50 | 62.8056 | 62.8432 | 0.0376 | 752 | | |
| 4/24/2012 | C-31 | Loading Dock | 25 | 41.6768 | 41.7072 | 0.0304 | 1216 | 1358 | 200.8 |
| 4/24/2012 | C-31 | Loading Dock | 50 | 62.8057 | 62.8807 | 0.075 | 1500 | | |
| 5/5/2012 | C-31 | Loading Dock | 25 | 41.6767 | 41.7349 | 0.0582 | 2328 | 2464 | 192.3 |
| 5/5/2012 | C-31 | Loading Dock | 50 | 62.8056 | 62.9356 | 0.13 | 2600 | | |
| 5/17/2012 | C-31 | Loading Dock | 25 | 41.6766 | 41.759 | 0.0824 | 3296 | 3511 | 304.1 |
| 5/17/2012 | C-31 | Loading Dock | 50 | 68.1293 | 68.3156 | 0.1863 | 3726 | | |
| 10/13/2011 | C-46 | Grass, Landscaping | 25 | 26.8898 | 26.9583 | 0.0685 | 2740 | 3169 | 606.7 |
| 10/13/2011 | C-46 | Grass, Landscaping | 50 | 47.3378 | 47.5177 | 0.1799 | 3598 | | |
| 10/25/2011 | C-46 | Grass, Landscaping | 25 | 26.8943 | 26.9067 | 0.0124 | 496 | 489 | 9.9 |
| 10/25/2011 | C-46 | Grass, Landscaping | 50 | 47.3413 | 47.3654 | 0.0241 | 482 | | |
| 11/23/2011 | C-46 | Grass, Landscaping | 25 | 28.3348 | 28.3679 | 0.0331 | 1324 | 1280 | 62.2 |
| 11/23/2011 | C-46 | Grass, Landscaping | 50 | 47.3406 | 47.4024 | 0.0618 | 1236 | | |
| 1/27/2012 | C-46 | Grass, Landscaping | 25 | 43.4929 | 43.5405 | 0.0476 | 1904 | 1603 | 425.7 |
| 1/27/2012 | C-46 | Grass, Landscaping | 50 | 71.9204 | 71.9855 | 0.0651 | 1302 | | |
| 2/24/2012 | C-46 | Grass, Landscaping | 25 | 33.9854 | 33.9991 | 0.0137 | 548 | 695 | 207.9 |
| 2/24/2012 | C-46 | Grass, Landscaping | 50 | 67.4225 | 67.4646 | 0.0421 | 842 | | |
| 3/26/2012 | C-46 | Grass, Landscaping | 50 | 62.8067 | 62.8204 | 0.0137 | 274 | 273 | 1.4 |
| 3/26/2012 | C-46 | Grass, Landscaping | 25 | 38.042 | 38.0488 | 0.0068 | 272 | | |
| 5/5/2012 | C-46 | Grass, Landscaping | 25 | 33.9851 | 33.9932 | 0.0081 | 324 | 372 | 67.9 |
| 5/5/2012 | C-46 | Grass, Landscaping | 50 | 71.9194 | 71.9404 | 0.021 | 420 | | |
| 10/13/2011 | C-47 | Roadway | 25 | 24.1465 | 24.1754 | 0.0289 | 1156 | 1256 | 141.4 |
| 10/13/2011 | C-47 | Roadway | 50 | 41.8226 | 41.8904 | 0.0678 | 1356 | | |
| 10/25/2011 | C-47 | Roadway | 25 | 24.1501 | 24.1832 | 0.0331 | 1324 | 1333 | 12.7 |
| 10/25/2011 | C-47 | Roadway | 50 | 41.8227 | 41.8898 | 0.0671 | 1342 | | |
| 11/23/2011 | C-47 | Roadway | 25 | 24.9519 | 25.0392 | 0.0873 | 3492 | 3433 | 83.4 |
| 11/23/2011 | C-47 | Roadway | 50 | 44.3466 | 44.5153 | 0.1687 | 3374 | | |
| 1/27/2012 | C-47 | Roadway | 25 | 42.218 | 42.5351 | 0.3171 | 12684 | 12498 | 263.0 |
| 1/27/2012 | C-47 | Roadway | 50 | 64.7908 | 65.4064 | 0.6156 | 12312 | | |
| 2/24/2012 | C-47 | Roadway | 25 | 37.3893 | 37.4789 | 0.0896 | 3584 | 3566 | 25.5 |

| Date | Sample | Type of Drain | Volume of Water Used (mL) | Weight of Dish (g) | Weight of Residue + Dish (g) | Final (g) | mgTS /L | Average | StDEV |
|---|---|---|---|---|---|---|---|---|---|
| 2/24/2012 | C-47 | Roadway | 50 | 71.1746 | 71.352 | 0.1774 | 3548 | | |
| 3/26/2012 | C-47 | Roadway | 50 | 71.9199 | 71.9917 | 0.0718 | 1436 | 1362 | 104.7 |
| 3/26/2012 | C-47 | Roadway | 25 | 41.0006 | 41.0328 | 0.0322 | 1288 | | |
| 4/11/2012 | C-47 | Roadway | 25 | 37.3887 | 37.4177 | 0.029 | 1160 | 1174 | 19.8 |
| 4/11/2012 | C-47 | Roadway | 50 | 71.1745 | 71.2339 | 0.0594 | 1188 | | |
| 4/24/2012 | C-47 | Roadway | 25 | 37.3887 | 37.4188 | 0.0301 | 1204 | 1239 | 49.5 |
| 4/24/2012 | C-47 | Roadway | 50 | 71.1743 | 71.238 | 0.0637 | 1274 | | |
| 5/5/2012 | C-47 | Roadway | 25 | 37.3887 | 37.5263 | 0.1376 | 5504 | 6828 | 1872.4 |
| 5/5/2012 | C-47 | Roadway | 50 | 71.1739 | 71.5815 | 0.4076 | 8152 | | |
| 11/23/2011 | D-10 | Roadway | 25 | 25.7046 | 25.7677 | 0.0631 | 2524 | 2522 | 2.8 |
| 11/23/2011 | D-10 | Roadway | 50 | 41.8219 | 41.9479 | 0.126 | 2520 | | |
| 1/27/2012 | D-10 | Roadway | 25 | 34.1814 | 34.2164 | 0.035 | 1400 | 1339 | 86.3 |
| 1/27/2012 | D-10 | Roadway | 50 | 68.1298 | 68.1937 | 0.0639 | 1278 | | |
| 2/24/2012 | D-10 | Roadway | 25 | 36.9435 | 36.986 | 0.0425 | 1700 | 2232 | 752.4 |
| 2/24/2012 | D-10 | Roadway | 50 | 60.5751 | 60.7133 | 0.1382 | 2764 | | |
| 4/11/2012 | D-10 | Roadway | 25 | 36.9425 | 36.9746 | 0.0321 | 1284 | 1341 | 80.6 |
| 4/11/2012 | D-10 | Roadway | 50 | 60.573 | 60.6429 | 0.0699 | 1398 | | |
| 4/24/2012 | D-10 | Roadway | 25 | 36.9422 | 36.9828 | 0.0406 | 1624 | 1796 | 243.2 |
| 4/24/2012 | D-10 | Roadway | 50 | 60.5725 | 60.6709 | 0.0984 | 1968 | | |
| 5/5/2012 | D-10 | Roadway | 25 | 36.9422 | 37.0003 | 0.0581 | 2324 | 2773 | 635.0 |
| 5/5/2012 | D-10 | Roadway | 50 | 60.5716 | 60.7327 | 0.1611 | 3222 | | |
| 5/17/2012 | D-10 | Roadway | 25 | 36.941 | 37.0059 | 0.0649 | 2596 | 3455 | 1214.8 |
| 5/17/2012 | D-10 | Roadway | 50 | 60.5692 | 60.7849 | 0.2157 | 4314 | | |
| 10/13/2011 | D-27 | Landscaping, Sidewalk | 25 | 25.0341 | 25.0409 | 0.0068 | 272 | 256 | 22.6 |
| 10/13/2011 | D-27 | Landscaping, Sidewalk | 50 | 47.2916 | 47.3036 | 0.012 | 240 | | |
| 10/25/2011 | D-27 | Landscaping, Sidewalk | 25 | 25.0377 | 25.0449 | 0.0072 | 288 | 290 | 2.8 |
| 10/25/2011 | D-27 | Landscaping, Sidewalk | 50 | 66.6489 | 66.6635 | 0.0146 | 292 | | |
| 11/23/2011 | D-27 | Landscaping, Sidewalk | 25 | 25.6566 | 25.6641 | 0.0075 | 300 | 398 | 138.6 |
| 11/23/2011 | D-27 | Landscaping, Sidewalk | 50 | 66.6434 | 66.6682 | 0.0248 | 496 | | |
| 1/27/2012 | D-27 | Landscaping, Sidewalk | 25 | 33.9851 | 34.076 | 0.0909 | 3636 | 3469 | 236.2 |
| 1/27/2012 | D-27 | Landscaping, Sidewalk | 50 | 67.4217 | 67.5868 | 0.1651 | 3302 | | |
| 2/24/2012 | D-27 | Landscaping, Sidewalk | 25 | 43.4926 | 43.5243 | 0.0317 | 1268 | 1465 | 278.6 |
| 2/24/2012 | D-27 | Landscaping, Sidewalk | 50 | 66.5543 | 66.6374 | 0.0831 | 1662 | | |
| 3/26/2012 | D-27 | Landscaping, Sidewalk | 50 | 70.3045 | 70.3336 | 0.0291 | 582 | 433 | 210.7 |
| 3/26/2012 | D-27 | Landscaping, Sidewalk | 25 | 39.96 | 39.9671 | 0.0071 | 284 | | |
| 4/24/2012 | D-27 | Landscaping, Sidewalk | 25 | 35.47 | 35.4897 | 0.0197 | 788 | 881 | 131.5 |

| Date | Sample | Type of Drain | Volume of Water Used (mL) | Weight of Dish (g) | Weight of Residue + Dish (g) | Final (g) | mgTS /L | Average | StDEV |
|---|---|---|---|---|---|---|---|---|---|
| 4/24/2012 | D-27 | Landscaping, Sidewalk | 50 | 67.4222 | 67.4709 | 0.0487 | 974 | | |
| 5/5/2012 | D-27 | Landscaping, Sidewalk | 25 | 35.4702 | 35.5141 | 0.0439 | 1756 | 2165 | 578.4 |
| 5/5/2012 | D-27 | Landscaping, Sidewalk | 50 | 67.4128 | 67.5415 | 0.1287 | 2574 | | |
| 5/17/2012 | D-27 | Landscaping, Sidewalk | 25 | 35.4699 | 35.5474 | 0.0775 | 3100 | 2223 | 1240.3 |
| 5/17/2012 | D-27 | Landscaping, Sidewalk | 50 | 67.422 | 67.4893 | 0.0673 | 1346 | | |
| 4/11/2012 | D-9 | Roadway | 25 | 33.9846 | 33.9975 | 0.0129 | 516 | 518 | 2.8 |
| 4/11/2012 | D-9 | Roadway | 50 | 71.9202 | 71.9462 | 0.026 | 520 | | |
| 4/24/2012 | D-9 | Roadway | 25 | 33.9849 | 33.9955 | 0.0106 | 424 | 427 | 4.2 |
| 4/24/2012 | D-9 | Roadway | 50 | 71.92 | 71.9415 | 0.0215 | 430 | | |
| 10/13/2011 | F-4 | Parking Lot | 25 | 23.9626 | 23.9659 | 0.0033 | 132 | 204 | 101.8 |
| 10/13/2011 | F-4 | Parking Lot | 50 | 44.0991 | 44.1129 | 0.0138 | 276 | | |
| 10/25/2011 | F-4 | Parking Lot | 25 | 23.9618 | 23.9657 | 0.0039 | 156 | 204 | 67.9 |
| 10/25/2011 | F-4 | Parking Lot | 50 | 44.0919 | 44.1045 | 0.0126 | 252 | | |
| 11/23/2011 | F-4 | Parking Lot | 25 | 27.4348 | 27.4531 | 0.0183 | 732 | 743 | 15.6 |
| 11/23/2011 | F-4 | Parking Lot | 50 | 50.127 | 50.1647 | 0.0377 | 754 | | |
| 1/27/2012 | F-4 | Parking Lot | 25 | 39.3625 | 39.4859 | 0.1234 | 4936 | 4872 | 90.5 |
| 1/27/2012 | F-4 | Parking Lot | 50 | 64.2088 | 64.4492 | 0.2404 | 4808 | | |
| 2/24/2012 | F-4 | Parking Lot | 25 | 38.3539 | 38.3619 | 0.008 | 320 | 329 | 12.7 |
| 2/24/2012 | F-4 | Parking Lot | 50 | 70.3026 | 70.3195 | 0.0169 | 338 | | |
| 3/26/2012 | F-4 | Parking Lot | 50 | 71.1737 | 71.1815 | 0.0078 | 156 | 112 | 62.2 |
| 3/26/2012 | F-4 | Parking Lot | 25 | 37.1575 | 37.1592 | 0.0017 | 68 | | |
| 4/11/2012 | F-4 | Parking Lot | 25 | 38.3539 | 38.3915 | 0.0376 | 1504 | 1521 | 24.0 |
| 4/11/2012 | F-4 | Parking Lot | 50 | 64.2077 | 64.2846 | 0.0769 | 1538 | | |
| 4/24/2012 | F-4 | Parking Lot | 25 | 38.3533 | 38.3736 | 0.0203 | 812 | 868 | 79.2 |
| 4/24/2012 | F-4 | Parking Lot | 50 | 64.2065 | 64.2527 | 0.0462 | 924 | | |
| 5/5/2012 | F-4 | Parking Lot | 25 | 38.8468 | 38.8931 | 0.0463 | 1852 | 2071 | 309.7 |
| 5/5/2012 | F-4 | Parking Lot | 50 | 61.1905 | 61.305 | 0.1145 | 2290 | | |
| 10/13/2011 | G-2 | Parking Lot | 25 | 24.5324 | 24.5445 | 0.0121 | 484 | 505 | 29.7 |
| 10/13/2011 | G-2 | Parking Lot | 50 | 44.337 | 44.3633 | 0.0263 | 526 | | |
| 10/25/2011 | G-2 | Parking Lot | 25 | 24.5376 | 24.5388 | 0.0012 | 48 | 51 | 4.2 |
| 10/25/2011 | G-2 | Parking Lot | 50 | 44.3462 | 44.3489 | 0.0027 | 54 | | |
| 11/23/2011 | G-2 | Parking Lot | 25 | 27.7001 | 27.7032 | 0.0031 | 124 | 149 | 35.4 |
| 11/23/2011 | G-2 | Parking Lot | 50 | 48.3412 | 48.3499 | 0.0087 | 174 | | |
| 1/27/2012 | G-2 | Parking Lot | 25 | 35.4705 | 35.48 | 0.0095 | 380 | 370 | 14.1 |
| 1/27/2012 | G-2 | Parking Lot | 50 | 67.6488 | 67.6668 | 0.018 | 360 | | |
| 2/24/2012 | G-2 | Parking Lot | 25 | 39.9509 | 39.9574 | 0.0065 | 260 | 262 | 2.8 |
| 2/24/2012 | G-2 | Parking Lot | 50 | 68.1294 | 68.1426 | 0.0132 | 264 | | |
| 3/26/2012 | G-2 | Parking Lot | 50 | 73.6495 | 73.6473 | -0.0022 | -44 | 36 | 113.1 |

| Date | Sample | Type of Drain | Volume of Water Used (mL) | Weight of Dish (g) | Weight of Residue + Dish (g) | Final (g) | mgTS /L | Average | StDEV |
|---|---|---|---|---|---|---|---|---|---|
| 3/26/2012 | G-2 | Parking Lot | 25 | 41.6788 | 41.6817 | 0.0029 | 116 | | |
| 4/11/2012 | G-2 | Parking Lot | 25 | 39.9508 | 39.9583 | 0.0075 | 300 | 308 | 11.3 |
| 4/11/2012 | G-2 | Parking Lot | 50 | 64.7904 | 64.8062 | 0.0158 | 316 | | |
| 4/24/2012 | G-2 | Parking Lot | 25 | 39.9504 | 39.9533 | 0.0029 | 116 | 116 | 0.0 |
| 4/24/2012 | G-2 | Parking Lot | 50 | 64.7904 | 64.7962 | 0.0058 | 116 | | |
| 5/5/2012 | G-2 | Parking Lot | 25 | 39.9507 | 39.9722 | 0.0215 | 860 | 904 | 62.2 |
| 5/5/2012 | G-2 | Parking Lot | 50 | 64.7904 | 64.8378 | 0.0474 | 948 | | |
| 5/17/2012 | G-2 | Parking Lot | 25 | 39.9503 | 39.9671 | 0.0168 | 672 | 676 | 5.7 |
| 5/17/2012 | G-2 | Parking Lot | 50 | 64.7895 | 64.8235 | 0.034 | 680 | | |
| 11/23/2011 | Rain | | 25 | 24.8274 | 24.8271 | -0.0003 | -12 | -68 | 79.2 |
| 11/23/2011 | Rain | | 50 | 46.4315 | 46.4253 | -0.0062 | -124 | | |
| 1/27/2012 | Rain | | 25 | 39.6418 | 39.6428 | 0.001 | 40 | 32 | 11.3 |
| 1/27/2012 | Rain | | 50 | 60.5746 | 60.5758 | 0.0012 | 24 | | |
| 2/24/2012 | Rain | | 25 | 38.0426 | 38.0428 | 0.0002 | 8 | -6 | 19.8 |
| 2/24/2012 | Rain | | 50 | 64.793 | 64.792 | -0.001 | -20 | | |
| 4/24/2012 | Rain | | 25 | 39.6474 | 39.6509 | 0.0035 | 140 | 70 | |
| 4/24/2012 | Rain | | 50 | 68.1293 | 66.135 | -1.9943 | | | |
| 5/5/2012 | Rain | | 25 | 39.6474 | 39.6483 | 0.0009 | 36 | 40 | 5.7 |
| 5/5/2012 | Rain | | 50 | 68.129 | 68.1312 | 0.0022 | 44 | | |
| 10/14/2011 | Rain (10/13) | | 25 | 24.5986 | 24.5976 | -0.001 | -40 | | |
| 10/14/2011 | Rain (10/14) | | 25 | 21.524 | 21.5228 | -0.0012 | -48 | | |
| 10/25/2011 | Rain (10/25) | | 25 | 24.5985 | 24.5988 | 0.0003 | 12 | | |
| 10/13/2011 | Blank | | 50 | 66.6565 | 66.656 | -0.0005 | -10 | -10 | 1.4 |
| 11/23/2011 | Blank | | 25 | 26.76 | 26.7597 | -0.0003 | -12 | 12 | |
| 11/23/2011 | Blank | | 50 | 48.863 | 48.8648 | 0.0018 | 36 | | |
| 10/25/2011 | Blank (2 25s) | | 25 | 21.5229 | 21.5244 | 0.0015 | 60 | 52 | 11.3 |
| 10/25/2011 | Blank (2 25s) | | 25 | 24.8189 | 24.82 | 0.0011 | 44 | | |
| 1/27/2012 | D.I. | | 25 | 42.1764 | 42.1768 | 0.0004 | 16 | 0 | 22.6 |
| 1/27/2012 | D.I. | | 50 | 66.3492 | 66.3484 | -0.0008 | -16 | | |
| 2/24/2012 | D.I. | | 25 | 40.3593 | 40.3597 | 0.0004 | 16 | 8 | 11.3 |
| 2/24/2012 | D.I. | | 50 | 73.6424 | 73.6424 | 0 | 0 | | |
| 3/26/2012 | D.I. | | 50 | 60.5719 | 60.5727 | 0.0008 | 16 | -10 | 36.8 |
| 3/26/2012 | D.I. | | 25 | 43.4931 | 43.4922 | -0.0009 | -36 | | |
| 4/11/2012 | D.I. | | 25 | 43.4922 | 43.4927 | 0.0005 | 20 | 1 | 26.9 |
| 4/11/2012 | D.I. | | 50 | 66.3488 | 66.3479 | -0.0009 | -18 | | |
| 4/24/2012 | D.I. | | 25 | 43.4923 | 43.4926 | 0.0003 | 12 | 8 | 5.7 |
| 4/24/2012 | D.I. | | 50 | 66.3479 | 66.3481 | 0.0002 | 4 | | |
| 5/5/2012 | D.I. | | 25 | 43.4926 | 43.4922 | -0.0004 | -16 | -13 | 4.2 |

| Date | Sample | Type of Drain | Volume of Water Used (mL) | Weight of Dish (g) | Weight of Residue + Dish (g) | Final (g) | mgTS /L | Average | StDEV |
|---|---|---|---|---|---|---|---|---|---|
| 5/5/2012 | D.I. | | 50 | 66.3479 | 66.3474 | -0.0005 | -10 | | |
| 5/17/2012 | D.I. | | 25 | 43.4927 | 43.4932 | 0.0005 | 20 | 18 | 2.8 |
| 5/17/2012 | D.I. | | 50 | 66.3482 | 66.349 | 0.0008 | 16 | | |

# APPENDIX E

Raw data calculations for total suspended solids.

| Date | Sample | Type of Drain | Sample Volume(mL) | Filter Before (g) | Filter After (g) | Final (g) | mgTSS/ L | Average | StDEV |
|---|---|---|---|---|---|---|---|---|---|
| 10/13/2011 | A-28 | | 10 | 0.1099 | 0.1153 | 0.0054 | 540 | 434 | 149.91 |
| 10/13/2011 | A-28 | | 25 | 0.1055 | 0.1137 | 0.0082 | 328 | | |
| 10/25/2011 | A-28 | | 10 | 0.1085 | 0.1102 | 0.0017 | 170 | 217 | 66.47 |
| 10/25/2011 | A-28 | | 25 | 0.1068 | 0.1134 | 0.0066 | 264 | | |
| 11/23/2011 | A-28 | | 10 | 0.1097 | 0.1141 | 0.0044 | 440 | 442 | 2.83 |
| 11/23/2011 | A-28 | | 25 | 0.1094 | 0.1205 | 0.0111 | 444 | | |
| 10/13/2011 | B-24 | Roadway | 10 | 0.1103 | 0.1106 | 0.0003 | 30 | 29 | 1.41 |
| 10/13/2011 | B-24 | Roadway | 25 | 0.1061 | 0.1068 | 0.0007 | 28 | | |
| 10/25/2011 | B-24 | Roadway | 10 | 0.1083 | 0.1098 | 0.0015 | 150 | 151 | 1.41 |
| 10/25/2011 | B-24 | Roadway | 25 | 0.1085 | 0.1123 | 0.0038 | 152 | | |
| 11/23/2011 | B-24 | Roadway | 10 | 0.1084 | 0.1152 | 0.0068 | 680 | 572 | 152.74 |
| 11/23/2011 | B-24 | Roadway | 25 | 0.1069 | 0.1185 | 0.0116 | 464 | | |
| 1/27/2012 | B-24 | Roadway | 10 | 0.1097 | 0.15 | 0.0403 | 4030 | 2671 | 1921.92 |
| 1/27/2012 | B-24 | Roadway | 25 | 0.108 | 0.1408 | 0.0328 | 1312 | | |
| 2/24/2012 | B-24 | Roadway | 10 | 0.1095 | 0.1119 | 0.0024 | 240 | 220 | 28.28 |
| 2/24/2012 | B-24 | Roadway | 25 | 0.1107 | 0.1157 | 0.005 | 200 | | |
| 3/26/2012 | B-24 | Roadway | 25 | 0.115 | 0.12 | 0.005 | 200 | 130 | 98.99 |
| 3/26/2012 | B-24 | Roadway | 10 | 0.1131 | 0.1137 | 0.0006 | 60 | | |
| 4/24/2012 | B-24 | Roadway | 10 | 0.1172 | 0.1179 | 0.0007 | 70 | 61 | 12.73 |
| 4/24/2012 | B-24 | Roadway | 25 | 0.1159 | 0.1172 | 0.0013 | 52 | | |
| 5/5/2012 | B-24 | Roadway | 10 | 0.1113 | 0.1565 | 0.0452 | 4520 | 2892 | 2302.34 |
| 5/5/2012 | B-24 | Roadway | 25 | 0.1173 | 0.1489 | 0.0316 | 1264 | | |
| 5/17/2012 | B-24 | Roadway | 10 | 0.1135 | 0.1174 | 0.0039 | 390 | 383 | 9.90 |
| 5/17/2012 | B-24 | Roadway | 25 | 0.1141 | 0.1235 | 0.0094 | 376 | | |
| 10/13/2011 | C-1 | Roadway, Sidewalk | 10 | 0.1107 | 0.1122 | 0.0015 | 150 | 129 | 29.70 |
| 10/13/2011 | C-1 | Roadway, Sidewalk | 25 | 0.109 | 0.1117 | 0.0027 | 108 | | |
| 10/25/2011 | C-1 | Roadway, Sidewalk | 10 | 0.1102 | 0.1126 | 0.0024 | 240 | 260 | 28.28 |
| 10/25/2011 | C-1 | Roadway, Sidewalk | 25 | 0.1072 | 0.1142 | 0.007 | 280 | | |
| 11/23/2011 | C-1 | Roadway, Sidewalk | 10 | 0.1086 | 0.1165 | 0.0079 | 790 | 1111 | 453.96 |
| 11/23/2011 | C-1 | Roadway, Sidewalk | 25 | 0.1097 | 0.1455 | 0.0358 | 1432 | | |
| 1/27/2012 | C-1 | Roadway, Sidewalk | 10 | 0.1092 | 0.1162 | 0.007 | 700 | 626 | 104.65 |
| 1/27/2012 | C-1 | Roadway, Sidewalk | 25 | 0.1118 | 0.1256 | 0.0138 | 552 | | |
| 2/24/2012 | C-1 | Roadway, Sidewalk | 10 | 0.1193 | 0.1207 | 0.0014 | 140 | 146 | 8.49 |
| 2/24/2012 | C-1 | Roadway, Sidewalk | 25 | 0.1221 | 0.1259 | 0.0038 | 152 | | |
| 3/26/2012 | C-1 | Roadway, Sidewalk | 25 | 0.1162 | 0.1184 | 0.0022 | 88 | 79 | 12.73 |
| 3/26/2012 | C-1 | Roadway, Sidewalk | 10 | 0.1171 | 0.1178 | 0.0007 | 70 | | |

| Date | Sample | Type of Drain | Sample Volume(mL) | Filter Before (g) | Filter After (g) | Final (g) | mgTSS/L | Average | StDEV |
|---|---|---|---|---|---|---|---|---|---|
| 4/11/2012 | C-1 | Roadway, Sidewalk | 10 | 0.1173 | 0.1178 | 0.0005 | 50 | 63 | 18.38 |
| 4/11/2012 | C-1 | Roadway, Sidewalk | 25 | 0.1183 | 0.1202 | 0.0019 | 76 | | |
| 4/24/2012 | C-1 | Roadway, Sidewalk | 10 | 0.1161 | 0.1214 | 0.0053 | 530 | 373 | 222.03 |
| 4/24/2012 | C-1 | Roadway, Sidewalk | 25 | 0.113 | 0.1184 | 0.0054 | 216 | | |
| 5/5/2012 | C-1 | Roadway, Sidewalk | 10 | 0.1162 | 0.1325 | 0.0163 | 1630 | 1297 | 470.93 |
| 5/5/2012 | C-1 | Roadway, Sidewalk | 25 | 0.1156 | 0.1397 | 0.0241 | 964 | | |
| 5/17/2012 | C-1 | Roadway, Sidewalk | 10 | 0.1109 | 0.1146 | 0.0037 | 370 | 321 | 69.30 |
| 5/17/2012 | C-1 | Roadway, Sidewalk | 25 | 0.1135 | 0.1203 | 0.0068 | 272 | | |
| 11/23/2011 | C-20 | Roadway | 10 | 0.1096 | 0.1124 | 0.0028 | 280 | 254 | 36.77 |
| 11/23/2011 | C-20 | Roadway | 25 | 0.1078 | 0.1135 | 0.0057 | 228 | | |
| 1/27/2012 | C-20 | Roadway | 10 | 0.1099 | 0.1172 | 0.0073 | 730 | 979 | 352.14 |
| 1/27/2012 | C-20 | Roadway | 25 | 0.1083 | 0.139 | 0.0307 | 1228 | | |
| 2/24/2012 | C-20 | Roadway | 10 | 0.1168 | 0.1248 | 0.008 | 800 | 730 | 98.99 |
| 2/24/2012 | C-20 | Roadway | 25 | 0.1188 | 0.1353 | 0.0165 | 660 | | |
| 3/26/2012 | C-20 | Roadway | 25 | 0.1162 | 0.1165 | 0.0003 | 12 | 16 | 5.66 |
| 3/26/2012 | C-20 | Roadway | 10 | 0.1137 | 0.1139 | 0.0002 | 20 | | |
| 4/11/2012 | C-20 | Roadway | 10 | 0.117 | 0.1177 | 0.0007 | 70 | 73 | 4.24 |
| 4/11/2012 | C-20 | Roadway | 25 | 0.1142 | 0.1161 | 0.0019 | 76 | | |
| 4/24/2012 | C-20 | Roadway | 10 | 0.1138 | 0.1164 | 0.0026 | 260 | 224 | 50.91 |
| 4/24/2012 | C-20 | Roadway | 25 | 0.1147 | 0.1194 | 0.0047 | 188 | | |
| 5/5/2012 | C-20 | Roadway | 10 | 0.1133 | 0.1436 | 0.0303 | 3030 | 2101 | 1313.80 |
| 5/5/2012 | C-20 | Roadway | 25 | 0.1192 | 0.1485 | 0.0293 | 1172 | | |
| 5/17/2012 | C-20 | Roadway | 10 | 0.1104 | 0.1121 | 0.0017 | 170 | 141 | 41.01 |
| 5/17/2012 | C-20 | Roadway | 25 | 0.1142 | 0.117 | 0.0028 | 112 | | |
| 10/13/2011 | C-31 | Loading Dock | 10 | 0.1119 | 0.113 | 0.0011 | 110 | 115 | 7.07 |
| 10/13/2011 | C-31 | Loading Dock | 25 | 0.1106 | 0.1136 | 0.003 | 120 | | |
| 10/25/2011 | C-31 | Loading Dock | 10 | 0.1091 | 0.1134 | 0.0043 | 430 | 417 | 18.38 |
| 10/25/2011 | C-31 | Loading Dock | 25 | 0.1062 | 0.1163 | 0.0101 | 404 | | |
| 11/23/2011 | C-31 | Loading Dock | 10 | 0.1069 | 0.1103 | 0.0034 | 340 | 406 | 93.34 |
| 11/23/2011 | C-31 | Loading Dock | 25 | 0.1079 | 0.1197 | 0.0118 | 472 | | |
| 1/27/2012 | C-31 | Loading Dock | 10 | 0.1066 | 0.1121 | 0.0055 | 550 | 499 | 72.12 |
| 1/27/2012 | C-31 | Loading Dock | 25 | 0.1087 | 0.1199 | 0.0112 | 448 | | |
| 2/24/2012 | C-31 | Loading Dock | 10 | 0.1221 | 0.125 | 0.0029 | 290 | 293 | 4.24 |
| 2/24/2012 | C-31 | Loading Dock | 25 | 0.1159 | 0.1233 | 0.0074 | 296 | | |
| 3/26/2012 | C-31 | Loading Dock | 25 | 0.1162 | 0.1319 | 0.0157 | 628 | 769 | 199.40 |
| 3/26/2012 | C-31 | Loading Dock | 10 | 0.1196 | 0.1287 | 0.0091 | 910 | | |
| 4/11/2012 | C-31 | Loading Dock | 10 | 0.1153 | 0.1206 | 0.0053 | 530 | 381 | 210.72 |
| 4/11/2012 | C-31 | Loading Dock | 25 | 0.1234 | 0.1292 | 0.0058 | 232 | | |

| Date | Sample | Type of Drain | Sample Volume(mL) | Filter Before (g) | Filter After (g) | Final (g) | mgTSS/L | Average | StDEV |
|---|---|---|---|---|---|---|---|---|---|
| 4/24/2012 | C-31 | Loading Dock | 10 | 0.1167 | 0.123 | 0.0063 | 630 | 439 | 270.11 |
| 4/24/2012 | C-31 | Loading Dock | 25 | 0.1198 | 0.126 | 0.0062 | 248 | | |
| 5/5/2012 | C-31 | Loading Dock | 10 | 0.1192 | 0.1491 | 0.0299 | 2990 | 2323 | 943.28 |
| 5/5/2012 | C-31 | Loading Dock | 25 | 0.1192 | 0.1606 | 0.0414 | 1656 | | |
| 5/17/2012 | C-31 | Loading Dock | 10 | 0.1156 | 0.1347 | 0.0191 | 1910 | 1701 | 295.57 |
| 5/17/2012 | C-31 | Loading Dock | 25 | 0.109 | 0.1463 | 0.0373 | 1492 | | |
| 10/13/2011 | C-46 | Grass, Landscaping | 10 | 0.1112 | 0.1147 | 0.0035 | 350 | 350 | |
| 10/13/2011 | C-46 | Grass, Landscaping | 25 | (did not drain) | (did not drain) | | | | |
| 10/25/2011 | C-46 | Grass, Landscaping | 10 | 0.1077 | 0.1112 | 0.0035 | 350 | 323 | 38.18 |
| 10/25/2011 | C-46 | Grass, Landscaping | 25 | 0.1075 | 0.1149 | 0.0074 | 296 | | |
| 11/23/2011 | C-46 | Grass, Landscaping | 10 | 0.1097 | 0.1181 | 0.0084 | 840 | 962 | 172.53 |
| 11/23/2011 | C-46 | Grass, Landscaping | 25 | 0.1084 | 0.1355 | 0.0271 | 1084 | | |
| 1/27/2012 | C-46 | Grass, Landscaping | 10 | 0.1097 | 0.1137 | 0.004 | 400 | 1166 | 1083.29 |
| 1/27/2012 | C-46 | Grass, Landscaping | 25 | 0.1061 | 0.1544 | 0.0483 | 1932 | | |
| 2/24/2012 | C-46 | Grass, Landscaping | 10 | 0.1074 | 0.1143 | 0.0069 | 690 | 481 | 295.57 |
| 2/24/2012 | C-46 | Grass, Landscaping | 25 | 0.1082 | 0.115 | 0.0068 | 272 | | |
| 3/26/2012 | C-46 | Grass, Landscaping | 25 | 0.1151 | 0.1179 | 0.0028 | 112 | 121 | 12.73 |
| 3/26/2012 | C-46 | Grass, Landscaping | 10 | 0.1132 | 0.1145 | 0.0013 | 130 | | |
| 5/5/2012 | C-46 | Grass, Landscaping | 10 | 0.1176 | 0.119 | 0.0014 | 140 | 102 | 53.74 |
| 5/5/2012 | C-46 | Grass, Landscaping | 25 | 0.1133 | 0.1149 | 0.0016 | 64 | | |
| 10/13/2011 | C-47 | Roadway | 10 | 0.1076 | 0.1122 | 0.0046 | 460 | 416 | 62.23 |
| 10/13/2011 | C-47 | Roadway | 25 | 0.11 | 0.1193 | 0.0093 | 372 | | |
| 10/25/2011 | C-47 | Roadway | 10 | 0.1096 | 0.125 | 0.0154 | 1540 | 1516 | 33.94 |
| 10/25/2011 | C-47 | Roadway | 25 | 0.1106 | 0.1479 | 0.0373 | 1492 | | |
| 11/23/2011 | C-47 | Roadway | 10 | 0.1096 | 0.1344 | 0.0248 | 2480 | 2488 | 11.31 |
| 11/23/2011 | C-47 | Roadway | 25 | 0.1077 | 0.1701 | 0.0624 | 2496 | | |
| 1/27/2012 | C-47 | Roadway | 10 | 0.1087 | 0.1268 | 0.0181 | 1810 | 1811 | 1.41 |
| 1/27/2012 | C-47 | Roadway | 25 | 0.1084 | 0.1537 | 0.0453 | 1812 | | |
| 2/24/2012 | C-47 | Roadway | 10 | 0.1111 | 0.1136 | 0.0025 | 250 | 233 | 24.04 |
| 2/24/2012 | C-47 | Roadway | 25 | 0.1093 | 0.1147 | 0.0054 | 216 | | |
| 3/26/2012 | C-47 | Roadway | 25 | 0.1134 | 0.1246 | 0.0112 | 448 | 294 | 217.79 |
| 3/26/2012 | C-47 | Roadway | 10 | 0.1167 | 0.1181 | 0.0014 | 140 | | |
| 4/11/2012 | C-47 | Roadway | 10 | 0.1137 | 0.115 | 0.0013 | 130 | 121 | 12.73 |
| 4/11/2012 | C-47 | Roadway | 25 | 0.1162 | 0.119 | 0.0028 | 112 | | |
| 4/24/2012 | C-47 | Roadway | 10 | 0.1146 | 0.1173 | 0.0027 | 270 | 203 | 94.75 |
| 4/24/2012 | C-47 | Roadway | 25 | 0.1164 | 0.1198 | 0.0034 | 136 | | |
| 5/5/2012 | C-47 | Roadway | 10 | 0.1163 | 0.1761 | 0.0598 | 5980 | 4638 | 1897.87 |
| 5/5/2012 | C-47 | Roadway | 25 | 0.1161 | 0.1985 | 0.0824 | 3296 | | |
| 11/23/2011 | D-10 | Roadway | 10 | 0.1079 | 0.123 | 0.0151 | 1510 | 2007 | 702.86 |

| Date | Sample | Type of Drain | Sample Volume(mL) | Filter Before (g) | Filter After (g) | Final (g) | mgTSS/ L | Average | StDEV |
|---|---|---|---|---|---|---|---|---|---|
| 11/23/2011 | D-10 | Roadway | 25 | 0.1078 | 0.1704 | 0.0626 | 2504 | | |
| 1/27/2012 | D-10 | Roadway | 10 | 0.1071 | 0.1207 | 0.0136 | 1360 | 1016 | 486.49 |
| 1/27/2012 | D-10 | Roadway | 25 | 0.1088 | 0.1256 | 0.0168 | 672 | | |
| 2/24/2012 | D-10 | Roadway | 10 | 0.1089 | 0.122 | 0.0131 | 1310 | 871 | 620.84 |
| 2/24/2012 | D-10 | Roadway | 25 | 0.1097 | 0.1205 | 0.0108 | 432 | | |
| 4/11/2012 | D-10 | Roadway | 10 | 0.1191 | 0.1197 | 0.0006 | 60 | 118 | 82.02 |
| 4/11/2012 | D-10 | Roadway | 25 | 0.1216 | 0.126 | 0.0044 | 176 | | |
| 4/24/2012 | D-10 | Roadway | 10 | 0.1133 | 0.1163 | 0.003 | 300 | 326 | 36.77 |
| 4/24/2012 | D-10 | Roadway | 25 | 0.1179 | 0.1267 | 0.0088 | 352 | | |
| 5/5/2012 | D-10 | Roadway | 10 | 0.1161 | 0.1406 | 0.0245 | 2450 | 1915 | 756.60 |
| 5/5/2012 | D-10 | Roadway | 25 | 0.1188 | 0.1533 | 0.0345 | 1380 | | |
| 5/17/2012 | D-10 | Roadway | 10 | 0.1157 | 0.1139 | -0.0018 | -180 | 438 | 873.98 |
| 5/17/2012 | D-10 | Roadway | 25 | 0.1083 | 0.1347 | 0.0264 | 1056 | | |
| 10/13/2011 | D-27 | Landscaping, Sidewalk | 10 | 0.1087 | 0.1092 | 0.0005 | 50 | 39 | 15.56 |
| 10/13/2011 | D-27 | Landscaping, Sidewalk | 25 | 0.1075 | 0.1082 | 0.0007 | 28 | | |
| 10/25/2011 | D-27 | Landscaping, Sidewalk | 10 | 0.1089 | 0.109 | 0.0001 | 10 | 103 | 131.52 |
| 10/25/2011 | D-27 | Landscaping, Sidewalk | 25 | 0.1106 | 0.1155 | 0.0049 | 196 | | |
| 11/23/2011 | D-27 | Landscaping, Sidewalk | 10 | 0.1075 | 0.1088 | 0.0013 | 130 | 173 | 60.81 |
| 11/23/2011 | D-27 | Landscaping, Sidewalk | 25 | 0.1069 | 0.1123 | 0.0054 | 216 | | |
| 1/27/2012 | D-27 | Landscaping, Sidewalk | 10 | 0.1091 | 0.1652 | 0.0561 | 5610 | 4347 | 1786.15 |
| 1/27/2012 | D-27 | Landscaping, Sidewalk | 25 | 0.109 | 0.1861 | 0.0771 | 3084 | | |
| 2/24/2012 | D-27 | Landscaping, Sidewalk | 10 | 0.1089 | 0.1212 | 0.0123 | 1230 | 851 | 535.99 |
| 2/24/2012 | D-27 | Landscaping, Sidewalk | 25 | 0.1075 | 0.1193 | 0.0118 | 472 | | |
| 3/26/2012 | D-27 | Landscaping, Sidewalk | 25 | 0.1142 | 0.1314 | 0.0172 | 688 | 384 | 429.92 |
| 3/26/2012 | D-27 | Landscaping, Sidewalk | 10 | 0.117 | 0.1178 | 0.0008 | 80 | | |
| 4/24/2012 | D-27 | Landscaping, Sidewalk | 10 | 0.1143 | 0.1173 | 0.003 | 300 | 236 | 90.51 |
| 4/24/2012 | D-27 | Landscaping, Sidewalk | 25 | 0.1133 | 0.1176 | 0.0043 | 172 | | |
| 5/5/2012 | D-27 | Landscaping, Sidewalk | 10 | 0.1173 | 0.1319 | 0.0146 | 1460 | 1034 | 602.45 |
| 5/5/2012 | D-27 | Landscaping, Sidewalk | 25 | 0.1169 | 0.1321 | 0.0152 | 608 | | |
| 5/17/2012 | D-27 | Landscaping, Sidewalk | 10 | 0.1136 | 0.1125 | -0.0011 | -110 | 157 | 377.60 |
| 5/17/2012 | D-27 | Landscaping, Sidewalk | 25 | 0.1146 | 0.1252 | 0.0106 | 424 | | |
| 4/11/2012 | D-9 | Roadway | 10 | 0.1183 | 0.1196 | 0.0013 | 130 | 87 | 60.81 |
| 4/11/2012 | D-9 | Roadway | 25 | 0.1183 | 0.1194 | 0.0011 | 44 | | |
| 4/24/2012 | D-9 | Roadway | 10 | 0.116 | 0.1164 | 0.0004 | 40 | 32 | 11.31 |
| 4/24/2012 | D-9 | Roadway | 25 | 0.1168 | 0.1174 | 0.0006 | 24 | | |
| 10/14/2011 | F-4 | Parking Lot | 10 | 0.1087 | 0.1091 | 0.0004 | 40 | 32 | 11.31 |
| 10/14/2011 | F-4 | Parking Lot | 25 | 0.1078 | 0.1084 | 0.0006 | 24 | | |
| 10/25/2011 | F-4 | Parking Lot | 10 | 0.1075 | 0.1131 | 0.0056 | 560 | 726 | 234.76 |
| 10/25/2011 | F-4 | Parking Lot | 25 | 0.1077 | 0.13 | 0.0223 | 892 | | |

| Date | Sample | Type of Drain | Sample Volume(mL) | Filter Before (g) | Filter After (g) | Final (g) | mgTSS/ L | Average | StDEV |
|---|---|---|---|---|---|---|---|---|---|
| 11/23/2011 | F-4 | Parking Lot | 10 | 0.1077 | 0.1136 | 0.0059 | 590 | 685 | 134.35 |
| 11/23/2011 | F-4 | Parking Lot | 25 | 0.1077 | 0.1272 | 0.0195 | 780 | | |
| 1/27/2012 | F-4 | Parking Lot | 10 | 0.1089 | 0.1281 | 0.0192 | 1920 | 1746 | 246.07 |
| 1/27/2012 | F-4 | Parking Lot | 25 | 0.1079 | 0.1472 | 0.0393 | 1572 | | |
| 2/24/2012 | F-4 | Parking Lot | 10 | 0.117 | 0.1181 | 0.0011 | 110 | 89 | 29.70 |
| 2/24/2012 | F-4 | Parking Lot | 25 | 0.1147 | 0.1164 | 0.0017 | 68 | | |
| 3/26/2012 | F-4 | Parking Lot | 25 | 0.1149 | 0.1155 | 0.0006 | 24 | 27 | 4.24 |
| 3/26/2012 | F-4 | Parking Lot | 10 | 0.1131 | 0.1134 | 0.0003 | 30 | | |
| 4/11/2012 | F-4 | Parking Lot | 10 | 0.1171 | 0.1201 | 0.003 | 300 | 254 | 65.05 |
| 4/11/2012 | F-4 | Parking Lot | 25 | 0.1166 | 0.1218 | 0.0052 | 208 | | |
| 4/24/2012 | F-4 | Parking Lot | 10 | 0.1154 | 0.1206 | 0.0052 | 520 | 368 | 214.96 |
| 4/24/2012 | F-4 | Parking Lot | 25 | 0.1152 | 0.1206 | 0.0054 | 216 | | |
| 5/5/2012 | F-4 | Parking Lot | 10 | 0.1139 | 0.124 | 0.0101 | 1010 | 671 | 479.42 |
| 5/5/2012 | F-4 | Parking Lot | 25 | 0.1172 | 0.1255 | 0.0083 | 332 | | |
| 10/14/2011 | G-2 | Parking Lot | 10 | 0.1104 | 0.1105 | 0.0001 | 10 | 145 | 190.92 |
| 10/14/2011 | G-2 | Parking Lot | 25 | 0.1104 | 0.1174 | 0.007 | 280 | | |
| 10/25/2011 | G-2 | Parking Lot | 10 | 0.1076 | 0.1087 | 0.0011 | 110 | 85 | 35.36 |
| 10/25/2011 | G-2 | Parking Lot | 25 | 0.1081 | 0.1096 | 0.0015 | 60 | | |
| 11/23/2011 | G-2 | Parking Lot | 10 | 0.1067 | 0.1078 | 0.0011 | 110 | 91 | 26.87 |
| 11/23/2011 | G-2 | Parking Lot | 25 | 0.11 | 0.1118 | 0.0018 | 72 | | |
| 1/27/2012 | G-2 | Parking Lot | 10 | 0.1064 | 0.1068 | 0.0004 | 40 | 38 | 2.83 |
| 1/27/2012 | G-2 | Parking Lot | 25 | 0.1077 | 0.1086 | 0.0009 | 36 | | |
| 2/24/2012 | G-2 | Parking Lot | 10 | 0.1087 | 0.1099 | 0.0012 | 120 | 90 | 42.43 |
| 2/24/2012 | G-2 | Parking Lot | 25 | 0.1111 | 0.1126 | 0.0015 | 60 | | |
| 3/26/2012 | G-2 | Parking Lot | 25 | 0.1169 | 0.1172 | 0.0003 | 12 | 6 | 8.49 |
| 3/26/2012 | G-2 | Parking Lot | 10 | 0.119 | 0.119 | 0 | 0 | | |
| 4/11/2012 | G-2 | Parking Lot | 10 | 0.1171 | 0.1173 | 0.0002 | 20 | 30 | 14.14 |
| 4/11/2012 | G-2 | Parking Lot | 25 | 0.1161 | 0.1171 | 0.001 | 40 | | |
| 4/24/2012 | G-2 | Parking Lot | 10 | 0.1162 | 0.1153 | -0.0009 | -90 | -43 | 66.47 |
| 4/24/2012 | G-2 | Parking Lot | 25 | 0.1159 | 0.116 | 0.0001 | 4 | | |
| 5/5/2012 | G-2 | Parking Lot | 10 | 0.1154 | 0.1176 | 0.0022 | 220 | 174 | 65.05 |
| 5/5/2012 | G-2 | Parking Lot | 25 | 0.1157 | 0.1189 | 0.0032 | 128 | | |
| 5/17/2012 | G-2 | Parking Lot | 10 | 0.1153 | 0.1162 | 0.0009 | 90 | 93 | 4.24 |
| 5/17/2012 | G-2 | Parking Lot | 25 | 0.1143 | 0.1167 | 0.0024 | 96 | | |
| 10/25/2011 | Rain | | 10 | 0.1087 | 0.1087 | 0 | 0 | 15 | |
| 11/23/2011 | Rain | | 10 | 0.1099 | 0.1102 | 0.0003 | 30 | 23 | |
| 11/23/2011 | Rain | | 25 | 0.1093 | 0.1097 | 0.0004 | 16 | | |
| 1/27/2012 | Rain | | 10 | 0.1079 | 0.108 | 0.0001 | 10 | 9 | |
| 1/27/2012 | Rain | | 25 | 0.1086 | 0.1088 | 0.0002 | 8 | | |
| 2/24/2012 | Rain | | 10 | 0.1077 | 0.108 | 0.0003 | 30 | 17 | |

| Date | Sample | Type of Drain | Sample Volume(mL) | Filter Before (g) | Filter After (g) | Final (g) | mgTSS/ L | Average | StDEV |
|---|---|---|---|---|---|---|---|---|---|
| 2/24/2012 | Rain | | 25 | 0.1106 | 0.1107 | 0.0001 | 4 | | |
| 4/24/2012 | Rain | | 10 | 0.1155 | 0.1155 | 0 | 0 | 34 | |
| 4/24/2012 | Rain | | 25 | 0.1136 | 0.1153 | 0.0017 | 68 | | |
| 5/5/2012 | Rain | | 10 | 0.1127 | 0.1125 | -0.0002 | -20 | -2 | |
| 5/5/2012 | Rain | | 25 | 0.116 | 0.1164 | 0.0004 | 16 | | |
| 10/13/2011 | Rain 10-13 | | 10 | 0.1061 | 0.1061 | 0 | 0 | 0 | |
| 10/14/2011 | Rain 10-14 | | 10 | 0.1095 | 0.1097 | 0.0002 | 20 | 20 | |
| 10/25/2011 | Blank | | 10 | 0.1081 | 0.1079 | -0.0002 | -20 | -10 | |
| 10/25/2011 | Blank | | 25 | 0.1075 | 0.1075 | 0 | 0 | | |
| 11/23/2011 | Blank | | 10 | 0.1092 | 0.1093 | 1E-04 | 10 | 3 | |
| 11/23/2011 | Blank | | 25 | 0.1079 | 0.1078 | -1E-04 | -4 | | |
| 10/14/2011 | Blank | | 10 | 0.1111 | 0.111 | -0.0001 | -10 | 1 | |
| 10/14/2011 | Blank | | 25 | 0.1083 | 0.1086 | 0.0003 | 12 | | |
| 1/27/2012 | D.I. | | 10 | 0.1113 | 0.1119 | 0.0006 | 60 | 38 | |
| 1/27/2012 | D.I. | | 25 | 0.1082 | 0.1086 | 0.0004 | 16 | | |
| 2/24/2012 | D.I. | | 10 | 0.1095 | 0.1096 | 0.0001 | 10 | 5 | |
| 2/24/2012 | D.I. | | 25 | 0.1064 | 0.1064 | 0 | 0 | | |
| 3/26/2012 | D.I. | | 25 | 0.1187 | 0.1185 | -0.0002 | -8 | -4 | |
| 3/26/2012 | D.I. | | 10 | 0.1149 | 0.1149 | 0 | 0 | | |
| 4/11/2012 | D.I. | | 10 | 0.1206 | 0.1204 | -0.0002 | -20 | -10 | |
| 4/11/2012 | D.I. | | 25 | 0.1186 | 0.1186 | 0 | 0 | | |
| 4/24/2012 | D.I. | | 10 | 0.1145 | 0.1147 | 0.0002 | 20 | 8 | |
| 4/24/2012 | D.I. | | 25 | 0.1162 | 0.1161 | -0.0001 | -4 | | |
| 5/5/2012 | D.I. | | 10 | 0.1128 | 0.1126 | -0.0002 | -20 | -10 | |
| 5/5/2012 | D.I. | | 25 | 0.1182 | 0.1182 | 0 | 0 | | |
| 5/17/2012 | D.I. | | 10 | 0.1121 | 0.112 | -0.0001 | -10 | -5 | |
| 5/17/2012 | D.I. | | 25 | 0.1106 | 0.1106 | 0 | 0 | | |

# APPENDIX F

Raw data calculations for volatile solids.

| Date | Sample | Type of Drain | Water Used (mL) | Dish + Residue Before Ignition (g) | Residue + Dish After Ignition (g) | Final (g) | mgVS/ L | Average | StDEV |
|---|---|---|---|---|---|---|---|---|---|
| 10/13/2011 | A-28 | | 25 | 24.5559 | 24.5465 | 0.0094 | 376 | 669 | 414.36 |
| 10/13/2011 | A-28 | | 50 | 48.3978 | 48.3497 | 0.0481 | 962 | | |
| 10/25/2011 | A-28 | | 25 | 24.5311 | 24.5282 | 0.0029 | 116 | 93 | 32.53 |
| 10/25/2011 | A-28 | | 50 | 48.2767 | 48.2732 | 0.0035 | 70 | | |
| 11/23/2011 | A-28 | | 25 | 26.5173 | 26.5037 | 0.0136 | 544 | 537 | 9.90 |
| 11/23/2011 | A-28 | | 50 | 48.3164 | 48.2899 | 0.0265 | 530 | | |
| 10/13/2011 | B-24 | Roadway | 25 | 23.9631 | 23.9597 | 0.0034 | 136 | 122 | 19.80 |
| 10/13/2011 | B-24 | Roadway | 50 | 46.4373 | 46.4319 | 0.0054 | 108 | | |
| 10/25/2011 | B-24 | Roadway | 25 | 23.9602 | 23.9583 | 0.0019 | 76 | 59 | 24.04 |
| 10/25/2011 | B-24 | Roadway | 50 | 46.4309 | 46.4288 | 0.0021 | 42 | | |
| 11/23/2011 | B-24 | Roadway | 25 | 26.77 | 26.7569 | 0.0131 | 524 | 509 | 21.21 |
| 11/23/2011 | B-24 | Roadway | 50 | 43.0159 | 42.9912 | 0.0247 | 494 | | |
| 1/27/2012 | B-24 | Roadway | 25 | 39.0176 | 38.9988 | 0.0188 | 752 | 692 | 84.85 |
| 1/27/2012 | B-24 | Roadway | 50 | 68.5461 | 68.5145 | 0.0316 | 632 | | |
| 2/24/2012 | B-24 | Roadway | 25 | 41.0258 | 41.0192 | 0.0066 | 264 | 257 | 9.90 |
| 2/24/2012 | B-24 | Roadway | 50 | 66.403 | 66.3905 | 0.0125 | 250 | | |
| 3/26/2012 | B-24 | Roadway | 50 | 64.2451 | 64.2271 | 0.018 | 360 | 330 | 42.43 |
| 3/26/2012 | B-24 | Roadway | 25 | 37.4053 | 37.3978 | 0.0075 | 300 | | |
| 4/24/2012 | B-24 | Roadway | 25 | 41.0064 | 41.0016 | 0.0048 | 192 | 218 | 36.77 |
| 4/24/2012 | B-24 | Roadway | 50 | 63.9724 | 63.9602 | 0.0122 | 244 | | |
| 5/5/2012 | B-24 | Roadway | 25 | 41.0743 | 41.0528 | 0.0215 | 860 | 974 | 161.22 |
| 5/5/2012 | B-24 | Roadway | 50 | 64.241 | 64.1866 | 0.0544 | 1088 | | |
| 5/17/2012 | B-24 | Roadway | 25 | 41.0276 | 41.0127 | 0.0149 | 596 | 604 | 11.31 |
| 5/17/2012 | B-24 | Roadway | 50 | 64.0114 | 63.9808 | 0.0306 | 612 | | |
| 10/14/2011 | C-1 | Roadway, Sidewalk | 25 | 24.7469 | 24.7442 | 0.0027 | 108 | 159 | 72.12 |
| 10/14/2011 | C-1 | Roadway, Sidewalk | 50 | 70.7965 | 70.786 | 0.0105 | 210 | | |
| 10/25/2011 | C-1 | Roadway, Sidewalk | 25 | 24.7367 | 24.734 | 0.0027 | 108 | 146 | 53.74 |
| 10/25/2011 | C-1 | Roadway, Sidewalk | 50 | 70.7645 | 70.7553 | 0.0092 | 184 | | |
| 11/23/2011 | C-1 | Roadway, Sidewalk | 25 | 26.6142 | 26.5908 | 0.0234 | 936 | 1022 | 121.62 |
| 11/23/2011 | C-1 | Roadway, Sidewalk | 50 | 70.8476 | 70.7922 | 0.0554 | 1108 | | |
| 1/27/2012 | C-1 | Roadway, Sidewalk | 25 | 41.6328 | 41.6202 | 0.0126 | 504 | 480 | 33.94 |
| 1/27/2012 | C-1 | Roadway, Sidewalk | 50 | 65.0763 | 65.0535 | 0.0228 | 456 | | |
| 2/24/2012 | C-1 | Roadway, Sidewalk | 25 | 35.5026 | 35.4917 | 0.0109 | 436 | 456 | 28.28 |
| 2/24/2012 | C-1 | Roadway, Sidewalk | 50 | 64.0273 | 64.0035 | 0.0238 | 476 | | |

| Date | Sample | Type of Drain | Water Used (mL) | Dish + Residue Before Ignition (g) | Residue + Dish After Ignition (g) | Final (g) | mgVS/L | Average | StDEV |
|---|---|---|---|---|---|---|---|---|---|
| 3/26/2012 | C-1 | Roadway, Sidewalk | 50 | 67.4589 | 67.4527 | 0.0062 | 124 | 130 | 8.49 |
| 3/26/2012 | C-1 | Roadway, Sidewalk | 25 | 38.3722 | 38.3688 | 0.0034 | 136 | | |
| 4/11/2012 | C-1 | Roadway, Sidewalk | 25 | 38.0597 | 38.0505 | 0.0092 | 368 | 397 | 41.01 |
| 4/11/2012 | C-1 | Roadway, Sidewalk | 50 | 73.6825 | 73.6612 | 0.0213 | 426 | | |
| 4/24/2012 | C-1 | Roadway, Sidewalk | 25 | 38.0807 | 38.0606 | 0.0201 | 804 | 843 | 55.15 |
| 4/24/2012 | C-1 | Roadway, Sidewalk | 50 | 73.7246 | 73.6805 | 0.0441 | 882 | | |
| 5/5/2012 | C-1 | Roadway, Sidewalk | 25 | 38.1072 | 38.0877 | 0.0195 | 780 | 858 | 110.31 |
| 5/5/2012 | C-1 | Roadway, Sidewalk | 50 | 73.8085 | 73.7617 | 0.0468 | 936 | | |
| 5/17/2012 | C-1 | Roadway, Sidewalk | 25 | 38.086 | 38.067 | 0.019 | 760 | 784 | 33.94 |
| 5/17/2012 | C-1 | Roadway, Sidewalk | 50 | 73.7368 | 73.6964 | 0.0404 | 808 | | |
| 11/23/2011 | C-20 | Roadway | 25 | 28.6498 | 28.6404 | 0.0094 | 376 | 421 | 63.64 |
| 11/23/2011 | C-20 | Roadway | 50 | 48.3091 | 48.2858 | 0.0233 | 466 | | |
| 1/27/2012 | C-20 | Roadway | 25 | 40.4121 | 40.3966 | 0.0155 | 620 | 589 | 43.84 |
| 1/27/2012 | C-20 | Roadway | 50 | 70.4016 | 70.3737 | 0.0279 | 558 | | |
| 2/24/2012 | C-20 | Roadway | 25 | 37.2443 | 37.2287 | 0.0156 | 624 | 604 | 28.28 |
| 2/24/2012 | C-20 | Roadway | 50 | 64.3956 | 64.3664 | 0.0292 | 584 | | |
| 3/26/2012 | C-20 | Roadway | 50 | 66.3693 | 66.3649 | 0.0044 | 88 | 92 | 5.66 |
| 3/26/2012 | C-20 | Roadway | 25 | 33.996 | 33.9936 | 0.0024 | 96 | | |
| 4/11/2012 | C-20 | Roadway | 25 | 37.1748 | 37.1681 | 0.0067 | 268 | 292 | 33.94 |
| 4/11/2012 | C-20 | Roadway | 50 | 70.3461 | 70.3303 | 0.0158 | 316 | | |
| 4/24/2012 | C-20 | Roadway | 25 | 37.2106 | 37.1933 | 0.0173 | 692 | 699 | 9.90 |
| 4/24/2012 | C-20 | Roadway | 50 | 70.4166 | 70.3813 | 0.0353 | 706 | | |
| 5/5/2012 | C-20 | Roadway | 25 | 37.2135 | 37.1969 | 0.0166 | 664 | 790 | 178.19 |
| 5/5/2012 | C-20 | Roadway | 50 | 70.4733 | 70.4275 | 0.0458 | 916 | | |
| 5/17/2012 | C-20 | Roadway | 25 | 39.7119 | 39.6921 | 0.0198 | 792 | 779 | 18.38 |
| 5/17/2012 | C-20 | Roadway | 50 | 70.4309 | 70.3926 | 0.0383 | 766 | | |
| 10/13/2011 | C-31 | Loading Dock | 25 | 24.3946 | 24.381 | 0.0136 | 544 | 574 | 42.43 |
| 10/13/2011 | C-31 | Loading Dock | 50 | 43.032 | 43.0018 | 0.0302 | 604 | | |
| 10/25/2011 | C-31 | Loading Dock | 25 | 24.3734 | 24.369 | 0.0044 | 176 | 179 | 4.24 |
| 10/25/2011 | C-31 | Loading Dock | 50 | 42.9803 | 42.9712 | 0.0091 | 182 | | |
| 11/23/2011 | C-31 | Loading Dock | 25 | 26.0846 | 26.0741 | 0.0105 | 420 | 364 | 79.20 |
| 11/23/2011 | C-31 | Loading Dock | 50 | 47.3769 | 47.3615 | 0.0154 | 308 | | |
| 1/27/2012 | C-31 | Loading Dock | 25 | 37.6661 | 37.6265 | 0.0396 | 1584 | 1508 | 107.48 |
| 1/27/2012 | C-31 | Loading Dock | 50 | 65.7064 | 65.6348 | 0.0716 | 1432 | | |
| 2/24/2012 | C-31 | Loading Dock | 25 | 41.7078 | 41.6998 | 0.008 | 320 | 338 | 25.46 |

| Date | Sample | Type of Drain | Water Used (mL) | Dish + Residue Before Ignition (g) | Residue + Dish After Ignition (g) | Final (g) | mgVS/L | Average | StDEV |
|---|---|---|---|---|---|---|---|---|---|
| 2/24/2012 | C-31 | Loading Dock | 50 | 62.8676 | 62.8498 | 0.0178 | 356 | | |
| 3/26/2012 | C-31 | Loading Dock | 50 | 64.8814 | 64.8484 | 0.033 | 660 | 678 | 25.46 |
| 3/26/2012 | C-31 | Loading Dock | 25 | 36.9932 | 36.9758 | 0.0174 | 696 | | |
| 4/11/2012 | C-31 | Loading Dock | 25 | 41.6956 | 41.6888 | 0.0068 | 272 | 292 | 28.28 |
| 4/11/2012 | C-31 | Loading Dock | 50 | 62.8432 | 62.8276 | 0.0156 | 312 | | |
| 4/24/2012 | C-31 | Loading Dock | 25 | 41.7072 | 41.6911 | 0.0161 | 644 | 710 | 93.34 |
| 4/24/2012 | C-31 | Loading Dock | 50 | 62.8807 | 62.8419 | 0.0388 | 776 | | |
| 5/5/2012 | C-31 | Loading Dock | 25 | 41.7349 | 41.7152 | 0.0197 | 788 | 868 | 113.14 |
| 5/5/2012 | C-31 | Loading Dock | 50 | 62.9356 | 62.8882 | 0.0474 | 948 | | |
| 5/17/2012 | C-31 | Loading Dock | 25 | 41.759 | 41.7163 | 0.0427 | 1708 | 1805 | 137.18 |
| 5/17/2012 | C-31 | Loading Dock | 50 | 68.3156 | 68.2205 | 0.0951 | 1902 | | |
| 10/14/2011 | C-46 | Grass, Landscaping | 25 | 26.9583 | 26.9472 | 0.0111 | 444 | 574 | 183.85 |
| 10/14/2011 | C-46 | Grass, Landscaping | 50 | 47.5177 | 47.4825 | 0.0352 | 704 | | |
| 10/25/2011 | C-46 | Grass, Landscaping | 25 | 26.9067 | 26.9026 | 0.0041 | 164 | 167 | 4.24 |
| 10/25/2011 | C-46 | Grass, Landscaping | 50 | 47.3654 | 47.3569 | 0.0085 | 170 | | |
| 11/23/2011 | C-46 | Grass, Landscaping | 25 | 28.3679 | 28.3544 | 0.0135 | 540 | 540 | 0.00 |
| 11/23/2011 | C-46 | Grass, Landscaping | 50 | 47.4024 | 47.3754 | 0.027 | 540 | | |
| 1/27/2012 | C-46 | Grass, Landscaping | 25 | 43.5405 | 43.5294 | 0.0111 | 444 | 394 | 70.71 |
| 1/27/2012 | C-46 | Grass, Landscaping | 50 | 71.9855 | 71.9683 | 0.0172 | 344 | | |
| 2/24/2012 | C-46 | Grass, Landscaping | 25 | 33.9991 | 33.994 | 0.0051 | 204 | 241 | 52.33 |
| 2/24/2012 | C-46 | Grass, Landscaping | 50 | 67.4646 | 67.4507 | 0.0139 | 278 | | |
| 3/26/2012 | C-46 | Grass, Landscaping | 50 | 62.8204 | 62.8118 | 0.0086 | 172 | 168 | 5.66 |
| 3/26/2012 | C-46 | Grass, Landscaping | 25 | 38.0488 | 38.0447 | 0.0041 | 164 | | |
| 5/5/2012 | C-46 | Grass, Landscaping | 25 | 33.9932 | 33.9893 | 0.0039 | 156 | 175 | 26.87 |
| 5/5/2012 | C-46 | Grass, Landscaping | 50 | 71.9404 | 71.9307 | 0.0097 | 194 | | |
| 10/14/2011 | C-47 | Roadway | 25 | 24.1754 | 24.1704 | 0.005 | 200 | 244 | 62.23 |
| 10/14/2011 | C-47 | Roadway | 50 | 41.8904 | 41.876 | 0.0144 | 288 | | |
| 10/25/2011 | C-47 | Roadway | 25 | 24.1832 | 24.1733 | 0.0099 | 396 | 417 | 29.70 |
| 10/25/2011 | C-47 | Roadway | 50 | 41.8898 | 41.8679 | 0.0219 | 438 | | |
| 11/23/2011 | C-47 | Roadway | 25 | 25.0392 | 24.9976 | 0.0416 | 1664 | 1643 | 29.70 |
| 11/23/2011 | C-47 | Roadway | 50 | 44.5153 | 44.4342 | 0.0811 | 1622 | | |
| 1/27/2012 | C-47 | Roadway | 25 | 42.5351 | 42.5108 | 0.0243 | 972 | 905 | 94.75 |
| 1/27/2012 | C-47 | Roadway | 50 | 65.4064 | 65.3645 | 0.0419 | 838 | | |

| Date | Sample | Type of Drain | Water Used (mL) | Dish + Residue Before Ignition (g) | Residue + Dish After Ignition (g) | Final (g) | mgVS/L | Average | StDEV |
|---|---|---|---|---|---|---|---|---|---|
| 2/24/2012 | C-47 | Roadway | 25 | 37.4789 | 37.4683 | 0.0106 | 424 | 362 | 87.68 |
| 2/24/2012 | C-47 | Roadway | 50 | 71.352 | 71.337 | 0.015 | 300 | | |
| 3/26/2012 | C-47 | Roadway | 50 | 71.9917 | 71.9613 | 0.0304 | 608 | 600 | 11.31 |
| 3/26/2012 | C-47 | Roadway | 25 | 41.0328 | 41.018 | 0.0148 | 592 | | |
| 4/11/2012 | C-47 | Roadway | 25 | 37.4177 | 37.4099 | 0.0078 | 312 | 317 | 7.07 |
| 4/11/2012 | C-47 | Roadway | 50 | 71.2339 | 71.2178 | 0.0161 | 322 | | |
| 4/24/2012 | C-47 | Roadway | 25 | 37.4188 | 37.4086 | 0.0102 | 408 | 425 | 24.04 |
| 4/24/2012 | C-47 | Roadway | 50 | 71.238 | 71.2159 | 0.0221 | 442 | | |
| 5/5/2012 | C-47 | Roadway | 25 | 37.5263 | 37.5008 | 0.0255 | 1020 | 1246 | 319.61 |
| 5/5/2012 | C-47 | Roadway | 50 | 71.5815 | 71.5079 | 0.0736 | 1472 | | |
| 11/23/2011 | D-10 | Roadway | 25 | 25.7677 | 25.7414 | 0.0263 | 1052 | 998 | 76.37 |
| 11/23/2011 | D-10 | Roadway | 50 | 41.9479 | 41.9007 | 0.0472 | 944 | | |
| 1/27/2012 | D-10 | Roadway | 25 | 34.2164 | 34.2048 | 0.0116 | 464 | 435 | 41.01 |
| 1/27/2012 | D-10 | Roadway | 50 | 68.1937 | 68.1734 | 0.0203 | 406 | | |
| 2/24/2012 | D-10 | Roadway | 25 | 36.986 | 36.969 | 0.017 | 680 | 752 | 101.82 |
| 2/24/2012 | D-10 | Roadway | 50 | 60.7133 | 60.6721 | 0.0412 | 824 | | |
| 4/11/2012 | D-10 | Roadway | 25 | 36.9746 | 36.9588 | 0.0158 | 632 | 657 | 35.36 |
| 4/11/2012 | D-10 | Roadway | 50 | 60.6429 | 60.6088 | 0.0341 | 682 | | |
| 4/24/2012 | D-10 | Roadway | 25 | 36.9828 | 36.9628 | 0.02 | 800 | 944 | 203.65 |
| 4/24/2012 | D-10 | Roadway | 50 | 60.6709 | 60.6165 | 0.0544 | 1088 | | |
| 5/5/2012 | D-10 | Roadway | 25 | 37.0003 | 36.981 | 0.0193 | 772 | 838 | 93.34 |
| 5/5/2012 | D-10 | Roadway | 50 | 60.7327 | 60.6875 | 0.0452 | 904 | | |
| 5/17/2012 | D-10 | Roadway | 25 | 37.0059 | 36.9726 | 0.0333 | 1332 | 1632 | 424.26 |
| 5/17/2012 | D-10 | Roadway | 50 | 60.7849 | 60.6883 | 0.0966 | 1932 | | |
| 10/13/2011 | D-27 | Landscaping, Sidewalk | 25 | 25.0409 | 25.04 | 0.0009 | 36 | 57 | 29.70 |
| 10/13/2011 | D-27 | Landscaping, Sidewalk | 50 | 47.3036 | 47.2997 | 0.0039 | 78 | | |
| 10/25/2011 | D-27 | Landscaping, Sidewalk | 25 | 25.0449 | 25.0407 | 0.0042 | 168 | 163 | 7.07 |
| 10/25/2011 | D-27 | Landscaping, Sidewalk | 50 | 66.6635 | 66.6556 | 0.0079 | 158 | | |
| 11/23/2011 | D-27 | Landscaping, Sidewalk | 25 | 25.6641 | 25.6603 | 0.0038 | 152 | 165 | 18.38 |
| 11/23/2011 | D-27 | Landscaping, Sidewalk | 50 | 66.6682 | 66.6593 | 0.0089 | 178 | | |
| 1/27/2012 | D-27 | Landscaping, Sidewalk | 25 | 34.076 | 34.0521 | 0.0239 | 956 | 938 | 25.46 |
| 1/27/2012 | D-27 | Landscaping, Sidewalk | 50 | 67.5868 | 67.5408 | 0.046 | 920 | | |
| 2/24/2012 | D-27 | Landscaping, Sidewalk | 25 | 43.5243 | 43.512 | 0.0123 | 492 | 563 | 100.41 |
| 2/24/2012 | D-27 | Landscaping, Sidewalk | 50 | 66.6374 | 66.6057 | 0.0317 | 634 | | |
| 3/26/2012 | D-27 | Landscaping, Sidewalk | 50 | 70.3336 | 70.3187 | 0.0149 | 298 | 317 | 26.87 |
| 3/26/2012 | D-27 | Landscaping, Sidewalk | 25 | 39.9671 | 39.9587 | 0.0084 | 336 | | |

| Date | Sample | Type of Drain | Water Used (mL) | Dish + Residue Before Ignition (g) | Residue + Dish After Ignition (g) | Final (g) | mgVS/L | Average | StDEV |
|---|---|---|---|---|---|---|---|---|---|
| 4/24/2012 | D-27 | Landscaping, Sidewalk | 25 | 35.4897 | 35.4801 | 0.0096 | 384 | 440 | 79.20 |
| 4/24/2012 | D-27 | Landscaping, Sidewalk | 50 | 67.4709 | 67.4461 | 0.0248 | 496 | | |
| 5/5/2012 | D-27 | Landscaping, Sidewalk | 25 | 35.5141 | 35.4911 | 0.023 | 920 | 1126 | 291.33 |
| 5/5/2012 | D-27 | Landscaping, Sidewalk | 50 | 67.5415 | 67.4749 | 0.0666 | 1332 | | |
| 5/17/2012 | D-27 | Landscaping, Sidewalk | 25 | 35.5474 | 35.5137 | 0.0337 | 1348 | 912 | 616.60 |
| 5/17/2012 | D-27 | Landscaping, Sidewalk | 50 | 67.4893 | 67.4655 | 0.0238 | 476 | | |
| 4/11/2012 | D-9 | Roadway | 25 | 33.9975 | 33.9908 | 0.0067 | 268 | 269 | 1.41 |
| 4/11/2012 | D-9 | Roadway | 50 | 71.9462 | 71.9327 | 0.0135 | 270 | | |
| 4/24/2012 | D-9 | Roadway | 25 | 33.9955 | 33.9892 | 0.0063 | 252 | 254 | 2.83 |
| 4/24/2012 | D-9 | Roadway | 50 | 71.9415 | 71.9287 | 0.0128 | 256 | | |
| 10/13/2011 | F-4 | Parking Lot | 25 | 23.9659 | 23.9633 | 0.0026 | 104 | 146 | 59.40 |
| 10/13/2011 | F-4 | Parking Lot | 50 | 44.1129 | 44.1035 | 0.0094 | 188 | | |
| 10/25/2011 | F-4 | Parking Lot | 25 | 23.9657 | 23.963 | 0.0027 | 108 | 129 | 29.70 |
| 10/25/2011 | F-4 | Parking Lot | 50 | 44.1045 | 44.097 | 0.0075 | 150 | | |
| 11/23/2011 | F-4 | Parking Lot | 25 | 27.4531 | 27.4411 | 0.012 | 480 | 485 | 7.07 |
| 11/23/2011 | F-4 | Parking Lot | 50 | 50.1647 | 50.1402 | 0.0245 | 490 | | |
| 1/27/2012 | F-4 | Parking Lot | 25 | 39.4859 | 39.4701 | 0.0158 | 632 | 608 | 33.94 |
| 1/27/2012 | F-4 | Parking Lot | 50 | 64.4492 | 64.42 | 0.0292 | 584 | | |
| 2/24/2012 | F-4 | Parking Lot | 25 | 38.3619 | 38.358 | 0.0039 | 156 | 153 | 4.24 |
| 2/24/2012 | F-4 | Parking Lot | 50 | 70.3195 | 70.312 | 0.0075 | 150 | | |
| 3/26/2012 | F-4 | Parking Lot | 50 | 71.1815 | 71.1765 | 0.005 | 100 | 96 | 5.66 |
| 3/26/2012 | F-4 | Parking Lot | 25 | 37.1592 | 37.1569 | 0.0023 | 92 | | |
| 4/11/2012 | F-4 | Parking Lot | 25 | 38.3915 | 38.3692 | 0.0223 | 892 | 912 | 28.28 |
| 4/11/2012 | F-4 | Parking Lot | 50 | 64.2846 | 64.238 | 0.0466 | 932 | | |
| 4/24/2012 | F-4 | Parking Lot | 25 | 38.3736 | 38.3604 | 0.0132 | 528 | 560 | 45.25 |
| 4/24/2012 | F-4 | Parking Lot | 50 | 64.2527 | 64.2231 | 0.0296 | 592 | | |
| 5/5/2012 | F-4 | Parking Lot | 25 | 38.8931 | 38.8738 | 0.0193 | 772 | 806 | 48.08 |
| 5/5/2012 | F-4 | Parking Lot | 50 | 61.305 | 61.263 | 0.042 | 840 | | |
| 10/13/2011 | G-2 | Parking Lot | 25 | 24.5445 | 24.5409 | 0.0036 | 144 | 194 | 70.71 |
| 10/13/2011 | G-2 | Parking Lot | 50 | 44.3633 | 44.3511 | 0.0122 | 244 | | |
| 10/25/2011 | G-2 | Parking Lot | 25 | 24.5388 | 24.5381 | 0.0007 | 28 | 25 | 4.24 |
| 10/25/2011 | G-2 | Parking Lot | 50 | 44.3489 | 44.3478 | 0.0011 | 22 | | |
| 11/23/2011 | G-2 | Parking Lot | 25 | 27.7032 | 27.7003 | 0.0029 | 116 | 131 | 21.21 |
| 11/23/2011 | G-2 | Parking Lot | 50 | 48.3499 | 48.3426 | 0.0073 | 146 | | |
| 1/27/2012 | G-2 | Parking Lot | 25 | 35.48 | 35.4756 | 0.0044 | 176 | 175 | 1.41 |
| 1/27/2012 | G-2 | Parking Lot | 50 | 67.6668 | 67.6581 | 0.0087 | 174 | | |
| 2/24/2012 | G-2 | Parking Lot | 25 | 39.9574 | 39.9539 | 0.0035 | 140 | 132 | 11.31 |
| 2/24/2012 | G-2 | Parking Lot | 50 | 68.1426 | 68.1364 | 0.0062 | 124 | | |

| Date | Sample | Type of Drain | Water Used (mL) | Dish + Residue Before Ignition (g) | Residue + Dish After Ignition (g) | Final (g) | mgVS/ L | Average | StDEV |
|---|---|---|---|---|---|---|---|---|---|
| 3/26/2012 | G-2 | Parking Lot | 50 | 73.6473 | 73.6439 | 0.0034 | 68 | 78 | 14.14 |
| 3/26/2012 | G-2 | Parking Lot | 25 | 41.6817 | 41.6795 | 0.0022 | 88 | | |
| 4/11/2012 | G-2 | Parking Lot | 25 | 39.9583 | 39.9536 | 0.0047 | 188 | 193 | 7.07 |
| 4/11/2012 | G-2 | Parking Lot | 50 | 64.8062 | 64.7963 | 0.0099 | 198 | | |
| 4/24/2012 | G-2 | Parking Lot | 25 | 39.9533 | 39.9517 | 0.0016 | 64 | 71 | 9.90 |
| 4/24/2012 | G-2 | Parking Lot | 50 | 64.7962 | 64.7923 | 0.0039 | 78 | | |
| 5/5/2012 | G-2 | Parking Lot | 25 | 39.9722 | 39.9589 | 0.0133 | 532 | 550 | 25.46 |
| 5/5/2012 | G-2 | Parking Lot | 50 | 64.8378 | 64.8094 | 0.0284 | 568 | | |
| 5/17/2012 | G-2 | Parking Lot | 25 | 39.9671 | 39.957 | 0.0101 | 404 | 411 | 9.90 |
| 5/17/2012 | G-2 | Parking Lot | 50 | 64.8235 | 64.8026 | 0.0209 | 418 | | |
| 11/23/2011 | Rain | | 25 | 24.8271 | 24.8278 | -0.0007 | -28 | -7 | |
| 11/23/2011 | Rain | | 50 | 46.4253 | 46.4246 | 0.0007 | 14 | | |
| 1/27/2012 | Rain | | 25 | 39.6428 | 39.6422 | 0.0006 | 24 | 17 | |
| 1/27/2012 | Rain | | 50 | 60.5758 | 60.5753 | 0.0005 | 10 | | |
| 2/24/2012 | Rain | | 25 | 38.0428 | 38.0426 | 0.0002 | 8 | 10 | |
| 2/24/2012 | Rain | | 50 | 64.792 | 64.7914 | 0.0006 | 12 | | |
| 4/24/2012 | Rain | | 25 | 39.6509 | 39.6475 | 0.0034 | 136 | 119 | |
| 4/24/2012 | Rain | | 50 | 66.135 | 66.1299 | 0.0051 | 102 | | |
| 5/5/2012 | Rain | | 25 | 39.6483 | 39.648 | 0.0003 | 12 | 12 | |
| 5/5/2012 | Rain | | 50 | 68.1312 | 68.1306 | 0.0006 | 12 | | |
| 10/13/2011 | Rain (10/13) | | 25 | 24.5976 | 24.5983 | -0.0007 | -28 | -28 | |
| 10/14/2011 | Rain (10/14) | | 25 | 21.5228 | 21.5232 | -0.0004 | -16 | -16 | |
| 10/25/2011 | Rain (10/25) | | 25 | 24.5988 | 24.5986 | 0.0002 | 8 | 8 | |
| 10/13/2011 | Blank | | 50 | 66.656 | 66.6544 | 0.0016 | 32 | 32 | |
| 11/23/2011 | Blank | | 25 | 26.7597 | 26.7592 | 0.0005 | 20 | 19 | |
| 11/23/2011 | Blank | | 50 | 48.8648 | 48.8639 | 0.0009 | 18 | | |
| 10/25/2011 | Blank (2 25s) | | 25 | 21.5244 | 21.5243 | 1E-04 | 4 | 56 | |
| 1/27/2012 | D.I. | | 25 | 42.1768 | 42.1769 | -0.0001 | -4 | -2 | |
| 1/27/2012 | D.I. | | 50 | 66.3484 | 66.3484 | 0 | 0 | | |
| 2/24/2012 | D.I. | | 25 | 40.3597 | 40.3592 | 0.0005 | 20 | 11 | |
| 2/24/2012 | D.I. | | 50 | 73.6424 | 73.6423 | 1E-04 | 2 | | |
| 3/26/2012 | D.I. | | 50 | 60.5727 | 60.5718 | 0.0009 | 18 | 19 | |
| 3/26/2012 | D.I. | | 25 | 43.4922 | 43.4917 | 0.0005 | 20 | | |
| 4/11/2012 | D.I. | | 25 | 43.4927 | 43.4927 | 0 | 0 | 2 | |
| 4/11/2012 | D.I. | | 50 | 66.3479 | 66.3477 | 0.0002 | 4 | | |
| 4/24/2012 | D.I. | | 25 | 43.4926 | 43.4926 | 0 | 0 | -2 | |
| 4/24/2012 | D.I. | | 50 | 66.3481 | 66.3483 | -0.0002 | -4 | | |
| 5/5/2012 | D.I. | | 25 | 43.4922 | 43.4926 | -0.0004 | -16 | -16 | |

| Date | Sample | Type of Drain | Water Used (mL) | Dish + Residue Before Ignition (g) | Residue + Dish After Ignition (g) | Final (g) | mgVS/L | Average | StDEV |
|---|---|---|---|---|---|---|---|---|---|
| 5/5/2012 | D.I. | | 50 | 66.3474 | 66.3482 | -0.0008 | -16 | | |
| 5/17/2012 | D.I. | | 25 | 43.4932 | 43.4928 | 0.0004 | 16 | 9 | |
| 5/17/2012 | D.I. | | 50 | 66.349 | 66.3489 | 0.0001 | 2 | | |

## APPENDIX G

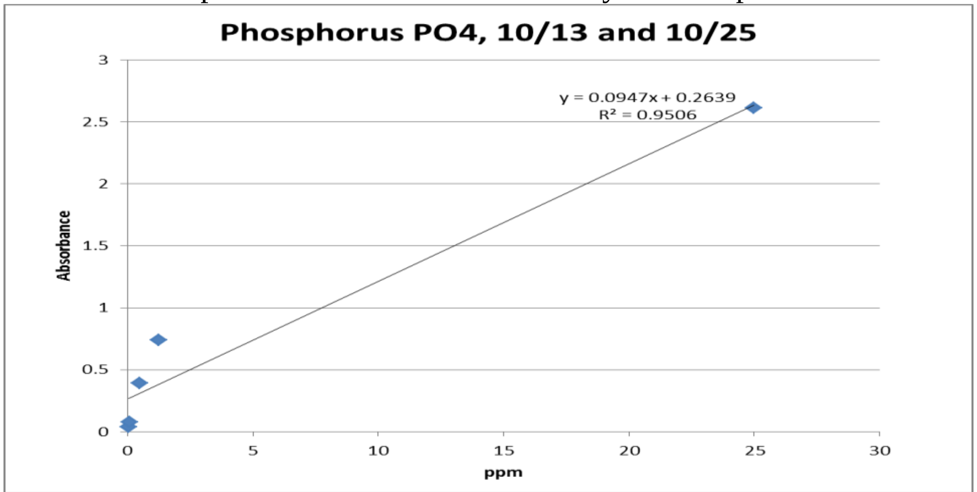
Raw data calculations for phosphorus.

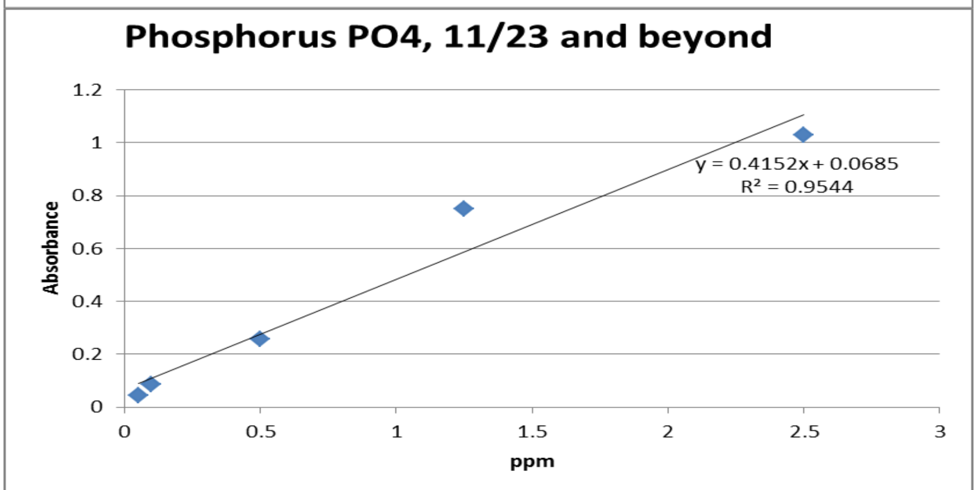
| Date | Site | Type of Drain | Rep | Absorbance | ppm | Rep | Absorbance | ppm | Average | StDev |
|---|---|---|---|---|---|---|---|---|---|---|
| 10/13/2011 | A-28 | | 2 | 0.273 | 2.62 | 3 | 0.216 | 2.02 | 2.32 | 0.43 |
| 10/25/2011 | A-28 | | 1 | 0.108 | 0.88 | 2 | 0.1 | 0.79 | 0.83 | 0.060 |
| 11/23/2011 | A-28 | | 1 | 0.031 | 0.01 | 2 | 0.034 | 0.01 | 0.01 | 0.005 |
| 10/13/2011 | B-24 | Roadway | 1 | 0.667 | 6.78 | 2 | 0.681 | 6.93 | 6.85 | 0.105 |
| 10/25/2011 | B-24 | Roadway | 1 | 0.097 | 0.76 | 2 | 0.074 | 0.52 | 0.64 | 0.172 |
| 11/23/2011 | B-24 | Roadway | 1 | 0.21 | 0.44 | 2 | 0.2 | 0.41 | 0.43 | 0.017 |
| 1/27/2012 | B-24 | Roadway | 1 | 0.087 | 0.14 | 2 | 0.091 | 0.15 | 0.15 | 0.007 |
| 2/23/2012 | B-24 | Roadway | 1 | 0.148 | 0.29 | 2 | 0.153 | 0.30 | 0.29 | 0.009 |
| 3/26/2012 | B-24 | Roadway | 1 | 0.442 | 1.00 | 2 | 0.62 | 1.42 | 1.21 | 0.303 |
| 4/24/2012 | B-24 | Roadway | 1 | 0.208 | 0.43 | 2 | 0.211 | 0.44 | 0.44 | 0.005 |
| 5/5/2012 | B-24 | Roadway | 1 | 0.004 | -0.06 | 2 | 0.004 | -0.06 | -0.06 | 0.000 |
| 5/17/2012 | B-24 | Roadway | 1 | 0.533 | 1.22 | 2 | 0.407 | 0.91 | 1.06 | 0.215 |
| 10/14/2011 | C-1 | Roadway, Sidewalk | 1 | 0.182 | 1.66 | 2 | 0.196 | 1.81 | 1.73 | 0.105 |
| 10/25/2011 | C-1 | Roadway, Sidewalk | 1 | 0.147 | 1.29 | 2 | 0.144 | 1.26 | 1.27 | 0.022 |
| 11/23/2011 | C-1 | Roadway, Sidewalk | 1 | 0.034 | 0.01 | 2 | 0.045 | 0.04 | 0.03 | 0.019 |
| 1/27/2012 | C-1 | Roadway, Sidewalk | 1 | 0.011 | -0.04 | 2 | 0.01 | -0.04 | -0.04 | 0.002 |
| 2/23/2012 | C-1 | Roadway, Sidewalk | 1 | 0.026 | -0.01 | 2 | 0.026 | -0.01 | -0.01 | 0.000 |
| 3/26/2012 | C-1 | Roadway, Sidewalk | 1 | 0.179 | 0.36 | 2 | 0.123 | 0.23 | 0.30 | 0.095 |
| 4/11/2012 | C-1 | Roadway, Sidewalk | 1 | 0.005 | -0.06 | 2 | 0.004 | -0.06 | -0.06 | 0.002 |
| 4/24/2012 | C-1 | Roadway, Sidewalk | 1 | 0.063 | 0.08 | 2 | 0.063 | 0.08 | 0.08 | 0.000 |
| 5/5/2012 | C-1 | Roadway, Sidewalk | 1 | 0.063 | 0.08 | 2 | 0.064 | 0.09 | 0.08 | 0.002 |
| 5/17/2012 | C-1 | Roadway, Sidewalk | 1 | 0.033 | 0.01 | 2 | 0.034 | 0.01 | 0.01 | 0.002 |
| 11/23/2011 | C-20 | Roadway | 1 | 0.095 | 0.16 | 2 | 0.098 | 0.17 | 0.16 | 0.005 |
| 1/27/2012 | C-20 | Roadway | 1 | 0.023 | -0.01 | 2 | 0.024 | -0.01 | -0.01 | 0.002 |
| 2/23/2012 | C-20 | Roadway | 1 | 0.033 | 0.01 | 2 | 0.033 | 0.01 | 0.01 | 0.000 |
| 3/26/2012 | C-20 | Roadway | 1 | 0.087 | 0.14 | 2 | 0.089 | 0.15 | 0.14 | 0.003 |
| 4/11/2012 | C-20 | Roadway | 1 | 0.316 | 0.69 | 2 | 0.321 | 0.70 | 0.70 | 0.009 |
| 4/24/2012 | C-20 | Roadway | 1 | 0.641 | 1.48 | 2 | 0.654 | 1.51 | 1.49 | 0.022 |
| 5/5/2012 | C-20 | Roadway | 1 | 0.071 | 0.10 | 2 | 0.073 | 0.11 | 0.10 | 0.003 |
| 5/17/2012 | C-20 | Roadway | 1 | 0.134 | 0.25 | 2 | 0.138 | 0.26 | 0.26 | 0.007 |
| 10/13/2011 | C-31 | Loading Dock | 1 | 0.109 | 0.89 | 3 | 0.098 | 0.77 | 0.83 | 0.082 |
| 10/25/2011 | C-31 | Loading Dock | 1 | 0.678 | 6.90 | 2 | 0.789 | 8.07 | 7.48 | 0.829 |
| 11/23/2011 | C-31 | Loading Dock | 1 | 0.083 | 0.13 | 2 | 0.085 | 0.14 | 0.13 | 0.003 |

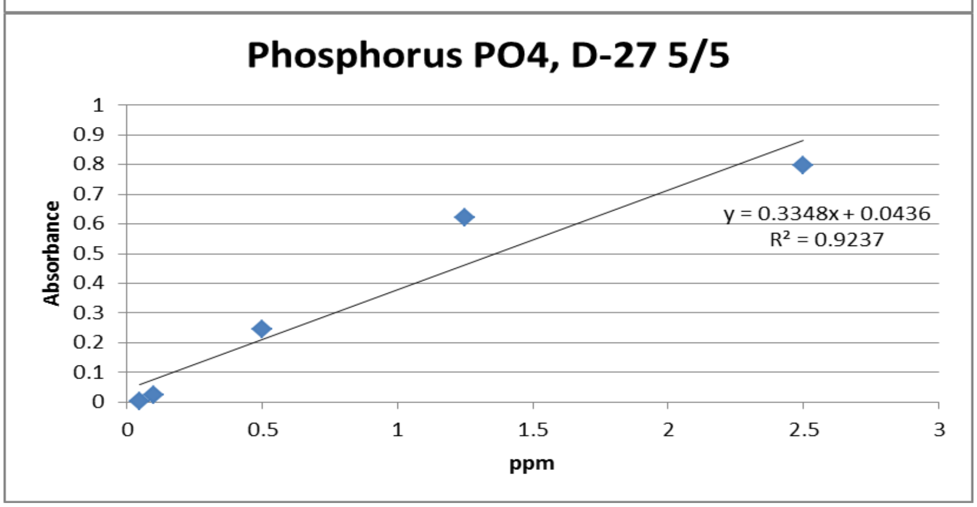
| Date | Site | Type of Drain | Rep | Absorbance | ppm | Rep | Absorbance | ppm | Average | StDev |
|---|---|---|---|---|---|---|---|---|---|---|
| 1/27/2012 | C-31 | Loading Dock | 1 | 0.237 | 0.50 | 2 | 0.241 | 0.51 | 0.51 | 0.007 |
| 2/23/2012 | C-31 | Loading Dock | 1 | 0.007 | -0.05 | 2 | 0.006 | -0.05 | -0.05 | 0.002 |
| 3/26/2012 | C-31 | Loading Dock | 1 | 0.004 | -0.06 | 2 | 0.004 | -0.06 | -0.06 | 0.000 |
| 4/11/2012 | C-31 | Loading Dock | 1 | 0.135 | 0.26 | 2 | 0.136 | 0.26 | 0.26 | 0.002 |
| 4/24/2012 | C-31 | Loading Dock | 1 | 0.302 | 0.66 | 2 | 0.309 | 0.68 | 0.67 | 0.012 |
| 5/5/2012 | C-31 | Loading Dock | 1 | 0.564 | 1.29 | 2 | 0.585 | 1.34 | 1.32 | 0.036 |
| 5/17/2012 | C-31 | Loading Dock | 1 | 0.403 | 0.90 | 2 | 0.417 | 0.94 | 0.92 | 0.024 |
| 10/14/2011 | C-46 | Grass, Landscaping | 1 | 0.383 | 3.78 | 2 | 0.377 | 3.72 | 3.75 | 0.045 |
| 10/25/2011 | C-46 | Grass, Landscaping | 1 | 0.166 | 1.49 | 2 | 0.162 | 1.45 | 1.47 | 0.030 |
| 11/23/2011 | C-46 | Grass, Landscaping | 1 | 0.64 | 1.47 | 2 | 0.652 | 1.50 | 1.49 | 0.020 |
| 1/27/2012 | C-46 | Grass, Landscaping | 1 | 0.072 | 0.10 | 2 | 0.022 | -0.02 | 0.04 | 0.085 |
| 2/23/2012 | C-46 | Grass, Landscaping | 1 | 0.033 | 0.01 | 2 | 0.034 | 0.01 | 0.01 | 0.002 |
| 5/5/2012 | C-46 | Grass, Landscaping | 1 | 0.635 | 1.46 | 2 | 0.655 | 1.51 | 1.48 | 0.034 |
| 10/14/2011 | C-47 | Roadway | 1 | 0.562 | 5.67 | 2 | 0.576 | 5.82 | 5.74 | 0.105 |
| 10/25/2011 | C-47 | Roadway | 1 | 0.837 | 8.57 | 2 | 0.846 | 8.67 | 8.62 | 0.067 |
| 11/23/2011 | C-47 | Roadway | 1 | 0.039 | 0.03 | 2 | 0.041 | 0.03 | 0.03 | 0.003 |
| 1/27/2012 | C-47 | Roadway | 1 | 0.029 | 0.00 | 2 | 0.029 | 0.00 | 0.00 | 0.000 |
| 2/23/2012 | C-47 | Roadway | 1 | 0.014 | -0.03 | 2 | 0.014 | -0.03 | -0.03 | 0.000 |
| 3/26/2012 | C-47 | Roadway | 1 | 0.092 | 0.15 | 2 | 0.145 | 0.28 | 0.22 | 0.090 |
| 4/11/2012 | C-47 | Roadway | 1 | 0.224 | 0.47 | 2 | 0.225 | 0.47 | 0.47 | 0.002 |
| 4/24/2012 | C-47 | Roadway | 1 | 0.349 | 0.77 | 2 | 0.358 | 0.79 | 0.78 | 0.015 |
| 5/5/2012 | C-47 | Roadway | 1 | 0.021 | -0.02 | 2 | 0.022 | -0.02 | -0.02 | 0.002 |
| 11/23/2011 | D-10 | Roadway | 1 | 0.018 | -0.03 | 2 | 0.019 | -0.02 | -0.02 | 0.002 |
| 1/27/2012 | D-10 | Roadway | 1 | 0.021 | -0.02 | 2 | 0.02 | -0.02 | -0.02 | 0.002 |
| 2/23/2012 | D-10 | Roadway | 1 | 0.006 | -0.05 | 2 | 0.006 | -0.05 | -0.05 | 0.000 |
| 4/11/2012 | D-10 | Roadway | 1 | 0.051 | 0.05 | 2 | 0.052 | 0.06 | 0.06 | 0.002 |
| 4/24/2012 | D-10 | Roadway | 1 | 0.988 | 2.31 | 2 | 1.026 | 2.40 | 2.36 | 0.065 |
| 5/5/2012 | D-10 | Roadway | 1 | 0.02 | -0.02 | 2 | 0.02 | -0.02 | -0.02 | 0.000 |
| 5/17/2012 | D-10 | Roadway | 1 | 0.324 | 0.71 | 2 | 0.293 | 0.64 | 0.67 | 0.053 |
| 10/13/2011 | D-27 | Landscaping, Sidewalk | 1 | 0.089 | 0.68 | 2 | 0.085 | 0.63 | 0.65 | 0.030 |
| 10/25/2011 | D-27 | Landscaping, Sidewalk | 1 | 0.382 | 3.77 | 2 | 0.388 | 3.83 | 3.80 | 0.045 |
| 11/23/2011 | D-27 | Landscaping, Sidewalk | 1 | 0.548 | 1.25 | 2 | 0.555 | 1.27 | 1.26 | 0.012 |
| 1/27/2012 | D-27 | Landscaping, Sidewalk | 1 | 0.804 | 1.87 | 2 | 0.892 | 2.08 | 1.97 | 0.150 |
| 2/23/2012 | D-27 | Landscaping, Sidewalk | 1 | 0.034 | 0.01 | 2 | 0.034 | 0.01 | 0.01 | 0.000 |
| 3/26/2012 | D-27 | Landscaping, Sidewalk | 1 | 0.205 | 0.43 | 2 | 0.807 | 1.88 | 1.15 | 1.025 |

| Date | Site | Type of Drain | Rep | Absorbance | ppm | Rep | Absorbance | ppm | Average | StDev |
|---|---|---|---|---|---|---|---|---|---|---|
| 4/24/2012 | D-27 | Landscaping, Sidewalk | 1 | 0.755 | 1.75 | 2 | 0.778 | 1.81 | 1.78 | 0.039 |
| 5/5/2012 | D-27 | Landscaping, Sidewalk | 1 | 0.759 | 4.45 | 2 | 0.739 | 4.33 | 4.39 | 0.084 |
| 5/17/2012 | D-27 | Landscaping, Sidewalk | 1 | 0.711 | 1.64 | 2 | 0.678 | 1.56 | 1.60 | 0.056 |
| 4/11/2012 | D-9 | Roadway | 1 | 0.759 | 1.76 | 2 | 0.333 | 0.73 | 1.25 | 0.725 |
| 4/24/2012 | D-9 | Roadway | 1 | 0.222 | 0.47 | 2 | 0.229 | 0.48 | 0.47 | 0.012 |
| 10/13/2011 | F-4 | Parking Lot | 1 | 0.379 | 3.74 | 2 | 0.391 | 3.86 | 3.80 | 0.090 |
| 10/25/2011 | F-4 | Parking Lot | 1 | 0.405 | 4.01 | 2 | 0.522 | 5.25 | 4.63 | 0.874 |
| 11/23/2011 | F-4 | Parking Lot | 1 | 0.007 | -0.05 | 2 | 0.006 | -0.05 | -0.05 | 0.002 |
| 1/27/2012 | F-4 | Parking Lot | 1 | 0.006 | -0.05 | 2 | 0.007 | -0.05 | -0.05 | 0.002 |
| 2/23/2012 | F-4 | Parking Lot | 1 | 0.045 | 0.04 | 2 | 0.047 | 0.04 | 0.04 | 0.003 |
| 3/26/2012 | F-4 | Parking Lot | 1 | 0.089 | 0.15 | 2 | 0.09 | 0.15 | 0.15 | 0.002 |
| 4/11/2012 | F-4 | Parking Lot | 1 | 0.336 | 0.74 | 2 | 0.333 | 0.73 | 0.74 | 0.005 |
| 4/24/2012 | F-4 | Parking Lot | 1 | 0.294 | 0.64 | 2 | 0.299 | 0.65 | 0.65 | 0.009 |
| 5/5/2012 | F-4 | Parking Lot | 1 | 0.001 | -0.07 | 2 | 0.001 | -0.07 | -0.07 | 0.000 |
| 10/13/2011 | G-2 | Parking Lot | 1 | 0.348 | 3.41 | 2 | 0.455 | 4.54 | 3.98 | 0.799 |
| 10/25/2011 | G-2 | Parking Lot | 1 | 0.019 | -0.06 | 2 | 0.019 | -0.06 | -0.06 | 0.000 |
| 11/23/2011 | G-2 | Parking Lot | 1 | 0.039 | 0.03 | 2 | 0.039 | 0.03 | 0.03 | 0.000 |
| 1/27/2012 | G-2 | Parking Lot | 1 | 0.013 | -0.04 | 2 | 0.008 | -0.05 | -0.04 | 0.009 |
| 2/23/2012 | G-2 | Parking Lot | 1 | 0.082 | 0.13 | 2 | 0.083 | 0.13 | 0.13 | 0.002 |
| 3/26/2012 | G-2 | Parking Lot | 1 | 0.003 | -0.06 | 2 | 0.003 | -0.06 | -0.06 | 0.000 |
| 4/11/2012 | G-2 | Parking Lot | 1 | 0.052 | 0.06 | 2 | 0.052 | 0.06 | 0.06 | 0.000 |
| 4/24/2012 | G-2 | Parking Lot | 1 | 0.017 | -0.03 | 2 | 0.017 | -0.03 | -0.03 | 0.000 |
| 5/5/2012 | G-2 | Parking Lot | 1 | 0.001 | -0.07 | 2 | 0.001 | -0.07 | -0.07 | 0.000 |
| 5/17/2012 | G-2 | Parking Lot | 1 | 0.045 | 0.04 | 2 | 0.045 | 0.04 | 0.04 | 0.000 |
| 11/23/2011 | Rain | | 1 | 0.01 | -0.04 | 2 | 0.012 | -0.04 | -0.04 | 0.003 |
| 1/27/2012 | Rain | | 1 | 0.01 | -0.04 | 2 | 0.019 | -0.02 | -0.03 | 0.015 |
| 4/24/2012 | Rain | | 1 | 0.427 | 0.96 | 2 | 0.443 | 1.00 | 0.98 | 0.027 |
| 5/5/2012 | Rain | | 1 | 0.154 | 0.30 | 2 | 0.152 | 0.30 | 0.30 | 0.003 |

Phosphorus standard curves for analytical comparison.



# APPENDIX H

Raw data calculations for ammonium.

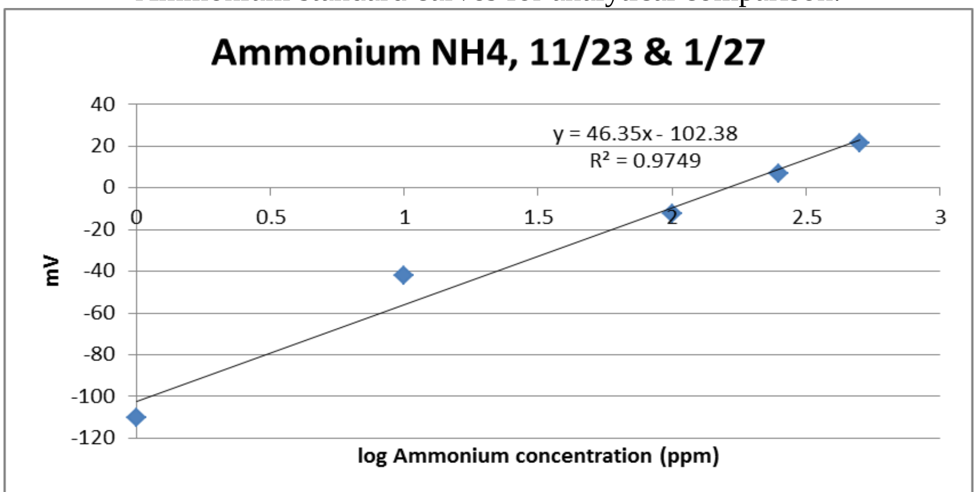
| Date | Sample | Type of Drain | Rep | mV | log NH3 | NH3 ppm | Rep | mV | log NH3 | NH3 ppm | Average | StDev |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10/13/2011 | A-28 | | 1 | -114.3 | 0.16 | 1.44 | 2 | -110.8 | 0.22 | 1.65 | 1.55 | 0.15 |
| 10/25/2011 | A-28 | | 1 | -43.3 | 1.39 | 24.35 | 2 | -47.7 | 1.31 | 20.43 | 22.39 | 2.77 |
| 11/23/2011 | A-28 | | 1 | -155.6 | -1.15 | 0.071 | 2 | -158.5 | -1.21 | 0.062 | 0.07 | 0.01 |
| 10/13/2011 | B-24 | Roadway | 1 | -38.6 | 1.47 | 29.36 | 2 | -44.6 | 1.36 | 23.12 | 26.24 | 4.41 |
| 10/25/2011 | B-24 | Roadway | 1 | -62.3 | 1.06 | 11.42 | 2 | -65 | 1.01 | 10.26 | 10.84 | 0.82 |
| 11/23/2011 | B-24 | Roadway | 1 | -107.7 | -0.11 | 0.768 | 2 | -112.9 | -0.23 | 0.593 | 0.68 | 0.12 |
| 1/27/2012 | B-24 | Roadway | 1 | -113.8 | -0.25 | 0.567 | 2 | -112.5 | -0.22 | 0.605 | 0.59 | 0.03 |
| 2/23/2012 | B-24 | Roadway | 1 | -69 | 0.94 | 8.75 | 2 | -71.7 | 0.90 | 7.85 | 8.30 | 0.63 |
| 3/26/2012 | B-24 | Roadway | 1 | -57.7 | 1.14 | 13.72 | 2 | -61.4 | 1.07 | 11.84 | 12.78 | 1.33 |
| 4/24/2012 | B-24 | Roadway | 1 | -44.8 | 1.36 | 22.93 | 2 | -50.5 | 1.26 | 18.27 | 20.60 | 3.29 |
| 5/5/2012 | B-24 | Roadway | 1 | -66.2 | 0.99 | 9.78 | 2 | -66.9 | 0.98 | 9.51 | 9.64 | 0.19 |
| 5/17/2012 | B-24 | Roadway | 1 | -55 | 1.18 | 15.28 | 2 | -62.9 | 1.05 | 11.15 | 13.21 | 2.92 |
| 10/13/2011 | C-1 | Roadway, Sidewalk | 1 | -119.1 | 0.07 | 1.19 | 2 | -118.3 | 0.09 | 1.23 | 1.21 | 0.03 |
| 10/25/2011 | C-1 | Roadway, Sidewalk | 1 | -51.6 | 1.24 | 17.49 | 2 | -52.6 | 1.23 | 16.81 | 17.15 | 0.48 |
| 11/23/2011 | C-1 | Roadway, Sidewalk | 1 | -139.7 | -0.81 | 0.157 | 2 | -134.6 | -0.70 | 0.202 | 0.18 | 0.03 |
| 1/27/2012 | C-1 | Roadway, Sidewalk | 1 | -120 | -0.38 | 0.417 | 2 | -120.6 | -0.39 | 0.404 | 0.41 | 0.01 |
| 2/23/2012 | C-1 | Roadway, Sidewalk | 1 | -123.3 | 0.00 | 1.01 | 2 | -122.6 | 0.01 | 1.03 | 1.02 | 0.02 |
| 3/26/2012 | C-1 | Roadway, Sidewalk | 1 | -44.9 | 1.36 | 22.84 | 2 | -49.3 | 1.28 | 19.17 | 21.01 | 2.60 |
| 4/11/2012 | C-1 | Roadway, Sidewalk | 1 | -83.6 | 0.69 | 4.89 | 2 | -95.8 | 0.48 | 3.01 | 3.95 | 1.33 |
| 4/24/2012 | C-1 | Roadway, Sidewalk | 1 | -70.8 | 0.91 | 8.14 | 2 | -69.6 | 0.93 | 8.54 | 8.34 | 0.28 |
| 5/5/2012 | C-1 | Roadway, Sidewalk | 1 | -45.9 | 1.34 | 21.95 | 2 | -45.9 | 1.34 | 21.95 | 21.95 | 0.00 |
| 5/17/2012 | C-1 | Roadway, Sidewalk | 1 | -91.7 | 0.55 | 3.54 | 2 | -91.8 | 0.55 | 3.53 | 3.53 | 0.01 |
| 11/23/2011 | C-20 | Roadway | 1 | -65.5 | 0.80 | 6.25 | 2 | -67.6 | 0.75 | 5.63 | 5.94 | 0.44 |
| 1/27/2012 | C-20 | Roadway | 1 | -150.6 | -1.04 | 0.091 | 2 | -148.9 | -1.00 | 0.099 | 0.10 | 0.01 |
| 2/23/2012 | C-20 | Roadway | 1 | -90.7 | 0.57 | 3.68 | 2 | -91.3 | 0.56 | 3.60 | 3.64 | 0.06 |
| 3/26/2012 | C-20 | Roadway | 1 | -66.7 | 0.98 | 9.58 | 2 | -69.4 | 0.93 | 8.61 | 9.10 | 0.69 |
| 4/11/2012 | C-20 | Roadway | 1 | -37.7 | 1.48 | 30.43 | 2 | -48.8 | 1.29 | 19.56 | 24.99 | 7.69 |
| 4/24/2012 | C-20 | Roadway | 1 | -51.6 | 1.24 | 17.49 | 2 | -52.1 | 1.23 | 17.15 | 17.32 | 0.24 |
| 5/5/2012 | C-20 | Roadway | 1 | -47 | 1.32 | 21.01 | 2 | -46.6 | 1.33 | 21.35 | 21.18 | 0.24 |
| 5/17/2012 | C-20 | Roadway | 1 | -58.5 | 1.12 | 13.29 | 2 | -59.4 | 1.11 | 12.82 | 13.05 | 0.33 |
| 10/13/2011 | C-31 | Loading Dock | 1 | -40.7 | 1.43 | 27.00 | 2 | -43.5 | 1.38 | 24.15 | 25.58 | 2.02 |

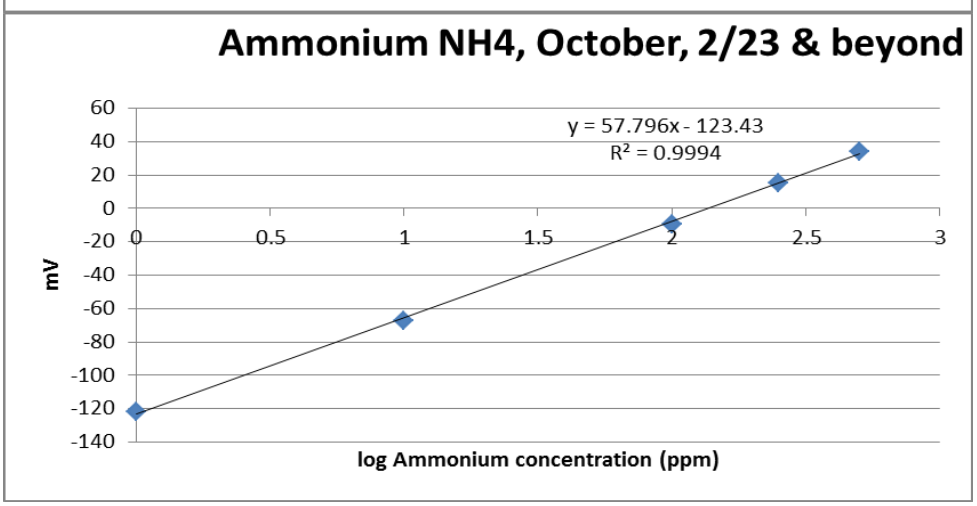
| Date | Sample | Type of Drain | Rep | mV | log NH3 | NH3 ppm | Rep | mV | log NH3 | NH3 ppm | Average | StDev |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10/25/2011 | C-31 | Loading Dock | 1 | -63 | 1.05 | 11.11 | 2 | -65.5 | 1.00 | 10.05 | 10.58 | 0.74 |
| 11/23/2011 | C-31 | Loading Dock | 1 | -52.7 | 1.07 | 11.80 | 2 | -56 | 1.00 | 10.01 | 10.91 | 1.26 |
| 1/27/2012 | C-31 | Loading Dock | 1 | -60 | 0.91 | 8.21 | 2 | -59.7 | 0.92 | 8.33 | 8.27 | 0.09 |
| 2/23/2012 | C-31 | Loading Dock | 1 | -79.9 | 0.75 | 5.66 | 2 | -79.8 | 0.75 | 5.69 | 5.68 | 0.02 |
| 3/26/2012 | C-31 | Loading Dock | 1 | -80.2 | 0.75 | 5.60 | 2 | -78.3 | 0.78 | 6.04 | 5.82 | 0.31 |
| 4/11/2012 | C-31 | Loading Dock | 1 | -54.2 | 1.20 | 15.77 | 2 | -56.8 | 1.15 | 14.22 | 14.99 | 1.10 |
| 4/24/2012 | C-31 | Loading Dock | 1 | -61 | 1.08 | 12.03 | 2 | -62.4 | 1.06 | 11.38 | 11.70 | 0.46 |
| 5/5/2012 | C-31 | Loading Dock | 1 | -40 | 1.44 | 27.77 | 2 | -39.8 | 1.45 | 27.99 | 27.88 | 0.16 |
| 5/17/2012 | C-31 | Loading Dock | 1 | -42.4 | 1.40 | 25.23 | 2 | -45.3 | 1.35 | 22.48 | 23.86 | 1.95 |
| 10/13/2011 | C-46 | Grass, Landscaping | 1 | -27.6 | 1.66 | 45.51 | 2 | -31.3 | 1.59 | 39.27 | 42.39 | 4.41 |
| 10/25/2011 | C-46 | Grass, Landscaping | 1 | -46.6 | 1.33 | 21.35 | 2 | -49.8 | 1.27 | 18.79 | 20.07 | 1.81 |
| 11/23/2011 | C-46 | Grass, Landscaping | 1 | -38 | 1.39 | 24.49 | 2 | -43.1 | 1.28 | 19.01 | 21.75 | 3.88 |
| 1/27/2012 | C-46 | Grass, Landscaping | 1 | -59.2 | 0.93 | 8.54 | 2 | -60.1 | 0.91 | 8.17 | 8.36 | 0.26 |
| 2/23/2012 | C-46 | Grass, Landscaping | 1 | -41.3 | 1.42 | 26.37 | 2 | -47 | 1.32 | 21.01 | 23.69 | 3.79 |
| 3/26/2012 | C-46 | Grass, Landscaping | 1 | -60.8 | 1.08 | 12.12 | | | | | 12.12 | |
| 5/5/2012 | C-46 | Grass, Landscaping | 1 | -26.1 | 1.68 | 48.31 | 2 | -37.6 | 1.49 | 30.55 | 39.43 | 12.56 |
| 10/13/2011 | C-47 | Roadway | 1 | -130.6 | -0.12 | 0.75 | 2 | -128.2 | -0.08 | 0.83 | 0.79 | 0.05 |
| 10/25/2011 | C-47 | Roadway | 1 | -139 | -0.27 | 0.54 | 2 | -136.2 | -0.22 | 0.60 | 0.57 | 0.04 |
| 11/23/2011 | C-47 | Roadway | 1 | -125.2 | -0.49 | 0.322 | 2 | -121.1 | -0.40 | 0.395 | 0.36 | 0.05 |
| 1/27/2012 | C-47 | Roadway | 1 | -87.8 | 0.31 | 2.06 | 2 | -89.1 | 0.29 | 1.93 | 2.00 | 0.09 |
| 2/23/2012 | C-47 | Roadway | 1 | -63.8 | 1.03 | 10.76 | 2 | -62.7 | 1.05 | 11.24 | 11.00 | 0.34 |
| 3/26/2012 | C-47 | Roadway | 1 | -77.6 | 0.79 | 6.21 | 2 | -67.7 | 0.96 | 9.21 | 7.71 | 2.12 |
| 4/11/2012 | C-47 | Roadway | 1 | -61.8 | 1.07 | 11.65 | 2 | -63.8 | 1.03 | 10.76 | 11.20 | 0.63 |
| 4/24/2012 | C-47 | Roadway | 1 | -26.9 | 1.67 | 46.79 | 2 | -41.2 | 1.42 | 26.47 | 36.63 | 14.37 |
| 5/5/2012 | C-47 | Roadway | 1 | -67.3 | 0.97 | 9.36 | 2 | -67.6 | 0.97 | 9.25 | 9.30 | 0.08 |
| 11/23/2011 | D-10 | Roadway | 1 | -157.2 | -1.18 | 0.066 | 2 | -158.7 | -1.22 | 0.061 | 0.06 | 0.00 |
| 1/27/2012 | D-10 | Roadway | 2 | -70.8 | 0.68 | 4.80 | 3 | -69.5 | 0.71 | 5.12 | 3.31 | 0.23 |
| 2/23/2012 | D-10 | Roadway | 1 | -165.4 | -0.73 | 0.19 | 2 | -164.9 | -0.72 | 0.19 | 0.19 | 0.00 |
| 4/11/2012 | D-10 | Roadway | 1 | -80.2 | 0.75 | 5.60 | 2 | -90.5 | 0.57 | 3.71 | 4.66 | 1.33 |
| 4/24/2012 | D-10 | Roadway | 1 | -56.1 | 1.16 | 14.62 | 2 | -54 | 1.20 | 15.90 | 15.26 | 0.90 |
| 5/5/2012 | D-10 | Roadway | 1 | -53.1 | 1.22 | 16.48 | 2 | -51.5 | 1.24 | 17.56 | 17.02 | 0.77 |
| 5/17/2012 | D-10 | Roadway | 1 | -84 | 0.68 | 4.81 | 2 | -76.9 | 0.81 | 6.38 | 5.60 | 1.11 |
| 10/13/2011 | D-27 | Landscaping, Sidewalk | 1 | -52.8 | 1.22 | 16.67 | 2 | -52.6 | 1.23 | 16.81 | 16.74 | 0.09 |

| Date | Sample | Type of Drain | Rep | mV | log NH3 | NH3 ppm | Rep | mV | log NH3 | NH3 ppm | Average | StDev |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10/25/2011 | D-27 | Landscaping, Sidewalk | 1 | -56.9 | 1.15 | 14.16 | 2 | -58 | 1.13 | 13.55 | 13.86 | 0.43 |
| 11/23/2011 | D-27 | Landscaping, Sidewalk | 1 | -63.5 | 0.84 | 6.90 | 2 | -66 | 0.78 | 6.09 | 6.50 | 0.57 |
| 1/27/2012 | D-27 | Landscaping, Sidewalk | 1 | -86.8 | 0.34 | 2.17 | 2 | -82.6 | 0.43 | 2.67 | 2.42 | 0.36 |
| 2/23/2012 | D-27 | Landscaping, Sidewalk | 1 | -119.5 | 0.07 | 1.17 | 2 | -119.3 | 0.07 | 1.18 | 1.17 | 0.01 |
| 3/26/2012 | D-27 | Landscaping, Sidewalk | 1 | -66.1 | 0.99 | 9.82 | 2 | -64 | 1.03 | 10.67 | 10.24 | 0.61 |
| 4/24/2012 | D-27 | Landscaping, Sidewalk | 1 | -38.5 | 1.47 | 29.48 | 2 | -43.2 | 1.39 | 24.44 | 26.96 | 3.56 |
| 5/5/2012 | D-27 | Landscaping, Sidewalk | 1 | -12.1 | 1.93 | 84.38 | 2 | -11 | 1.95 | 88.16 | 86.27 | 2.67 |
| 5/17/2012 | D-27 | Landscaping, Sidewalk | 1 | -59.7 | 1.10 | 12.67 | 2 | -27.3 | 1.66 | 46.05 | 29.36 | 23.61 |
| 4/11/2012 | D-9 | Roadway | 1 | -87.9 | 0.61 | 4.12 | 2 | -52.7 | 1.22 | 16.74 | 10.43 | 8.93 |
| 4/24/2012 | D-9 | Roadway | 1 | -52.4 | 1.23 | 16.94 | 2 | -58.3 | 1.13 | 13.39 | 15.17 | 2.51 |
| 10/13/2011 | F-4 | Parking Lot | 1 | -46.3 | 1.33 | 21.60 | 2 | -48.1 | 1.30 | 20.11 | 20.86 | 1.06 |
| 10/25/2011 | F-4 | Parking Lot | 1 | -58.1 | 1.13 | 13.50 | 2 | -63.2 | 1.04 | 11.02 | 12.26 | 1.76 |
| 11/23/2011 | F-4 | Parking Lot | 1 | -137.1 | -0.75 | 0.178 | 2 | -136.1 | -0.73 | 0.187 | 0.18 | 0.01 |
| 1/27/2012 | F-4 | Parking Lot | 1 | -99.5 | 0.06 | 1.15 | 2 | -49.8 | 1.13 | 13.63 | 6.58 | 8.82 |
| 2/23/2012 | F-4 | Parking Lot | 1 | -62 | 1.06 | 11.56 | 2 | -67.3 | 0.97 | 9.36 | 10.46 | 1.56 |
| 3/26/2012 | F-4 | Parking Lot | 1 | -82.2 | 0.71 | 5.17 | 2 | -81.5 | 0.73 | 5.31 | 5.24 | 0.10 |
| 4/11/2012 | F-4 | Parking Lot | 1 | -97.6 | 0.45 | 2.80 | 2 | -97.1 | 0.46 | 2.85 | 2.83 | 0.04 |
| 4/24/2012 | F-4 | Parking Lot | 1 | -61.7 | 1.07 | 11.70 | 2 | -65.3 | 1.01 | 10.13 | 10.92 | 1.11 |
| 5/5/2012 | F-4 | Parking Lot | 1 | -108.3 | 0.26 | 1.83 | 2 | -108.9 | 0.25 | 1.78 | 1.81 | 0.03 |
| 10/13/2011 | G-2 | Parking Lot | 1 | -40.2 | 1.44 | 27.55 | 2 | -39.1 | 1.46 | 28.78 | 28.16 | 0.87 |
| 10/25/2011 | G-2 | Parking Lot | 1 | -47.8 | 1.31 | 20.35 | 2 | -57.2 | 1.15 | 13.99 | 17.17 | 4.49 |
| 11/23/2011 | G-2 | Parking Lot | 1 | -69.6 | 0.71 | 5.10 | 2 | -67.3 | 0.76 | 5.71 | 5.40 | 0.44 |
| 1/27/2012 | G-2 | Parking Lot | 1 | -56.5 | 0.99 | 9.77 | 2 | -59.1 | 0.93 | 8.59 | 9.18 | 0.84 |
| 2/23/2012 | G-2 | Parking Lot | 1 | -71.5 | 0.90 | 7.92 | 2 | -75.6 | 0.83 | 6.72 | 7.32 | 0.84 |
| 3/26/2012 | G-2 | Parking Lot | 1 | -75.8 | 0.82 | 6.67 | 2 | -83.8 | 0.69 | 4.85 | 5.76 | 1.29 |
| 4/11/2012 | G-2 | Parking Lot | 1 | -63.7 | 1.03 | 10.80 | 2 | -69.1 | 0.94 | 8.71 | 9.76 | 1.48 |
| 4/24/2012 | G-2 | Parking Lot | 1 | -62.4 | 1.06 | 11.38 | 2 | -67.2 | 0.97 | 9.40 | 10.39 | 1.40 |
| 5/5/2012 | G-2 | Parking Lot | 1 | -117.6 | 0.10 | 1.26 | 2 | -124.2 | -0.01 | 0.97 | 1.12 | 0.21 |
| 5/17/2012 | G-2 | Parking Lot | 1 | -61 | 1.08 | 12.03 | 2 | -66 | 0.99 | 9.86 | 10.94 | 1.54 |
| 11/23/2011 | Rain | | 1 | -64.1 | 0.83 | 6.70 | 2 | -63.7 | 0.83 | 6.83 | 6.76 | 0.10 |
| 1/27/2012 | Rain | | 1 | -53.4 | 1.06 | 11.40 | 2 | -58.4 | 0.95 | 8.89 | 10.14 | 1.77 |
| 2/23/2012 | Rain | | 1 | -34.2 | 1.54 | 34.98 | 2 | -43.4 | 1.38 | 24.25 | 29.62 | 7.59 |
| 3/26/2012 | Rain | | 1 | -43.8 | 1.38 | 23.87 | | | | | 23.87 | |

| Date | Sample | Type of Drain | Rep | mV | log NH3 | NH3 ppm | Rep | mV | log NH3 | NH3 ppm | Average | StDev |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4/11/ 2012 | Rain | | 1 | -44.6 | 1.36 | 23.12 | 2 | -52.8 | 1.22 | 16.67 | 19.90 | 4.56 |
| 4/24/ 2012 | Rain | | 1 | -51.5 | 1.24 | 17.56 | 2 | -53.1 | 1.22 | 16.48 | 17.02 | 0.77 |
| 5/5/ 2012 | Rain | | 1 | -29.8 | 1.62 | 41.69 | 2 | -36.7 | 1.50 | 31.67 | 36.68 | 7.08 |
| | | | 3 | -52.6 | 1.07 | 11.86 | 4 | -105.4 | -0.07 | | | |

Ammonium standard curves for analytical comparison.



# APPENDIX I

Raw data calculations for nitrate.

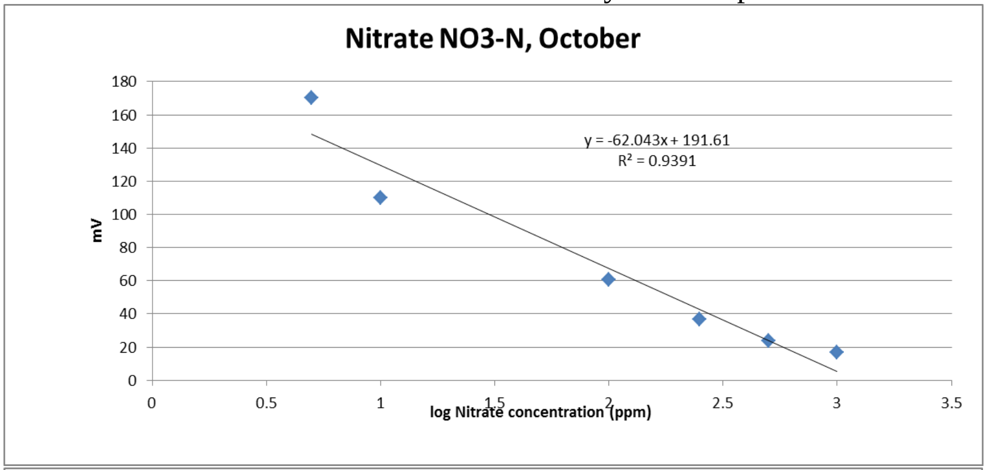
| Date | Sample | Type of Drain | Rep | mV | log NO3 | NO3 ppm | Rep | mV | log NO3 | NO3 ppm | Average | StDEV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10/13/ 2011 | A-28 | | 1 | 106.7 | 1.37 | 23.37 | 2 | 105.9 | 1.38 | 24.07 | 23.72 | 0.50 |
| 10/25/ 2011 | A-28 | | | 109.6 | 1.32 | 20.98 | | | | | 20.98 | |
| 11/23/ 2011 | A-28 | | 1 | 303 | 0.77 | 5.95 | 2 | 306 | 0.74 | 5.53 | 5.74 | 0.29 |
| 10/13/ 2011 | B-24 | Roadway | 1 | 98.1 | 1.51 | 32.15 | 2 | 96.2 | 1.54 | 34.50 | 33.32 | 1.66 |
| 10/25/ 2011 | B-24 | Roadway | 1 | 117.2 | 1.20 | 15.82 | 2 | 114.4 | 1.24 | 17.56 | 16.69 | 1.23 |
| 11/23/ 2011 | B-24 | Roadway | 1 | 285 | 0.96 | 9.18 | 2 | 291 | 0.90 | 7.95 | 8.56 | 0.87 |
| 1/27/ 2012 | B-24 | Roadway | 1 | 250 | 1.33 | 21.36 | 2 | 251 | 1.32 | 20.85 | 21.11 | 0.36 |
| 2/23/ 2012 | B-24 | Roadway | 1 | 201 | 0.97 | 9.27 | 2 | 201 | 0.97 | 9.27 | 9.27 | 0.00 |
| 3/26/ 2012 | B-24 | Roadway | 1 | 218 | 0.70 | 5.01 | 2 | 224 | 0.61 | 4.03 | 4.52 | 0.69 |
| 4/24/ 2012 | B-24 | Roadway | 1 | 217 | 0.72 | 5.20 | 2 | 219 | 0.68 | 4.83 | 5.01 | 0.26 |
| 5/5/ 2012 | B-24 | Roadway | 1 | 217 | 0.72 | 5.20 | 2 | 220 | 0.67 | 4.66 | 4.93 | 0.38 |
| 5/17/ 2012 | B-24 | Roadway | 1 | 194.5 | 1.07 | 11.73 | 2 | 198.9 | 1.00 | 10.00 | 10.87 | 1.22 |
| 10/14/ 2011 | C-1 | Roadway, Sidewalk | | 117.8 | 1.19 | 15.48 | | | | | 15.48 | |
| 10/25/ 2011 | C-1 | Roadway, Sidewalk | | 126.6 | 1.05 | 11.16 | | | | | 11.16 | |
| 11/23/ 2011 | C-1 | Roadway, Sidewalk | 1 | 285 | 0.96 | 9.18 | 2 | 284 | 0.97 | 9.41 | 9.30 | 0.16 |
| 1/27/ 2012 | C-1 | Roadway, Sidewalk | 1 | 262 | 1.20 | 15.99 | 2 | 261 | 1.21 | 16.38 | 16.19 | 0.28 |
| 2/23/ 2012 | C-1 | Roadway, Sidewalk | 1 | 217 | 0.72 | 5.20 | 2 | 217 | 0.72 | 5.20 | 5.20 | 0.00 |
| 3/26/ 2012 | C-1 | Roadway, Sidewalk | 1 | 210 | 0.83 | 6.69 | 2 | 212 | 0.79 | 6.23 | 6.46 | 0.33 |
| 4/11/ 2012 | C-1 | Roadway, Sidewalk | 1 | 223 | 0.62 | 4.18 | 2 | 225 | 0.59 | 3.89 | 4.04 | 0.21 |
| 4/24/ 2012 | C-1 | Roadway, Sidewalk | 1 | 221 | 0.65 | 4.50 | 2 | 221 | 0.65 | 4.50 | 4.50 | 0.00 |
| 5/5/ 2012 | C-1 | Roadway, Sidewalk | 1 | 207 | 0.87 | 7.46 | 2 | 206 | 0.89 | 7.74 | 7.60 | 0.19 |
| 5/17/ 2012 | C-1 | Roadway, Sidewalk | 1 | 193.4 | 1.09 | 12.21 | 2 | 198.6 | 1.00 | 10.11 | 11.16 | 1.48 |
| 11/23/ 2011 | C-20 | Roadway | 1 | 279 | 1.03 | 10.61 | 2 | 278 | 1.04 | 10.87 | 10.74 | 0.18 |
| 1/27/ 2012 | C-20 | Roadway | 1 | 291 | 0.90 | 7.95 | 2 | 291 | 0.90 | 7.95 | 7.95 | 0.00 |
| 2/23/ 2012 | C-20 | Roadway | 1 | 194.8 | 1.06 | 11.60 | 2 | 194.7 | 1.07 | 11.65 | 11.63 | 0.03 |
| 3/26/ 2012 | C-20 | Roadway | 1 | 219 | 0.68 | 4.83 | 2 | 220 | 0.67 | 4.66 | 4.75 | 0.12 |
| 4/11/ 2012 | C-20 | Roadway | 1 | 207 | 0.87 | 7.46 | 2 | 208 | 0.86 | 7.20 | 7.33 | 0.19 |
| 4/24/ 2012 | C-20 | Roadway | 1 | 199.1 | 1.00 | 9.93 | 2 | 194.5 | 1.07 | 11.73 | 10.83 | 1.27 |
| 5/5/ 2012 | C-20 | Roadway | 1 | 201 | 0.97 | 9.27 | 2 | 201 | 0.97 | 9.27 | 9.27 | 0.00 |
| 5/17/ 2012 | C-20 | Roadway | 1 | 185.9 | 1.20 | 16.02 | 2 | 182.4 | 1.26 | 18.18 | 17.10 | 1.53 |
| 10/13/ 2011 | C-31 | Loading Dock | 1 | 78.7 | 1.82 | 66.05 | 2 | 77.9 | 1.83 | 68.04 | 67.04 | 1.41 |

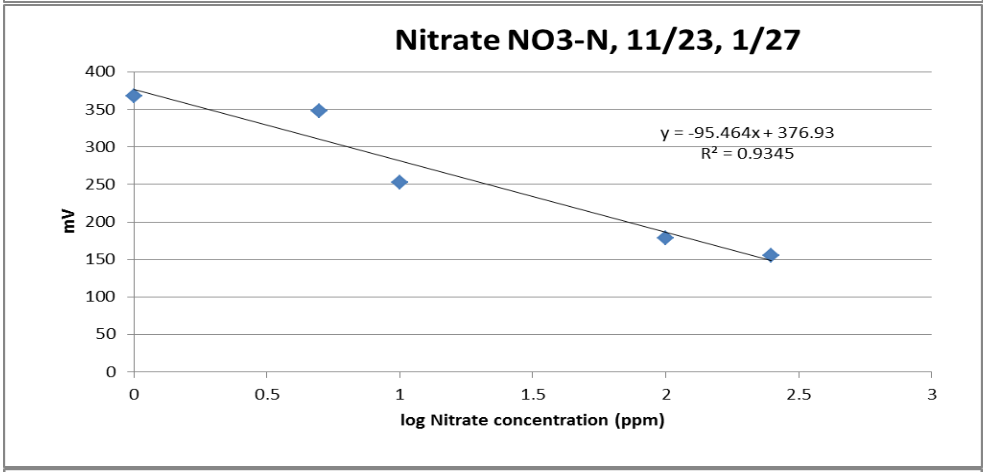
| Date | Sample | Type of Drain | Rep | mV | log NO3 | NO3 ppm | Rep | mV | log NO3 | NO3 ppm | Average | StDEV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10/25/2011 | C-31 | Loading Dock | 1 | 107.6 | 1.35 | 22.60 | 2 | 105 | 1.40 | 24.89 | 23.74 | 1.62 |
| 11/23/2011 | C-31 | Loading Dock | 1 | 282 | 0.99 | 9.87 | 2 | 279 | 1.03 | 10.61 | 10.24 | 0.52 |
| 1/27/2012 | C-31 | Loading Dock | 1 | 182.6 | 2.04 | 108.55 | 2 | 182.3 | 2.04 | 109.34 | 108.95 | 0.56 |
| 2/23/2012 | C-31 | Loading Dock | 1 | 204 | 0.92 | 8.32 | 2 | 203 | 0.94 | 8.62 | 8.47 | 0.22 |
| 3/26/2012 | C-31 | Loading Dock | 1 | 215 | 0.75 | 5.59 | 2 | 214 | 0.76 | 5.79 | 5.69 | 0.15 |
| 4/11/2012 | C-31 | Loading Dock | 1 | 210 | 0.83 | 6.69 | 2 | 208 | 0.86 | 7.20 | 6.95 | 0.36 |
| 4/24/2012 | C-31 | Loading Dock | 1 | 218 | 0.70 | 5.01 | 2 | 218 | 0.70 | 5.01 | 5.01 | 0.00 |
| 5/5/2012 | C-31 | Loading Dock | 1 | 206 | 0.89 | 7.74 | 2 | 213 | 0.78 | 6.01 | 6.87 | 1.22 |
| 5/17/2012 | C-31 | Loading Dock | 1 | 208 | 0.86 | 7.20 | 2 | 213 | 0.78 | 6.01 | 6.60 | 0.84 |
| 10/14/2011 | C-46 | Grass, Landscaping | | 105.2 | 1.39 | 24.70 | | | | | 24.70 | |
| 10/25/2011 | C-46 | Grass, Landscaping | | 114.1 | 1.25 | 17.75 | | | | | 17.75 | |
| 11/23/2011 | C-46 | Grass, Landscaping | 1 | 278 | 1.04 | 10.87 | 2 | 276 | 1.06 | 11.41 | 11.14 | 0.38 |
| 1/27/2012 | C-46 | Grass, Landscaping | 1 | 288 | 0.93 | 8.54 | 2 | 295 | 0.86 | 7.21 | 7.88 | 0.94 |
| 2/23/2012 | C-46 | Grass, Landscaping | 1 | 232 | 0.48 | 3.02 | 2 | 235 | 0.43 | 2.71 | 2.86 | 0.22 |
| 3/26/2012 | C-46 | Grass, Landscaping | 1 | 199.1 | 1.00 | 9.93 | | | | | 9.93 | |
| 5/5/2012 | C-46 | Grass, Landscaping | 1 | 215 | 0.75 | 5.59 | 2 | 214 | 0.76 | 5.79 | 5.69 | 0.15 |
| 10/14/2011 | C-47 | Roadway | | 120.6 | 1.14 | 13.95 | | | | | 13.95 | |
| 10/25/2011 | C-47 | Roadway | | 116.7 | 1.21 | 16.12 | | | | | 16.12 | |
| 11/23/2011 | C-47 | Roadway | 1 | 285 | 0.96 | 9.18 | 2 | 285 | 0.96 | 9.18 | 9.18 | 0.00 |
| 1/27/2012 | C-47 | Roadway | 1 | 222 | 1.62 | 41.97 | 2 | 221 | 1.63 | 42.99 | 42.48 | 0.72 |
| 2/23/2012 | C-47 | Roadway | 1 | 190.3 | 1.14 | 13.66 | 2 | 190.5 | 1.13 | 13.56 | 13.61 | 0.07 |
| 3/26/2012 | C-47 | Roadway | 1 | 219 | 0.68 | 4.83 | 2 | 204 | 0.92 | 8.32 | 6.58 | 2.46 |
| 4/11/2012 | C-47 | Roadway | 1 | 204 | 0.92 | 8.32 | 2 | 203 | 0.94 | 8.62 | 8.47 | 0.22 |
| 4/24/2012 | C-47 | Roadway | 1 | 219 | 0.68 | 4.83 | 2 | 217 | 0.72 | 5.20 | 5.01 | 0.26 |
| 5/5/2012 | C-47 | Roadway | 1 | 207 | 0.87 | 7.46 | 2 | 207 | 0.87 | 7.46 | 7.46 | 0.00 |
| 11/23/2011 | D-10 | Roadway | 1 | 294 | 0.87 | 7.39 | 2 | 295 | 0.86 | 7.21 | 7.30 | 0.12 |
| 1/27/2012 | D-10 | Roadway | 1 | 314 | 0.66 | 4.56 | 2 | 311 | 0.69 | 4.90 | 4.73 | 0.24 |
| 2/23/2012 | D-10 | Roadway | 1 | 232 | 0.48 | 3.02 | 2 | 234 | 0.45 | 2.81 | 2.91 | 0.15 |
| 4/11/2012 | D-10 | Roadway | 1 | 207 | 0.87 | 7.46 | 2 | 204 | 0.92 | 8.32 | 7.89 | 0.61 |
| 4/24/2012 | D-10 | Roadway | 1 | 213 | 0.78 | 6.01 | 2 | 214 | 0.76 | 5.79 | 5.90 | 0.15 |
| 5/5/2012 | D-10 | Roadway | 1 | 212 | 0.79 | 6.23 | 2 | 212 | 0.79 | 6.23 | 6.23 | 0.00 |
| 5/17/2012 | D-10 | Roadway | 1 | 194.3 | 1.07 | 11.82 | 2 | 192.5 | 1.10 | 12.61 | 12.21 | 0.56 |
| 10/13/2011 | D-27 | Landscaping, Sidewalk | 1 | 93.7 | 1.58 | 37.85 | 2 | 101.7 | 1.45 | 28.13 | 32.99 | 6.88 |

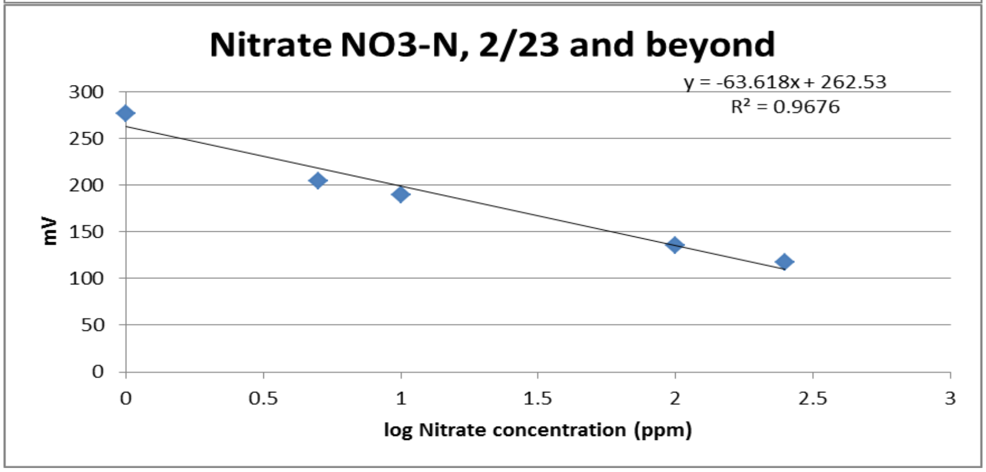
| Date | Sample | Type of Drain | Rep | mV | log NO3 | NO3 ppm | Rep | mV | log NO3 | NO3 ppm | Average | StDEV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10/25/ 2011 | D-27 | Landscaping, Sidewalk | | 123.5 | 1.10 | 12.53 | | | | | 12.53 | |
| 11/23/ 2011 | D-27 | Landscaping, Sidewalk | 1 | 285 | 0.96 | 9.18 | 2 | 284 | 0.97 | 9.41 | 9.30 | 0.16 |
| 1/27/ 2012 | D-27 | Landscaping, Sidewalk | 1 | 286 | 0.95 | 8.96 | 2 | 287 | 0.94 | 8.75 | 8.86 | 0.15 |
| 2/23/ 2012 | D-27 | Landscaping, Sidewalk | 1 | 227 | 0.56 | 3.62 | 2 | 228 | 0.54 | 3.49 | 3.55 | 0.09 |
| 3/26/ 2012 | D-27 | Landscaping, Sidewalk | 1 | 226 | 0.57 | 3.75 | 2 | 215 | 0.75 | 5.59 | 4.67 | 1.30 |
| 4/24/ 2012 | D-27 | Landscaping, Sidewalk | 1 | 204 | 0.92 | 8.32 | 2 | 209 | 0.84 | 6.94 | 7.63 | 0.97 |
| 5/5/ 2012 | D-27 | Landscaping, Sidewalk | 1 | 207 | 0.87 | 7.46 | 2 | 207 | 0.87 | 7.46 | 7.46 | 0.00 |
| 5/17/ 2012 | D-27 | Landscaping, Sidewalk | 1 | 204 | 0.92 | 8.32 | 2 | 203 | 0.94 | 8.62 | 8.47 | 0.22 |
| 4/11/ 2012 | D-9 | Roadway | 1 | 225 | 0.59 | 3.89 | 2 | 191.8 | 1.11 | 12.94 | 8.41 | 6.40 |
| 4/24/ 2012 | D-9 | Roadway | 1 | 219 | 0.68 | 4.83 | 2 | 220 | 0.67 | 4.66 | 4.75 | 0.12 |
| 10/13/ 2011 | F-4 | Parking Lot | 1 | 116.6 | 1.21 | 16.18 | 2 | 102.1 | 1.44 | 27.71 | 21.95 | 8.16 |
| 10/25/ 2011 | F-4 | Parking Lot | 1 | 108.5 | 1.34 | 21.86 | 2 | 103 | 1.43 | 26.80 | 24.33 | 3.50 |
| 11/23/ 2011 | F-4 | Parking Lot | 1 | 303 | 0.77 | 5.95 | 2 | 305 | 0.75 | 5.67 | 5.81 | 0.20 |
| 1/27/ 2012 | F-4 | Parking Lot | 1 | 241 | 1.42 | 26.54 | 2 | 240 | 1.43 | 27.19 | 26.86 | 0.46 |
| 2/23/ 2012 | F-4 | Parking Lot | 1 | 207 | 0.87 | 7.46 | 2 | 212 | 0.79 | 6.23 | 6.84 | 0.87 |
| 3/26/ 2012 | F-4 | Parking Lot | 1 | 229 | 0.53 | 3.37 | 2 | 232 | 0.48 | 3.02 | 3.19 | 0.24 |
| 4/11/ 2012 | F-4 | Parking Lot | 1 | 209 | 0.84 | 6.94 | 2 | 211 | 0.81 | 6.46 | 6.70 | 0.34 |
| 4/24/ 2012 | F-4 | Parking Lot | 1 | 217 | 0.72 | 5.20 | 2 | 219 | 0.68 | 4.83 | 5.01 | 0.26 |
| 5/5/ 2012 | F-4 | Parking Lot | 1 | 224 | 0.61 | 4.03 | 2 | 224 | 0.61 | 4.03 | 4.03 | 0.00 |
| 10/13/ 2011 | G-2 | Parking Lot | 1 | 98.1 | 1.51 | 32.15 | 2 | 98 | 1.51 | 32.27 | 32.21 | 0.08 |
| 10/25/ 2011 | G-2 | Parking Lot | | 105.8 | 1.38 | 24.16 | | | | | 24.16 | |
| 11/23/ 2011 | G-2 | Parking Lot | 1 | 277 | 1.05 | 11.14 | 2 | 276 | 1.06 | 11.41 | 11.27 | 0.19 |
| 1/27/ 2012 | G-2 | Parking Lot | 1 | 306 | 0.74 | 5.53 | 2 | 305 | 0.75 | 5.67 | 5.60 | 0.10 |
| 2/23/ 2012 | G-2 | Parking Lot | 1 | 222 | 0.64 | 4.34 | 2 | 223 | 0.62 | 4.18 | 4.26 | 0.11 |
| 3/26/ 2012 | G-2 | Parking Lot | 1 | 215 | 0.75 | 5.59 | 2 | 215 | 0.75 | 5.59 | 5.59 | 0.00 |
| 4/11/ 2012 | G-2 | Parking Lot | 1 | 196 | 1.05 | 11.11 | 2 | 194.2 | 1.07 | 11.86 | 11.49 | 0.53 |
| 4/24/ 2012 | G-2 | Parking Lot | 1 | 222 | 0.64 | 4.34 | 2 | 224 | 0.61 | 4.03 | 4.18 | 0.21 |
| 5/5/ 2012 | G-2 | Parking Lot | 1 | 223 | 0.62 | 4.18 | 2 | 223 | 0.62 | 4.18 | 4.18 | 0.00 |
| 5/17/ 2012 | G-2 | Parking Lot | 1 | 191.6 | 1.11 | 13.03 | 2 | 184.8 | 1.22 | 16.67 | 14.85 | 2.57 |
| 11/23/ 2011 | Rain | | 1 | 254 | 1.29 | 19.40 | 2 | 256 | 1.27 | 18.48 | 18.94 | 0.65 |
| 1/27/ 2012 | Rain | | 1 | 286 | 0.95 | 8.96 | 2 | 291 | 0.90 | 7.95 | 8.45 | 0.72 |
| 2/23/ 2012 | Rain | | 1 | 205 | 0.90 | 8.02 | 2 | 213 | 0.78 | 6.01 | 7.01 | 1.43 |
| 3/26/ 2012 | Rain | | 1 | 182.8 | 1.25 | 17.92 | | | | | 17.92 | |

| Date | Sample | Type of Drain | Rep | mV | log NO3 | NO3 ppm | Rep | mV | log NO3 | NO3 ppm | Average | StDEV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4/11/ 2012 | Rain | | 1 | 197.3 | 1.03 | 10.60 | 2 | 201 | 0.97 | 9.27 | 9.94 | 0.94 |
| 4/24/ 2012 | Rain | | 1 | 213 | 0.78 | 6.01 | 2 | 213 | 0.78 | 6.01 | 6.01 | 0.00 |
| 5/5/ 2012 | Rain | | 1 | 228 | 0.54 | 3.49 | 2 | 233 | 0.46 | 2.91 | 3.20 | 0.41 |

Nitrate standard curves for analytical comparison.



# APPENDIX J

Raw data calculations for chemical oxygen demand.

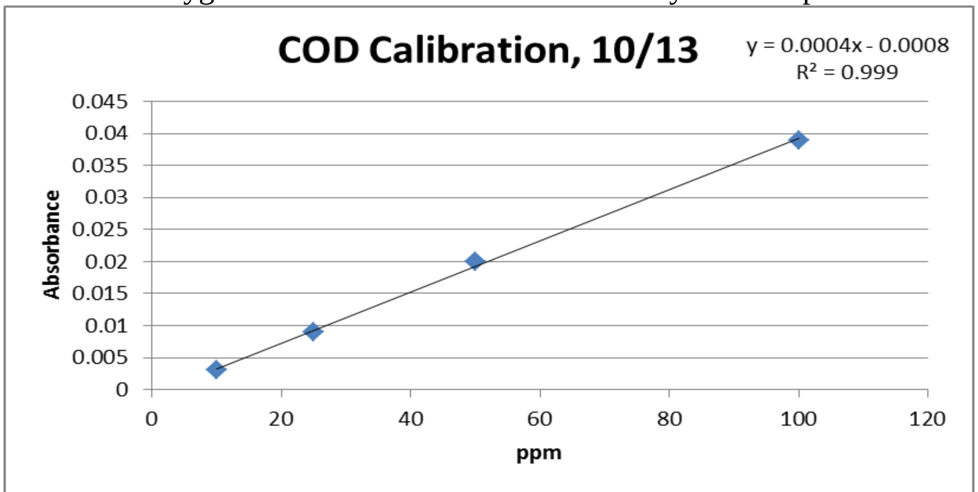
| Date | Sample | Type of Drain | Run | Read | ppm/2 | ppm | Run | Read | ppm/2 | ppm | Average | StDev |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10/13/2011 | A-28 | | 1 | 0.018 | 45.00 | 90.00 | 2 | 0.033 | 82.50 | 165.00 | 127.50 | 53.03 |
| 10/25/2011 | A-28 | | 1 | 0.02 | 50.00 | 100.00 | 2 | 0.019 | 47.50 | 95.00 | 97.50 | 3.54 |
| 11/25/2011 | A-28 | | 1 | 0.005 | 12.50 | 25.00 | 2 | 0.004 | 10.00 | 20.00 | 22.50 | 3.54 |
| 10/13/2011 | B-24 | Roadway | 1 | 0.025 | 62.50 | 125.00 | 2 | 0.027 | 67.50 | 135.00 | 130.00 | 7.07 |
| 10/25/2011 | B-24 | Roadway | 1 | 0.009 | 22.50 | 45.00 | 2 | 0.012 | 30.00 | 60.00 | 52.50 | 10.61 |
| 11/25/2011 | B-24 | Roadway | 1 | 0.005 | 12.50 | 25.00 | 2 | 0.002 | 5.00 | 10.00 | 17.50 | 10.61 |
| 1/27/2012 | B-24 | Roadway | 1 | 0.014 | 35.00 | 70.00 | 2 | 0.016 | 40.00 | 80.00 | 75.00 | 7.07 |
| 2/27/2012 | B-24 | Roadway | 1 | 0.019 | 38.00 | 76.00 | 2 | 0.019 | 38.00 | 76.00 | 76.00 | 0.00 |
| 3/26/2012 | B-24 | Roadway | 1 | 0.014 | 28.00 | 56.00 | 2 | 0.033 | 66.00 | 132.00 | 94.00 | 53.74 |
| 4/24/2012 | B-24 | Roadway | 1 | 0.023 | 46.00 | 92.00 | 2 | 0.009 | 18.00 | 36.00 | 64.00 | 39.60 |
| 5/5/2012 | B-24 | Roadway | 1 | 0.015 | 30.00 | 60.00 | 2 | 0.015 | 30.00 | 60.00 | 60.00 | 0.00 |
| 5/17/2012 | B-24 | Roadway | 1 | 0.039 | 78.00 | 156.00 | 2 | 0.04 | 80.00 | 160.00 | 158.00 | 2.83 |
| 10/13/2011 | C-1 | Roadway, Sidewalk | 1 | 0.007 | 17.50 | 35.00 | 2 | 0.031 | 77.50 | 155.00 | 95.00 | 84.85 |
| 10/25/2011 | C-1 | Roadway, Sidewalk | 1 | 0.014 | 35.00 | 70.00 | 2 | 0.014 | 35.00 | 70.00 | 70.00 | 0.00 |
| 11/25/2011 | C-1 | Roadway, Sidewalk | 1 | 0.01 | 25.00 | 50.00 | 2 | 0.009 | 22.50 | 45.00 | 47.50 | 3.54 |
| 1/27/2012 | C-1 | Roadway, Sidewalk | 1 | 0.008 | 20.00 | 40.00 | 2 | 0.005 | 12.50 | 25.00 | 32.50 | 10.61 |
| 2/27/2012 | C-1 | Roadway, Sidewalk | 1 | 0.008 | 16.00 | 32.00 | 2 | 0.008 | 16.00 | 32.00 | 32.00 | 0.00 |
| 3/26/2012 | C-1 | Roadway, Sidewalk | 1 | 0.013 | 26.00 | 52.00 | 2 | 0.009 | 18.00 | 36.00 | 44.00 | 11.31 |
| 4/11/2012 | C-1 | Roadway, Sidewalk | 1 | 0.017 | 34.00 | 68.00 | 2 | 0.016 | 32.00 | 64.00 | 66.00 | 2.83 |
| 4/24/2012 | C-1 | Roadway, Sidewalk | 1 | 0.023 | 46.00 | 92.00 | 2 | 0.029 | 58.00 | 116.00 | 104.00 | 16.97 |
| 5/5/2012 | C-1 | Roadway, Sidewalk | 1 | 0.08 | 200.00 | 400.01 | 2 | 0.087 | 217.50 | 435.01 | 417.51 | 24.75 |
| 5/17/2012 | C-1 | Roadway, Sidewalk | 1 | 0.087 | 217.50 | 435.01 | 2 | 0.091 | 227.50 | 455.01 | 445.01 | 14.14 |
| 11/25/2011 | C-20 | Roadway | 1 | 0.023 | 57.50 | 115.00 | 2 | 0.025 | 62.50 | 125.00 | 120.00 | 7.07 |
| 1/27/2012 | C-20 | Roadway | 1 | 0.004 | 10.00 | 20.00 | 2 | 0.003 | 7.50 | 15.00 | 17.50 | 3.54 |
| 2/27/2012 | C-20 | Roadway | 1 | 0.014 | 28.00 | 56.00 | 2 | 0.016 | 32.00 | 64.00 | 60.00 | 5.66 |
| 3/26/2012 | C-20 | Roadway | 1 | 0.01 | 20.00 | 40.00 | 2 | 0.009 | 18.00 | 36.00 | 38.00 | 2.83 |
| 4/11/2012 | C-20 | Roadway | 1 | 0.026 | 52.00 | 104.00 | 2 | 0.025 | 50.00 | 100.00 | 102.00 | 2.83 |
| 4/24/2012 | C-20 | Roadway | 1 | 0.18 | 450.00 | 900.01 | 2 | 0.128 | 320.00 | 640.01 | 770.01 | 183.85 |
| 5/5/2012 | C-20 | Roadway | 1 | 0.078 | 195.00 | 390.01 | 2 | 0.056 | 140.00 | 280.01 | 335.01 | 77.78 |
| 5/17/2012 | C-20 | Roadway | 1 | 0.156 | 390.00 | 780.01 | 2 | 0.226 | 565.00 | 1130.01 | 955.01 | 247.49 |
| 10/13/2011 | C-31 | Loading Dock | 1 | 0.191 | 477.50 | 955.01 | 2 | 0.206 | 515.00 | 1030.01 | 992.51 | 53.03 |

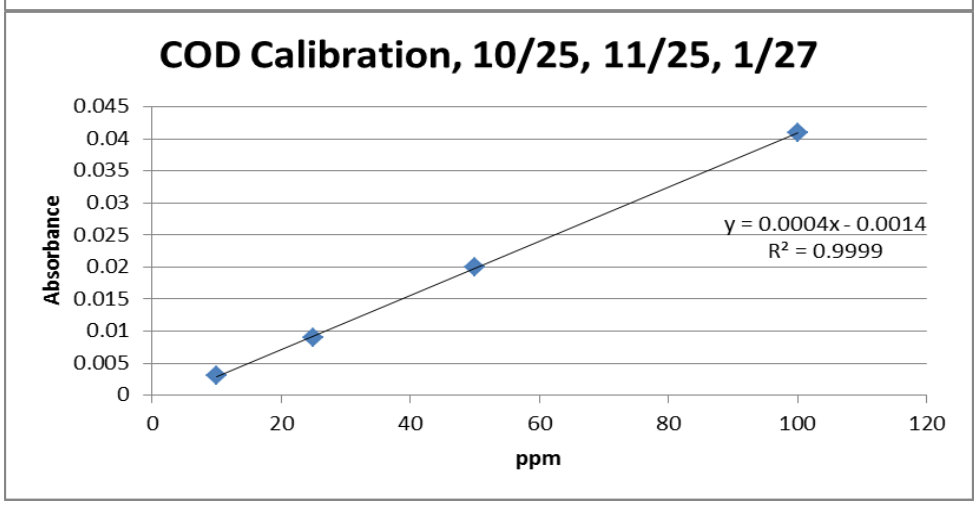
| Date | Sample | Type of Drain | Run | Read | ppm/2 | ppm | Run | Read | ppm/2 | ppm | Average | StDev |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10/13/2011 | C-31 | Loading Dock | 1 | 0.04 | 100.00 | 400.01 | 2 | 0.048 | 120.00 | 480.01 | 440.01 | 56.57 |
| 10/25/2011 | C-31 | Loading Dock | 1 | 0.111 | 277.50 | 555.01 | 2 | 0.112 | 280.00 | 560.01 | 557.51 | 3.54 |
| 11/25/2011 | C-31 | Loading Dock | 1 | 0.018 | 45.00 | 90.00 | 2 | 0.017 | 42.50 | 85.00 | 87.50 | 3.54 |
| 1/27/2012 | C-31 | Loading Dock | 1 | 0.183 | 457.50 | 1830.00 | 2 | 0.192 | 480.00 | 1920.00 | 1875.00 | 63.64 |
| 2/27/2012 | C-31 | Loading Dock | 1 | 0.019 | 38.00 | 76.00 | 2 | 0.017 | 34.00 | 68.00 | 72.00 | 5.66 |
| 3/26/2012 | C-31 | Loading Dock | 1 | 0.124 | 310.00 | 620.01 | 2 | 0.104 | 260.00 | 520.01 | 570.01 | 70.71 |
| 4/11/2012 | C-31 | Loading Dock | 1 | 0.026 | 52.00 | 104.00 | 2 | 0.024 | 48.00 | 96.00 | 100.00 | 5.66 |
| 4/24/2012 | C-31 | Loading Dock | 1 | 0.033 | 66.00 | 132.00 | 2 | 0.032 | 64.00 | 128.00 | 130.00 | 2.83 |
| 5/5/2012 | C-31 | Loading Dock | 1 | 0.129 | 322.50 | 645.01 | 2 | 0.147 | 367.50 | 735.01 | 690.01 | 63.64 |
| 5/17/2012 | C-31 | Loading Dock | 1 | 0.216 | 540.00 | 1080.01 | 2 | 0.17 | 425.00 | 850.01 | 965.01 | 162.63 |
| 10/13/2011 | C-46 | Grass, Landscaping | 1 | 0.019 | 47.50 | 95.00 | 2 | 0.017 | 42.50 | 85.00 | 90.00 | 7.07 |
| 10/25/2011 | C-46 | Grass, Landscaping | 1 | 0.011 | 27.50 | 55.00 | 2 | 0.013 | 32.50 | 65.00 | 60.00 | 7.07 |
| 11/25/2011 | C-46 | Grass, Landscaping | 1 | 0.027 | 67.50 | 135.00 | 2 | 0.028 | 70.00 | 140.00 | 137.50 | 3.54 |
| 1/27/2012 | C-46 | Grass, Landscaping | 1 | 0.004 | 10.00 | 20.00 | 2 | 0.001 | 2.50 | 5.00 | 12.50 | 10.61 |
| 2/27/2012 | C-46 | Grass, Landscaping | 1 | 0.007 | 14.00 | 28.00 | 2 | 0.009 | 18.00 | 36.00 | 32.00 | 5.66 |
| 3/26/2012 | C-46 | Grass, Landscaping | 1 | 0.023 | 46.00 | 92.00 | 2 | 0.028 | 56.00 | 112.00 | 102.00 | 14.14 |
| 5/5/2012 | C-46 | Grass, Landscaping | 1 | 0.022 | 44.00 | 88.00 | 2 | 0.021 | 42.00 | 84.00 | 86.00 | 2.83 |
| 10/13/2011 | C-47 | Roadway | 1 | 0.034 | 85.00 | 170.00 | 2 | 0.021 | 52.50 | 105.00 | 137.50 | 45.96 |
| 10/25/2011 | C-47 | Roadway | 1 | 0.019 | 47.50 | 95.00 | 2 | 0.024 | 60.00 | 120.00 | 107.50 | 17.68 |
| 11/25/2011 | C-47 | Roadway | 1 | 0.012 | 30.00 | 60.00 | 2 | 0.01 | 25.00 | 50.00 | 55.00 | 7.07 |
| 1/27/2012 | C-47 | Roadway | 1 | 0.023 | 57.50 | 115.00 | 2 | 0.026 | 65.00 | 130.00 | 122.50 | 10.61 |
| 2/27/2012 | C-47 | Roadway | 1 | 0.028 | 56.00 | 112.00 | 2 | 0.023 | 46.00 | 92.00 | 102.00 | 14.14 |
| 3/26/2012 | C-47 | Roadway | 1 | 0.011 | 22.00 | 44.00 | 2 | 0.008 | 16.00 | 32.00 | 38.00 | 8.49 |
| 4/11/2012 | C-47 | Roadway | 1 | 0.031 | 62.00 | 124.00 | 2 | 0.034 | 68.00 | 136.00 | 130.00 | 8.49 |
| 4/24/2012 | C-47 | Roadway | 1 | 0.023 | 46.00 | 92.00 | 2 | 0.022 | 44.00 | 88.00 | 90.00 | 2.83 |
| 5/5/2012 | C-47 | Roadway | 1 | 0.031 | 62.00 | 124.00 | 2 | 0.032 | 64.00 | 128.00 | 126.00 | 2.83 |
| 11/25/2011 | D-10 | Roadway | 1 | 0.006 | 15.00 | 30.00 | 2 | 0.006 | 15.00 | 30.00 | 30.00 | 0.00 |
| 1/27/2012 | D-10 | Roadway | 1 | 0.005 | 12.50 | 25.00 | 2 | 0.005 | 12.50 | 25.00 | 25.00 | 0.00 |
| 2/27/2012 | D-10 | Roadway | 1 | 0.005 | 10.00 | 20.00 | 2 | 0.006 | 12.00 | 24.00 | 22.00 | 2.83 |
| 4/11/2012 | D-10 | Roadway | 1 | 0.161 | 402.50 | 805.01 | 2 | 0.175 | 437.50 | 875.01 | 840.01 | 49.50 |
| 4/24/2012 | D-10 | Roadway | 1 | 0.208 | 520.00 | 1040.01 | 2 | 0.21 | 525.00 | 1050.01 | 1045.01 | 7.07 |
| 5/5/2012 | D-10 | Roadway | 1 | 0.027 | 54.00 | 108.00 | 2 | 0.02 | 40.00 | 80.00 | 94.00 | 19.80 |
| 5/17/2012 | D-10 | Roadway | 1 | 0.151 | 377.50 | 755.01 | 2 | 0.118 | 295.00 | 590.01 | 672.51 | 116.67 |

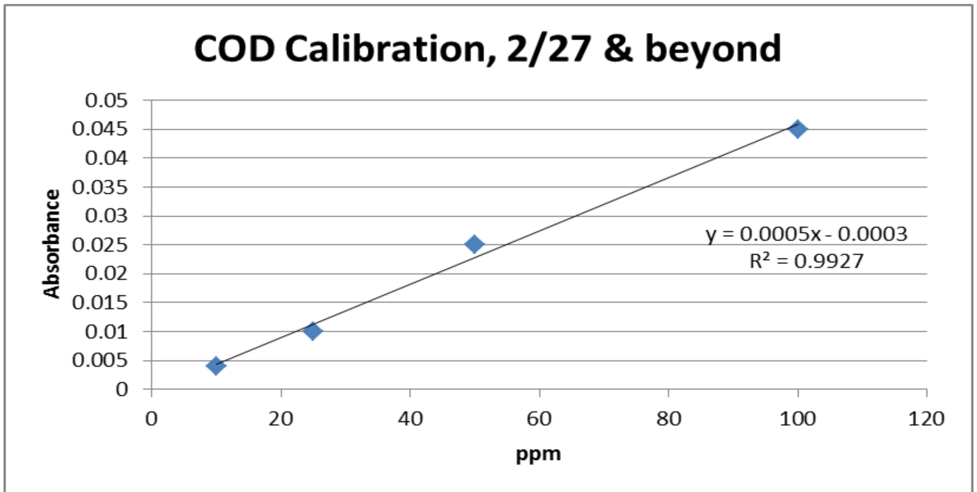
| Date | Sample | Type of Drain | Run | Read | ppm/2 | ppm | Run | Read | ppm/2 | ppm | Average | StDev |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10/13/2011 | D-27 | Landscaping, Sidewalk | 1 | 0.01 | 25.00 | 50.00 | 2 | 0.013 | 32.50 | 65.00 | 57.50 | 10.61 |
| 10/25/2011 | D-27 | Landscaping, Sidewalk | 1 | 0.021 | 52.50 | 105.00 | 2 | 0.019 | 47.50 | 95.00 | 100.00 | 7.07 |
| 11/25/2011 | D-27 | Landscaping, Sidewalk | 1 | 0.006 | 15.00 | 30.00 | 2 | 0.005 | 12.50 | 25.00 | 27.50 | 3.54 |
| 1/27/2012 | D-27 | Landscaping, Sidewalk | 1 | 0.017 | 42.50 | 85.00 | 2 | 0.014 | 35.00 | 70.00 | 77.50 | 10.61 |
| 2/27/2012 | D-27 | Landscaping, Sidewalk | 1 | 0.011 | 22.00 | 44.00 | 2 | 0.011 | 22.00 | 44.00 | 44.00 | 0.00 |
| 3/26/2012 | D-27 | Landscaping, Sidewalk | 1 | 0.013 | 26.00 | 52.00 | 2 | 0.007 | 14.00 | 28.00 | 40.00 | 16.97 |
| 4/24/2012 | D-27 | Landscaping, Sidewalk | 1 | 0.017 | 34.00 | 68.00 | 2 | 0.017 | 34.00 | 68.00 | 68.00 | 0.00 |
| 5/5/2012 | D-27 | Landscaping, Sidewalk | 1 | 0.218 | 545.00 | 1090.01 | 2 | 0.215 | 537.50 | 1075.01 | 1082.51 | 10.61 |
| 5/17/2012 | D-27 | Landscaping, Sidewalk | 1 | 0.015 | 30.00 | 60.00 | 2 | 0.04 | 80.00 | 160.00 | 110.00 | 70.71 |
| 4/11/2012 | D-9 | Roadway | 1 | 0.086 | 215.00 | 430.01 | 2 | 0.065 | 162.50 | 325.01 | 377.51 | 74.25 |
| 4/24/2012 | D-9 | Roadway | 1 | 0.017 | 34.00 | 68.00 | 2 | 0.017 | 34.00 | 68.00 | 68.00 | 0.00 |
| 10/13/2011 | F-4 | Parking Lot | 1 | 0.022 | 55.00 | 110.00 | 2 | 0.024 | 60.00 | 120.00 | 115.00 | 7.07 |
| 10/25/2011 | F-4 | Parking Lot | 1 | 0.032 | 80.00 | 160.00 | 2 | 0.018 | 45.00 | 90.00 | 125.00 | 49.50 |
| 11/25/2011 | F-4 | Parking Lot | 1 | 0.006 | 15.00 | 30.00 | 2 | 0.006 | 15.00 | 30.00 | 30.00 | 0.00 |
| 1/27/2012 | F-4 | Parking Lot | 1 | 0.009 | 22.50 | 45.00 | 2 | 0.016 | 40.00 | 80.00 | 62.50 | 24.75 |
| 2/27/2012 | F-4 | Parking Lot | 1 | 0.012 | 24.00 | 48.00 | 2 | 0.015 | 30.00 | 60.00 | 54.00 | 8.49 |
| 3/26/2012 | F-4 | Parking Lot | 1 | 0.008 | 16.00 | 32.00 | 2 | 0.004 | 8.00 | 16.00 | 24.00 | 11.31 |
| 4/11/2012 | F-4 | Parking Lot | 1 | 0.197 | 492.50 | 985.01 | 2 | 0.139 | 347.50 | 695.01 | 840.01 | 205.06 |
| 4/24/2012 | F-4 | Parking Lot | 1 | 0.014 | 28.00 | 56.00 | 2 | 0.02 | 40.00 | 80.00 | 68.00 | 16.97 |
| 5/5/2012 | F-4 | Parking Lot | 1 | 0.013 | 26.00 | 52.00 | 2 | 0.016 | 32.00 | 64.00 | 58.00 | 8.49 |
| 10/13/2011 | G-2 | Parking Lot | 1 | 0.024 | 60.00 | 120.00 | 2 | 0.036 | 90.00 | 180.00 | 150.00 | 42.43 |
| 10/25/2011 | G-2 | Parking Lot | 1 | 0.01 | 25.00 | 50.00 | 2 | 0.008 | 20.00 | 40.00 | 45.00 | 7.07 |
| 11/25/2011 | G-2 | Parking Lot | 1 | 0.006 | 15.00 | 30.00 | 2 | 0.006 | 15.00 | 30.00 | 30.00 | 0.00 |
| 1/27/2012 | G-2 | Parking Lot | 1 | 0.003 | 7.50 | 15.00 | 2 | 0.004 | 10.00 | 20.00 | 17.50 | 3.54 |
| 2/27/2012 | G-2 | Parking Lot | 1 | 0.008 | 16.00 | 32.00 | 2 | 0.01 | 20.00 | 40.00 | 36.00 | 5.66 |
| 3/26/2012 | G-2 | Parking Lot | 1 | 0.014 | 28.00 | 56.00 | 2 | 0.012 | 24.00 | 48.00 | 52.00 | 5.66 |
| 4/11/2012 | G-2 | Parking Lot | 1 | 0.031 | 62.00 | 124.00 | 2 | 0.037 | 74.00 | 148.00 | 136.00 | 16.97 |
| 4/24/2012 | G-2 | Parking Lot | 1 | 0.004 | 8.00 | 16.00 | 2 | 0.003 | 6.00 | 12.00 | 14.00 | 2.83 |
| 5/5/2012 | G-2 | Parking Lot | 1 | 0.011 | 22.00 | 44.00 | 2 | 0.011 | 22.00 | 44.00 | 44.00 | 0.00 |
| 5/17/2012 | G-2 | Parking Lot | 1 | 0.082 | 205.00 | 410.01 | 2 | 0.081 | 202.50 | 405.01 | 407.51 | 3.54 |
| 11/25/2011 | Rain | | 1 | 0.002 | 5.00 | 10.00 | 2 | 0.002 | 5.00 | 10.00 | 10.00 | 0.00 |
| 1/27/2012 | Rain | | 1 | 0.001 | 2.50 | 5.00 | 2 | 0 | 0.00 | 0.00 | 2.50 | 3.54 |
| 2/27/2012 | Rain | | 1 | 0.006 | 12.00 | 24.00 | 2 | 0.006 | 12.00 | 24.00 | 24.00 | 0.00 |

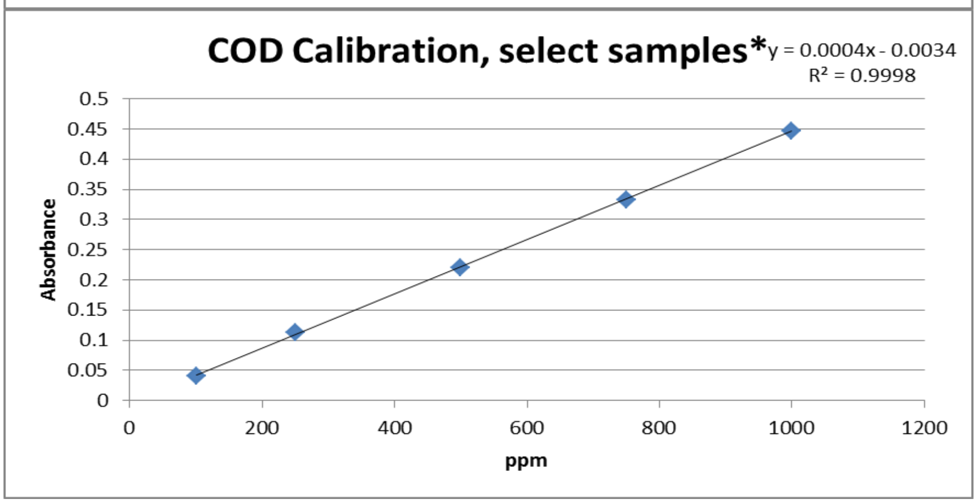
| Date | Sample | Type of Drain | Run | Read | ppm/2 | ppm | Run | Read | ppm/2 | ppm | Average | StDev |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3/26/2012 | Rain | | 1 | 0.007 | 14.00 | 28.00 | 2 | 0.006 | 12.00 | 24.00 | 26.00 | 2.83 |
| 4/11/2012 | Rain | | 1 | 0.003 | 6.00 | 12.00 | 2 | 0.003 | 6.00 | 12.00 | 12.00 | 0.00 |
| 4/24/2012 | Rain | | 1 | 0.013 | 26.00 | 52.00 | 2 | 0.009 | 18.00 | 36.00 | 44.00 | 11.31 |
| 5/5/2012 | Rain | | 1 | 0.003 | 6.00 | 12.00 | 2 | 0.003 | 6.00 | 12.00 | 12.00 | 0.00 |

Chemical oxygen demand standard curves for analytical comparison.

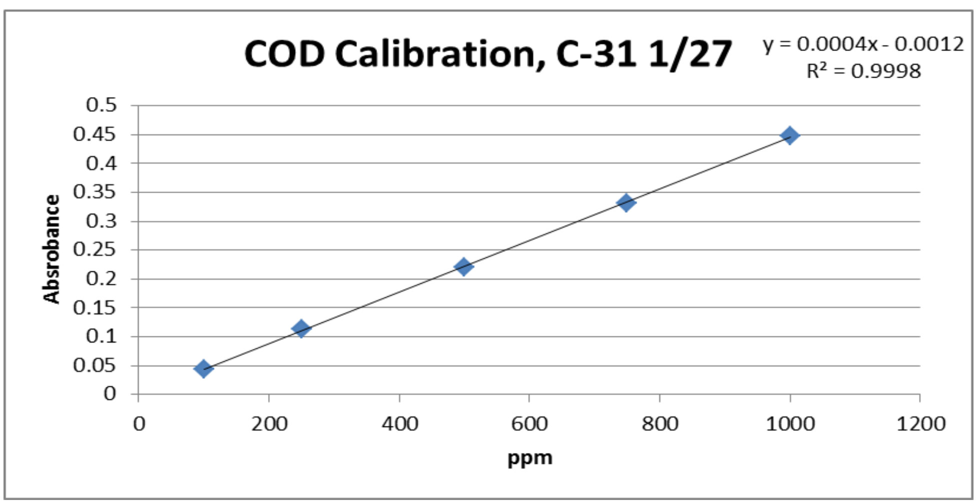





***C-31**: 10/13, 10/25, 3/26, 5/5, 5/17; **D-10**: 4/11, 4/24, 5/17; **D-9**: 4/11; **F-4**: 4/11; **C-20**: 4/24, 5/5, 5/17 **C-1**: 5/5, 5/17; **D-27**: 5/5; **G-2:** 5/17



## APPENDIX K

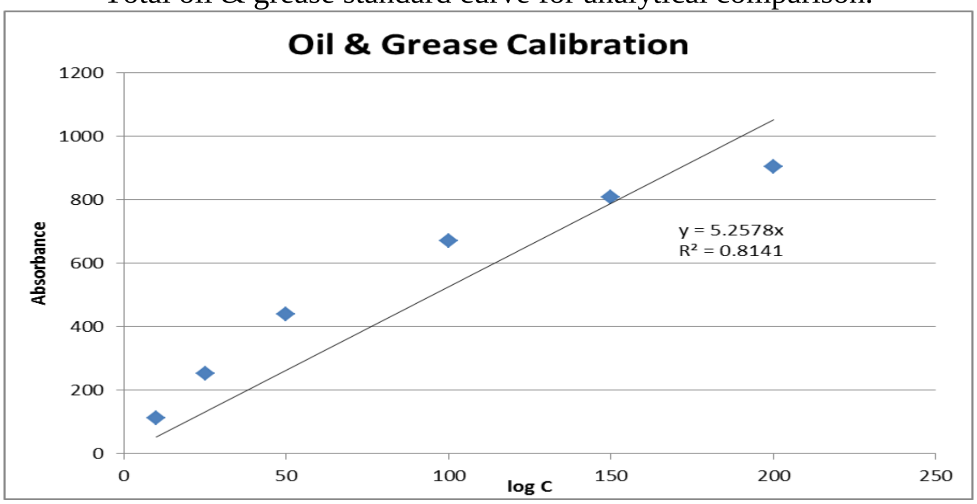
Raw data calculations for oil & grease.

| Date | Sample | Type of Drain | Absorbance | ppm |
|---|---|---|---|---|
| 10/13/2011 | A-28 | | 1 | 0.19 |
| 10/25/2011 | A-28 | | 0 | 0.00 |
| 11/23/2011 | A-28 | | 2 | 0.38 |
| 10/13/2011 | B-24 | Roadway | 0 | 0.00 |
| 10/25/2011 | B-24 | Roadway | 0 | 0.00 |
| 11/23/2011 | B-24 | Roadway | 2 | 0.38 |
| 1/27/2012 | B-24 | Roadway | 2 | 0.38 |
| 2/23/2012 | B-24 | Roadway | 1 | 0.19 |
| 3/26/2012 | B-24 | Roadway | 1 | 0.19 |
| 4/24/2012 | B-24 | Roadway | 1 | 0.19 |
| 5/5/2012 | B-24 | Roadway | 1 | 0.19 |
| 5/17/2012 | B-24 | Roadway | 1 | 0.19 |
| 10/13/2011 | C-1 | Roadway, Sidewalk | 0 | 0.00 |
| 10/25/2011 | C-1 | Roadway, Sidewalk | 1 | 0.19 |
| 11/23/2011 | C-1 | Roadway, Sidewalk | 0 | 0.00 |
| 1/27/2012 | C-1 | Roadway, Sidewalk | 3 | 0.57 |
| 2/23/2012 | C-1 | Roadway, Sidewalk | 0 | 0.00 |
| 3/26/2012 | C-1 | Roadway, Sidewalk | 0 | 0.00 |
| 4/11/2012 | C-1 | Roadway, Sidewalk | 0 | 0.00 |
| 4/24/2012 | C-1 | Roadway, Sidewalk | 0 | 0.00 |
| 5/5/2012 | C-1 | Roadway, Sidewalk | 1 | 0.19 |
| 11/23/2011 | C-20 | Roadway | 2 | 0.38 |
| 1/27/2012 | C-20 | Roadway | 2 | 0.38 |
| 2/23/2012 | C-20 | Roadway | 1 | 0.19 |
| 3/26/2012 | C-20 | Roadway | 1 | 0.19 |
| 4/11/2012 | C-20 | Roadway | 1 | 0.19 |
| 4/24/2012 | C-20 | Roadway | 0 | 0.00 |
| 5/5/2012 | C-20 | Roadway | 0 | 0.00 |
| 5/17/2012 | C-20 | Roadway | 0 | 0.00 |
| 10/13/2011 | C-31 | Loading Dock | 1 | 0.19 |
| 10/25/2011 | C-31 | Loading Dock | 1 | 0.19 |
| 11/23/2011 | C-31 | Loading Dock | 1 | 0.19 |
| 1/27/2012 | C-31 | Loading Dock | 1 | 0.19 |
| 2/23/2012 | C-31 | Loading Dock | 0 | 0.00 |
| 3/26/2012 | C-31 | Loading Dock | 1 | 0.19 |
| 4/11/2012 | C-31 | Loading Dock | 1 | 0.19 |
| 4/24/2012 | C-31 | Loading Dock | 0 | 0.00 |
| 5/5/2012 | C-31 | Loading Dock | 0 | 0.00 |

| Date | Sample | Type of Drain | Absorbance | ppm |
|---|---|---|---|---|
| 5/17/2012 | C-31 | Loading Dock | 1 | 0.19 |
| 5/17/2012 | C-31 | Loading Dock | 1 | 0.19 |
| 10/13/2011 | C-46 | Grass, Landscaping | 1 | 0.19 |
| 10/25/2011 | C-46 | Grass, Landscaping | 0 | 0.00 |
| 11/23/2011 | C-46 | Grass, Landscaping | 1 | 0.19 |
| 1/27/2012 | C-46 | Grass, Landscaping | 1 | 0.19 |
| 2/23/2012 | C-46 | Grass, Landscaping | 0 | 0.00 |
| 5/5/2012 | C-46 | Grass, Landscaping | 1 | 0.19 |
| 10/13/2011 | C-47 | Roadway | 1 | 0.19 |
| 10/25/2011 | C-47 | Roadway | 1 | 0.19 |
| 11/23/2011 | C-47 | Roadway | 1 | 0.19 |
| 1/27/2012 | C-47 | Roadway | 3 | 0.57 |
| 2/23/2012 | C-47 | Roadway | 0 | 0.00 |
| 3/26/2012 | C-47 | Roadway | 0 | 0.00 |
| 4/11/2012 | C-47 | Roadway | 0 | 0.00 |
| 4/24/2012 | C-47 | Roadway | 1 | 0.19 |
| 5/5/2012 | C-47 | Roadway | 0 | 0.00 |
| 11/23/2011 | D-10 | Roadway | 1 | 0.19 |
| 1/27/2012 | D-10 | Roadway | 1 | 0.19 |
| 2/23/2012 | D-10 | Roadway | 0 | 0.00 |
| 4/11/2012 | D-10 | Roadway | 0 | 0.00 |
| 5/5/2012 | D-10 | Roadway | 0 | 0.00 |
| 5/17/2012 | D-10 | Roadway | 2 | 0.38 |
| 10/13/2011 | D-27 | Landscaping, Sidewalk | 1 | 0.19 |
| 10/25/2011 | D-27 | Landscaping, Sidewalk | 1 | 0.19 |
| 11/23/2011 | D-27 | Landscaping, Sidewalk | 1 | 0.19 |
| 1/27/2012 | D-27 | Landscaping, Sidewalk | 3 | 0.57 |
| 2/23/2012 | D-27 | Landscaping, Sidewalk | 0 | 0.00 |
| 3/26/2012 | D-27 | Landscaping, Sidewalk | 1 | 0.19 |
| 4/24/2012 | D-27 | Landscaping, Sidewalk | 0 | 0.00 |
| 5/5/2012 | D-27 | Landscaping, Sidewalk | 0 | 0.00 |
| 5/17/2012 | D-27 | Landscaping, Sidewalk | 1 | 0.19 |
| 4/11/2012 | D-9 | Roadway | 0 | 0.00 |
| 4/24/2012 | D-9 | Roadway | 0 | 0.00 |
| 10/13/2011 | F-4 | Parking Lot | 0 | 0.00 |
| 10/25/2011 | F-4 | Parking Lot | 0 | 0.00 |
| 11/23/2011 | F-4 | Parking Lot | 1 | 0.19 |
| 1/27/2012 | F-4 | Parking Lot | 3 | 0.57 |
| 2/23/2012 | F-4 | Parking Lot | 0 | 0.00 |
| 3/26/2012 | F-4 | Parking Lot | 1 | 0.19 |

| Date | Sample | Type of Drain | Absorbance | ppm |
|---|---|---|---|---|
| 4/24/2012 | F-4 | Parking Lot | 1 | 0.19 |
| 5/5/2012 | F-4 | Parking Lot | 0 | 0.00 |
| 10/13/2011 | G-2 | Parking Lot | 0 | 0.00 |
| 10/25/2011 | G-2 | Parking Lot | 0 | 0.00 |
| 11/23/2011 | G-2 | Parking Lot | 0 | 0.00 |
| 1/27/2012 | G-2 | Parking Lot | 2 | 0.38 |
| 2/23/2012 | G-2 | Parking Lot | 1 | 0.19 |
| 3/26/2012 | G-2 | Parking Lot | 0 | 0.00 |
| 4/11/2012 | G-2 | Parking Lot | 1 | 0.19 |
| 4/24/2012 | G-2 | Parking Lot | 0 | 0.00 |
| 5/5/2012 | G-2 | Parking Lot | 1 | 0.19 |
| 5/17/2012 | G-2 | Parking Lot | 1 | 0.19 |
| 11/23/2011 | Rain | | 1 | 0.19 |
| 1/27/2012 | Rain | | 0 | 0.00 |
| 5/5/2012 | Rain | | 0 | 0.00 |

Total oil & grease standard curve for analytical comparison.



## APPENDIX L

Floating solids recorded observations.

| Date | Sample | Observations |
|---|---|---|
| 10/13/2011 | B-24 | a few leaves |
| 3/26/2012 | B-24 | many flowering buds |
| 4/24/2012 | B-24 | minimal seedlings |
| 5/17/2012 | B-24 | buds |
| 3/26/2012 | C-1 | flowering buds |
| 4/24/2012 | C-1 | buds, grass |
| 5/17/2012 | C-1 | one bud |
| 1/27/2012 | C-20 | 1 leaf |
| 3/26/2012 | C-20 | flowering buds, grass clippings, pine needles |
| 4/11/2012 | C-20 | grass clippings |
| 4/24/2012 | C-20 | buds, grass |
| 5/17/2012 | C-20 | leaves, grass |
| 1/27/2012 | C-31 | piece of bark |
| 3/26/2012 | C-31 | flowering buds, twigs |
| 4/24/2012 | C-31 | only a few buds, grass |
| 5/17/2012 | C-31 | small buds |
| 3/26/2012 | C-46 | flowering buds |
| 5/5/2012 | C-46 | a centipede, 1 blade of grass |
| 3/26/2012 | C-47 | flowering buds, stick |
| 4/24/2012 | C-47 | buds, leaves (new, green) |
| 4/11/2012 | D-10 | buds |
| 4/24/2012 | D-10 | buds, grass |
| 5/17/2012 | D-10 | buds |
| 10/13/2011 | D-27 | a few leaves |
| 3/26/2012 | D-27 | flowering buds |
| 4/24/2012 | D-27 | buds, grass |
| 4/24/2012 | D-27 | buds, grass |
| 5/17/2012 | D-27 | dead insects, buds, grass |
| 4/11/2012 | D-9 | flowering buds, gum wrapper |
| 4/24/2012 | D-9 | LOTS of flowering buds, grass |
| 10/13/2011 | F-4 | lots of leaves |
| 1/27/2012 | F-4 | 1 stick |
| 3/26/2012 | F-4 | flowering buds, stick |
| 4/11/2012 | F-4 | lots of grass, buds |
| 4/24/2012 | F-4 | buds, grass |
| 3/26/2012 | G-2 | flowering buds |
| 4/24/2012 | G-2 | buds, grass |
| 3/26/2012 | Rain | flowering buds |
| 4/24/2012 | Rain | lots of mosquitos, buds |
| 5/5/2012 | Rain | flies and maple helicopters |

## APPENDIX M

Raw data calculations for soluble metals. N/A = not analyzed.

| Date | Sample | Rep | Ag3280 | Al3944 | As1972 | Be3131 | Cd2265 | Co2307 | Cr2843 | Cu3247 | Fe2598 | Ni2316 | Pb2203 | Se2062 | V_2908 | Zn2138 | Mo3170 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10/13/2011 | **A-28** | **1** | 0.0134 | 0.5933 | 0.0029 | 0.0003 | 0.0045 | BDL | 0.0045 | 0.0452 | 21.37 | BDL | 0.0023 | 0.0187 | 0.0067 | 0.2353 | N/A |
| 10/13/2011 | **A-28** | **2** | 0.0144 | 1.307 | 0.0031 | 0.0005 | 0.0051 | BDL | 0.0057 | 0.0354 | 25.32 | BDL | 0.0059 | 0.0294 | 0.0027 | 0.3456 | N/A |
| 10/25/2011 | **A-28** | **1** | BDL | 5.244 | 0.0034 | 0.001 | BDL | 0.0019 | 0.0303 | 0.0645 | 11.97 | 0.0164 | 0.0406 | BDL | 0.0261 | 0.4937 | 0.0235 |
| 10/25/2011 | **A-28** | **2** | BDL | 5.132 | BDL | BDL | BDL | 0.0012 | 0.0092 | 0.0586 | 11.68 | 0.0161 | 0.0377 | BDL | 0.0071 | 0.4869 | BDL |
| 11/23/2011 | **A-28** | **1** | BDL | 0.0498 | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | 0.0216 | BDL |
| 11/23/2011 | **A-28** | **2** | BDL | 0.0823 | 0.0008 | BDL | BDL | BDL | 0.0013 | BDL | BDL | BDL | BDL | BDL | BDL | 0.0207 | BDL |
| 10/13/2011 | **B-24** | **1** | 0.0144 | 0.2285 | BDL | 0.0002 | 0.0001 | BDL | 0.0063 | 0.0583 | 0.6018 | BDL | 0.0041 | BDL | 0.0055 | 0.0916 | N/A |
| 10/13/2011 | **B-24** | **2** | 0.0135 | 0.2682 | 0.0019 | 0.0004 | 0.0015 | BDL | 0.0067 | 0.0712 | 0.8451 | BDL | 0.0046 | 0.0035 | 0.0068 | 0.1559 | N/A |
| 10/25/2011 | **B-24** | **1** | BDL | 1.286 | BDL | BDL | BDL | BDL | 0.0017 | 0.0128 | 2.476 | 0.0025 | 0.0097 | BDL | 0.0051 | 0.1808 | BDL |
| 10/25/2011 | **B-24** | **2** | BDL | 0.9251 | BDL | BDL | BDL | BDL | BDL | 0.0053 | 1.741 | 0.0008 | 0.004 | BDL | BDL | 0.1401 | BDL |
| 11/23/2011 | **B-24** | **1** | BDL | 0.076 | 0.0012 | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | 0.0238 | BDL |
| 11/23/2011 | **B-24** | **2** | BDL | 0.0749 | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | 0.0033 | 0.0265 | BDL |
| 1/27/2012 | **B-24** | **1** | BDL | 0.1699 | 0.0002 | BDL | BDL | BDL | BDL | BDL | 0.0502 | BDL | BDL | BDL | 0.0037 | BDL | BDL |
| 1/27/2012 | **B-24** | **2** | BDL | 0.169 | 0.0026 | BDL | BDL | BDL | BDL | BDL | 0.0367 | BDL | BDL | BDL | 0.0022 | BDL | BDL |
| 2/23/2012 | **B-24** | **1** | 0.034 | 1.799 | 0.0038 | BDL | BDL | BDL | 0.0023 | 0.0153 | 3.641 | 0.0022 | 0.0526 | BDL | 0.0011 | 0.1553 | BDL |
| 2/23/2012 | **B-24** | **2** | 0.0246 | 1.869 | 0.0035 | BDL | BDL | BDL | 0.0059 | 0.0132 | 3.732 | 0.0021 | 0.0536 | BDL | BDL | 0.1628 | BDL |
| 3/26/2012 | **B-24** | **1** | 0.0275 | 1.645 | 0.0035 | BDL | BDL | BDL | 0.0039 | 0.0289 | 4.717 | 0.0028 | 0.0077 | BDL | 0.001 | 0.1782 | BDL |
| 3/26/2012 | **B-24** | **2** | 0.0067 | 0.5771 | BDL | BDL | BDL | BDL | BDL | 0.0092 | 1.263 | BDL | 0.0035 | BDL | BDL | 0.067 | BDL |
| 4/24/2012 | **B-24** | **1** | 0.0072 | 0.5557 | 0.0034 | BDL | BDL | BDL | 0.0008 | 0.0108 | 1.187 | BDL | 0.0044 | BDL | 0.0004 | 0.0781 | 0.0122 |
| 4/24/2012 | **B-24** | **2** | 0.0183 | 0.5725 | 0.0021 | BDL | BDL | BDL | 0.001 | 0.0075 | 1.187 | BDL | 0.0056 | BDL | BDL | 0.0782 | BDL |
| 5/5/2012 | **B-24** | **1** | 0.0673 | 0.1345 | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | 0.0175 |
| 5/5/2012 | **B-24** | **2** | 0.0718 | 0.116 | BDL | BDL | BDL | BDL | 0.0031 | BDL | BDL | BDL | BDL | BDL | BDL | BDL | 0.0212 |
| 5/17/2012 | **B-24** | **1** | 0.0358 | 4.084 | 0.0015 | BDL | BDL | BDL | 0.0147 | 0.0852 | 11.81 | 0.0148 | 0.0336 | BDL | 0.0122 | 0.3815 | 0.0481 |
| 5/17/2012 | **B-24** | **2** | 0.0313 | 2.495 | 0.0005 | BDL | BDL | BDL | 0.0031 | 0.0495 | 4.565 | 0.0064 | 0.0192 | BDL | 0.0024 | 0.3549 | 0.0378 |
| 10/14/2011 | **C-1** | **1** | 0.0101 | 0.1631 | 0.0018 | 0.0004 | 0.0031 | BDL | 0.0047 | 0.0139 | 16.48 | BDL | BDL | 0.021 | 0.0037 | 0.0037 | N/A |

| Date | Sample | Rep | Ag3280 | Al3944 | As1972 | Be3131 | Cd2265 | Co2307 | Cr2843 | Cu3247 | Fe2598 | Ni2316 | Pb2203 | Se2062 | V_2908 | Zn2138 | Mo3170 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10/14/2011 | C-1 | 2 | 0.0086 | 0.1465 | 0.0017 | 0.0004 | 0.0031 | BDL | 0.003 | 0.0182 | 16.19 | BDL | 0.0006 | 0.0077 | 0.0021 | 0.0158 | N/A |
| 10/25/2011 | C-1 | 1 | BDL | 2.452 | 0.0016 | BDL | BDL | BDL | 0.0073 | 0.0333 | 4.612 | 0.008 | 0.0218 | BDL | 0.0044 | 0.6911 | 0.0191 |
| 10/25/2011 | C-1 | 2 | BDL | 2.461 | BDL | BDL | BDL | BDL | 0.0014 | 0.0368 | 4.591 | 0.0084 | 0.0232 | 0.0001 | 0.0045 | 0.7135 | BDL |
| 11/23/2011 | C-1 | 1 | BDL | 0.106 | 0.0097 | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | 0.0023 | 0.0043 | BDL |
| 11/23/2011 | C-1 | 2 | 0.0004 | 0.11 | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | 0.0021 | BDL |
| 1/27/2012 | C-1 | 1 | BDL | 0.1311 | 0.0015 | BDL | BDL | BDL | 0.0026 | BDL | 0.1533 | BDL | BDL | 0.0012 | 0.0105 | 0.0018 | BDL |
| 1/27/2012 | C-1 | 2 | BDL | 0.1402 | 0.002 | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | 0.0047 | BDL | 0.0047 | BDL |
| 2/23/2012 | C-1 | 1 | 0.0614 | 0.0709 | 0.0012 | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | 0.0387 |
| 2/23/2012 | C-1 | 2 | 0.0509 | 0.0541 | 0.0004 | BDL | BDL | BDL | 0.0023 | BDL | BDL | BDL | 0.0001 | BDL | BDL | BDL | BDL |
| 3/26/2012 | C-1 | 1 | 0.0141 | 1.186 | 0.0044 | BDL | BDL | BDL | 0.0191 | 0.0209 | 1.8 | BDL | 0.0113 | BDL | BDL | 0.2923 | BDL |
| 3/26/2012 | C-1 | 2 | 0.0175 | 0.7761 | 0.0021 | BDL | BDL | BDL | 0.0039 | 0.0121 | 1.095 | BDL | 0.0037 | BDL | BDL | 0.0829 | BDL |
| 4/11/2012 | C-1 | 1 | 0.0503 | 0.0689 | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | 0.0442 | BDL |
| 4/11/2012 | C-1 | 2 | 0.0483 | 0.0737 | BDL | BDL | BDL | BDL | BDL | BDL | 0.0037 | BDL | BDL | BDL | BDL | 0.0434 | BDL |
| 4/24/2012 | C-1 | 1 | 0.061 | 0.1 | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL |
| 4/24/2012 | C-1 | 2 | 0.0616 | 0.0878 | 0.003 | BDL | BDL | BDL | BDL | BDL | 0.0289 | BDL | BDL | BDL | BDL | BDL | 0.0067 |
| 5/5/2012 | C-1 | 1 | 0.059 | 0.1041 | BDL | BDL | BDL | BDL | BDL | 0.0015 | BDL | BDL | 0.0011 | BDL | BDL | BDL | 0.0079 |
| 5/5/2012 | C-1 | 2 | 0.0581 | 0.1319 | BDL | BDL | BDL | BDL | BDL | 0.0027 | BDL | BDL | 0.0016 | BDL | BDL | BDL | 0.0811 |
| 5/17/2012 | C-1 | 1 | 0 | 0.0606 | BDL | BDL | BDL | BDL | BDL | BDL | 0.1008 | BDL | BDL | BDL | BDL | 0.007 | 0.0247 |
| 5/17/2012 | C-1 | 2 | BDL | 0.0208 | BDL | BDL | BDL | BDL | BDL | BDL | 0.0114 | BDL | BDL | BDL | BDL | BDL | 0.0135 |
| 11/23/2011 | C-20 | 1 | BDL | 4.176 | BDL | BDL | BDL | BDL | 0.0106 | 0.0634 | 3.591 | 0.0077 | 0.0471 | BDL | 0.0059 | 0.519 | 0.0039 |
| 11/23/2011 | C-20 | 2 | BDL | 4.15 | BDL | BDL | BDL | BDL | 0.0079 | 0.0812 | 3.52 | 0.0071 | 0.0467 | BDL | 0.0026 | 0.5118 | BDL |
| 1/27/2012 | C-20 | 1 | BDL | 0.0957 | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | 0.0025 | 0.0056 | BDL |
| 1/27/2012 | C-20 | 2 | BDL | 0.0897 | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | 0 | 0.0089 | BDL |
| 2/23/2012 | C-20 | 1 | 0.0534 | 0.0723 | 0.0041 | BDL | BDL | BDL | BDL | 0.0025 | BDL | BDL | BDL | BDL | BDL | 0.009 | 0.0033 |
| 2/23/2012 | C-20 | 2 | 0.0599 | 0.0585 | 0.0017 | BDL | BDL | BDL | 0.0004 | 0.0007 | BDL | BDL | BDL | BDL | BDL | 0.0114 | BDL |
| 3/26/2012 | C-20 | 1 | 0.0125 | 0.2506 | BDL | BDL | BDL | BDL | BDL | 0.0068 | 0.2444 | BDL | 0.001 | BDL | BDL | 0.0526 | BDL |

| Date | Sample | Rep | Ag3280 | Al3944 | As1972 | Be3131 | Cd2265 | Co2307 | Cr2843 | Cu3247 | Fe2598 | Ni2316 | Pb2203 | Se2062 | V_2908 | Zn2138 | Mo3170 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3/26/2012 | **C-20** | **2** | 0.0094 | 0.2268 | 0.0026 | BDL | BDL | BDL | 0.0007 | 0.0042 | 0.2324 | BDL | 0.0013 | BDL | BDL | 0.0491 | BDL |
| 4/24/2012 | **C-20** | **1** | 0.0401 | 1.698 | 0.0015 | BDL | BDL | BDL | 0.0111 | 0.0027 | 3.295 | 0.0015 | 0.0021 | BDL | BDL | 0.1816 | BDL |
| 4/11/2012 | **C-20** | **1** | 0.0257 | 2.415 | 0.0026 | BDL | BDL | BDL | 0.0036 | 0.0258 | 2.227 | BDL | 0.0114 | BDL | BDL | 1.614 | BDL |
| 4/11/2012 | **C-20** | **2** | 0.0301 | 2.398 | 0.0003 | BDL | BDL | BDL | 0.0106 | 0.0271 | 2.208 | BDL | 0.0117 | BDL | BDL | 1.607 | BDL |
| 4/24/2012 | **C-20** | **2** | 0.0545 | 1.656 | 0.0024 | BDL | BDL | BDL | 0.0113 | 0.0012 | 2.869 | 0.0014 | 0.0015 | BDL | BDL | 0.1772 | BDL |
| 5/5/2012 | **C-20** | **1** | 0.065 | 0.1095 | 0.0065 | 0.0008 | BDL | BDL | 0.0029 | 0.005 | 0.012 | BDL | BDL | 0.2846 | BDL | 0.0004 | 0.0402 |
| 5/5/2012 | **C-20** | **2** | 0.0611 | 0.1222 | BDL | BDL | BDL | BDL | BDL | 0.0004 | 0.0111 | BDL | 0.0002 | BDL | BDL | BDL | BDL |
| 5/17/2012 | **C-20** | **1** | 0.0545 | 6.051 | BDL | BDL | BDL | BDL | 0.0203 | 0.0687 | 2.945 | 0.0065 | 0.0156 | BDL | 0.0056 | 0.3527 | BDL |
| 5/17/2012 | **C-20** | **2** | 0.0552 | 6.071 | BDL | BDL | BDL | BDL | 0.0186 | 0.0671 | 2.912 | 0.0062 | 0.015 | BDL | 0.0108 | 0.3514 | 0.062 |
| 10/13/2011 | **C-31** | **1** | 0.0097 | 2.48 | BDL | 0.0005 | 0.0036 | BDL | 0.0293 | 0.1191 | 13.55 | BDL | 0.0497 | BDL | 0.0234 | 0.8204 | N/A |
| 10/13/2011 | **C-31** | **2** | 0.0143 | 2.855 | 0.0054 | 0.0008 | 0.0041 | BDL | 0.0356 | 0.1371 | 15.39 | BDL | 0.0597 | 0.0222 | 0.0278 | 0.9158 | N/A |
| 10/25/2011 | **C-31** | **1** | BDL | 4.422 | 0.0161 | BDL | BDL | 0.0021 | 0.0037 | 0.0199 | 15.54 | 0.0161 | 0.0119 | BDL | 0.0074 | 0.2927 | 0.0079 |
| 10/25/2011 | **C-31** | **2** | BDL | 2.144 | BDL | BDL | BDL | BDL | 0.0066 | 0.0053 | 6.658 | 0.0043 | 0.0065 | BDL | 0.0006 | 0.1617 | BDL |
| 11/23/2011 | **C-31** | **1** | BDL | 3.773 | BDL | BDL | BDL | BDL | 0.0075 | 0.1761 | 2.306 | 0.0103 | 0.1234 | BDL | 0.0052 | 0.4622 | BDL |
| 11/23/2011 | **C-31** | **2** | BDL | 3.8 | BDL | BDL | BDL | 0 | 0.0139 | 0.173 | 2.359 | 0.0095 | 0.1227 | BDL | BDL | 0.4602 | BDL |
| 1/27/2012 | **C-31** | **1** | BDL | 0.2181 | 0.0056 | BDL | BDL | BDL | BDL | BDL | 0.1402 | BDL | BDL | BDL | 0.0051 | 0.0055 | BDL |
| 1/27/2012 | **C-31** | **2** | BDL | 0.224 | 0.003 | BDL | BDL | BDL | 0.0008 | BDL | 0.1404 | BDL | BDL | 0.0018 | 0.0039 | 0.0049 | BDL |
| 2/23/2012 | **C-31** | **1** | 0.0322 | 1.996 | BDL | BDL | BDL | BDL | 0.002 | 0.0293 | 1.641 | 0.0015 | 0.053 | BDL | BDL | 0.2597 | -0.015 |
| 2/23/2012 | **C-31** | **2** | 0.0434 | 2.338 | 0.0016 | BDL | BDL | BDL | 0.0053 | 0.0395 | 2.022 | 0.0033 | 0.06 | BDL | BDL | 0.3004 | BDL |
| 3/26/2012 | **C-31** | **1** | 0.0587 | 0.2381 | BDL | BDL | BDL | BDL | 0.0004 | BDL | 6.807 | 0.0031 | 0.0025 | BDL | BDL | 0.0735 | 0.0759 |
| 3/26/2012 | **C-31** | **2** | 0.0443 | 0.1966 | 0.002 | BDL | BDL | BDL | 0.0007 | BDL | 7.107 | 0.0031 | 0.003 | BDL | BDL | 0.0731 | BDL |
| 4/11/2012 | **C-31** | **1** | 0.0145 | 1.884 | 0.0052 | BDL | BDL | BDL | 0.006 | 0.0459 | 3.75 | 0.0037 | 0.0402 | BDL | BDL | 0.2721 | BDL |
| 4/11/2012 | **C-31** | **2** | 0.0134 | 1.888 | 0.0079 | BDL | BDL | BDL | 0.0054 | 0.0451 | 3.765 | 0.004 | 0.0409 | BDL | BDL | 0.2705 | BDL |
| 4/24/2012 | **C-31** | **1** | 0.028 | 3.923 | 0.0054 | BDL | BDL | BDL | 0.0036 | 0.0364 | 6.354 | 0.0129 | 0.0475 | BDL | 0.0026 | 0.8009 | 0.0168 |
| 4/24/2012 | **C-31** | **2** | 0.0297 | 3.945 | 0.0018 | BDL | BDL | BDL | 0.0101 | 0.0376 | 6.403 | 0.0128 | 0.0471 | BDL | 0.0033 | 0.7996 | BDL |
| 5/5/2012 | **C-31** | **1** | 0.0754 | 0.1819 | BDL | BDL | BDL | BDL | 0.0012 | BDL | 0.698 | BDL | 0.0018 | BDL | BDL | BDL | BDL |

| Date | Sample | Rep | Ag3280 | Al3944 | As1972 | Be3131 | Cd2265 | Co2307 | Cr2843 | Cu3247 | Fe2598 | Ni2316 | Pb2203 | Se2062 | V_2908 | Zn2138 | Mo3170 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5/5/2012 | **C-31** | **2** | 0.0639 | 0.1075 | 0.0002 | BDL | BDL | BDL | BDL | BDL | 0.5431 | BDL | 0.0011 | BDL | BDL | BDL | 0.0221 |
| 5/17/2012 | **C-31** | **1** | 0.0663 | 0.8575 | 0.0022 | BDL | 0.0018 | 0.0134 | 0.0097 | BDL | 48.6 | 0.0295 | 0.0112 | 0.0413 | BDL | 0.0273 | 0.2048 |
| 5/17/2012 | **C-31** | **2** | 0.0617 | 0.934 | 0.0042 | BDL | 0.0017 | 0.0131 | 0.0101 | BDL | 48.81 | 0.0287 | 0.0119 | 0.0175 | 0.0011 | 0.0176 | 0.1769 |
| 10/14/2011 | **C-46** | **1** | 0.0126 | 27.47 | 0.0234 | 0.0187 | 0.0167 | BDL | 0.0281 | 0.0897 | 15.55 | BDL | 0.237 | 0.0196 | 0.037 | 0.8195 | N/A |
| 10/14/2011 | **C-46** | **2** | 0.0093 | 28.2 | 0.0131 | 0.0071 | 0.0087 | BDL | 0.0157 | 0.0796 | 16.06 | BDL | 0.2308 | 0.0034 | 0.0276 | 0.822 | N/A |
| 10/25/2011 | **C-46** | **1** | BDL | 3.954 | 0.0007 | BDL | BDL | 0.0001 | BDL | 0.0071 | 2.977 | 0.0045 | 0.0329 | BDL | 0.002 | 0.0687 | BDL |
| 10/25/2011 | **C-46** | **2** | BDL | 3.904 | BDL | BDL | BDL | 0.0002 | BDL | 0.0052 | 2.995 | 0.0041 | 0.0334 | BDL | 0.0022 | 0.0661 | BDL |
| 11/23/2011 | **C-46** | **1** | BDL | 12.6 | 0.0057 | 0.0002 | 0.0003 | 0.0086 | 0.0059 | 0.0187 | 13.12 | 0.0198 | 0.068 | 0.0001 | 0.0164 | 0.3139 | BDL |
| 11/23/2011 | **C-46** | **2** | BDL | 12.58 | 0.0022 | 0.0002 | 0.0002 | 0.0083 | 0.005 | 0.0165 | 13.48 | 0.0199 | 0.0679 | BDL | 0.0194 | 0.3207 | 0.0039 |
| 1/27/2012 | **C-46** | **1** | BDL | 14.85 | BDL | 0.0019 | BDL | 0.0149 | 0.0029 | 0.0188 | 2.238 | 0.0212 | 0.0834 | BDL | 0.0011 | 0.3289 | BDL |
| 1/27/2012 | **C-46** | **2** | BDL | 7.258 | BDL | 0.0003 | BDL | 0.0052 | 0.0006 | 0.0111 | 0.5465 | 0.0071 | 0.0555 | BDL | BDL | 0.1546 | BDL |
| 2/23/2012 | **C-46** | **1** | 0.0115 | 4.304 | 0.0024 | BDL | BDL | BDL | 0.005 | 0.0176 | 3.122 | 0.0035 | 0.0423 | BDL | BDL | 0.0867 | 0.0114 |
| 2/23/2012 | **C-46** | **2** | 0.0053 | 4.485 | 0.0008 | BDL | BDL | BDL | 0.0035 | 0.0204 | 3.299 | 0.0036 | 0.0447 | BDL | BDL | 0.0897 | 0.0438 |
| 3/26/2012 | **C-46** | **1** | 0.0058 | 1.314 | BDL | BDL | BDL | BDL | 0.0021 | 0.0026 | 2.77 | BDL | 0.0076 | BDL | BDL | 0.0289 | BDL |
| 3/26/2012 | **C-46** | **2** | BDL | 1.307 | 0.0032 | BDL | BDL | BDL | 0.0005 | 0.0043 | 2.688 | BDL | 0.0089 | BDL | BDL | 0.0278 | BDL |
| 5/5/2012 | **C-46** | **1** | 0.0056 | 1.063 | 0.0006 | BDL | BDL | BDL | 0.0021 | 0.0175 | 3.835 | BDL | 0.0135 | 0.0039 | BDL | 0.0597 | 0.0003 |
| 5/5/2012 | **C-46** | **2** | 0.0049 | 1.074 | 0.0001 | BDL | BDL | BDL | BDL | 0.0147 | 3.853 | BDL | 0.0125 | BDL | 0.0006 | 0.0608 | 0.0425 |
| 10/14/2011 | **C-47** | **1** | 0.013 | 0.1299 | BDL | 0.0003 | 0.0006 | BDL | 0.0049 | 0.02 | 3.346 | BDL | 0.0014 | BDL | 0.0005 | 0.4981 | N/A |
| 10/14/2011 | **C-47** | **2** | 0.0081 | 0.1315 | 0.0005 | 0.0004 | 0.0007 | BDL | 0.0025 | 0.0216 | 3.576 | BDL | 0.0018 | BDL | BDL | 0.5018 | N/A |
| 10/25/2011 | **C-47** | **1** | BDL | 0.1275 | BDL | BDL | BDL | BDL | BDL | BDL | BDL | 0.0031 | BDL | BDL | 0.0012 | 0.3301 | BDL |
| 10/25/2011 | **C-47** | **2** | BDL | 0.0972 | BDL | BDL | BDL | BDL | BDL | BDL | BDL | 0.003 | BDL | BDL | 0.0037 | 0.3242 | BDL |
| 11/23/2011 | **C-47** | **1** | BDL | 0.0611 | BDL | BDL | BDL | BDL | 0.0005 | BDL | BDL | BDL | BDL | BDL | BDL | 0.0003 | BDL |
| 11/23/2011 | **C-47** | **2** | 0.0016 | 0.108 | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | 0.0013 | BDL |
| 1/27/2012 | **C-47** | **1** | 0.1396 | 0.1352 | 0.0006 | BDL | BDL | BDL | 0.0055 | BDL | 0.1266 | BDL | BDL | 0.0009 | 0.0013 | BDL | BDL |
| 1/27/2012 | **C-47** | **2** | 0.1084 | 0.124 | 0.0006 | BDL | BDL | BDL | 0.0023 | BDL | 0.1304 | BDL | BDL | BDL | BDL | BDL | 0.0144 |
| 2/23/2012 | **C-47** | **1** | 0.0415 | 2.452 | BDL | BDL | BDL | BDL | 0.0021 | 0.0275 | 0.4197 | BDL | 0.0231 | BDL | BDL | 0.3815 | 0.0306 |

| Date | Sample | Rep | Ag3280 | Al3944 | As1972 | Be3131 | Cd2265 | Co2307 | Cr2843 | Cu3247 | Fe2598 | Ni2316 | Pb2203 | Se2062 | V_2908 | Zn2138 | Mo3170 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2/23/2012 | **C-47** | **2** | 0.0506 | 2.436 | 0.0028 | BDL | BDL | BDL | 0.0025 | 0.0296 | 0.4755 | BDL | 0.022 | BDL | BDL | 0.3752 | 0.0408 |
| 3/26/2012 | **C-47** | **1** | 0.0421 | 1.515 | 0.0031 | BDL | BDL | BDL | 0.0114 | 0.0266 | 2.549 | BDL | 0.0158 | BDL | BDL | 0.2034 | BDL |
| 3/26/2012 | **C-47** | **2** | 0.0415 | 3.973 | BDL | BDL | BDL | BDL | 0.0075 | 0.0542 | 4.777 | 0.0058 | 0.03 | BDL | 0.0018 | 0.5835 | BDL |
| 4/11/2012 | **C-47** | **1** | 0.0345 | 2.033 | 0.002 | BDL | BDL | BDL | 0.0118 | 0.031 | 3.172 | 0.0013 | 0.0284 | BDL | BDL | 0.3935 | BDL |
| 4/11/2012 | **C-47** | **2** | 0.026 | 2.021 | 0.0026 | BDL | BDL | BDL | 0.0086 | 0.0335 | 3.165 | 0.0018 | 0.0291 | BDL | 0.0013 | 0.3941 | 0.0267 |
| 4/24/2012 | **C-47** | **1** | 0.0274 | 1.801 | 0.0035 | BDL | BDL | BDL | 0.014 | 0.0392 | 3.821 | 0.0031 | 0.0102 | BDL | 0.0036 | 0.3143 | BDL |
| 4/24/2012 | **C-47** | **2** | 0.0273 | 1.771 | BDL | BDL | BDL | BDL | 0.0107 | 0.0349 | 3.726 | 0.0032 | 0.0102 | BDL | 0.0007 | 0.3079 | 0.0022 |
| 5/5/2012 | **C-47** | **1** | 0.0618 | 0.121 | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL |
| 5/5/2012 | **C-47** | **2** | 0.0567 | 0.1138 | BDL | BDL | BDL | BDL | BDL | 0.0003 | BDL | BDL | BDL | BDL | BDL | BDL | BDL |
| 11/23/2011 | **D-10** | **1** | BDL | 0.0779 | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | 0.0045 | BDL |
| 11/23/2011 | **D-10** | **2** | BDL | 0.0616 | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | 0.0004 | 0.0054 | BDL |
| 1/27/2012 | **D-10** | **1** | 0.0816 | 0.0398 | 0.0048 | 0.0021 | 0.0005 | BDL | 0.0064 | BDL | BDL | BDL | 0.0026 | 0.0013 | 0.0064 | BDL | 0.0279 |
| 1/27/2012 | **D-10** | **2** | 0.0655 | 0.066 | 0.0026 | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | 0.004 | BDL | 0.044 |
| 2/23/2012 | **D-10** | **1** | 0.0697 | 0.0581 | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | 0.006 | BDL |
| 2/23/2012 | **D-10** | **2** | 0.0643 | 0.066 | 0 | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | 0.0079 | 0.008 |
| 4/11/2012 | **D-10** | **1** | 0.0462 | 1.905 | 0.0042 | BDL | BDL | BDL | 0.0026 | 0.0186 | 4.374 | 0.0035 | 0.0086 | BDL | BDL | 0.3524 | 0.0179 |
| 4/11/2012 | **D-10** | **2** | 0.051 | 1.927 | 0.0031 | BDL | BDL | BDL | 0.0029 | 0.0163 | 4.376 | 0.0034 | 0.0085 | BDL | BDL | 0.3466 | BDL |
| 4/24/2012 | **D-10** | **1** | 0.046 | 0.237 | 0.0044 | BDL | BDL | BDL | BDL | BDL | 4.098 | 0.0012 | 0.0017 | BDL | BDL | 0.0838 | 0.0459 |
| 4/24/2012 | **D-10** | **2** | 0.0363 | 0.263 | BDL | BDL | BDL | BDL | BDL | 0 | 3.908 | 0.0009 | 0.0024 | BDL | BDL | 0.1235 | BDL |
| 5/5/2012 | **D-10** | **1** | 0.0592 | 0.1269 | BDL | BDL | BDL | BDL | BDL | 0.0028 | 0.4176 | BDL | 0 | BDL | BDL | BDL | BDL |
| 5/5/2012 | **D-10** | **2** | 0.0649 | 0.1114 | BDL | BDL | BDL | BDL | BDL | BDL | 0.2683 | BDL | 0 | BDL | BDL | BDL | 0.0011 |
| 5/17/2012 | **D-10** | **1** | 0.0718 | 0.4686 | 0.0018 | BDL | BDL | BDL | BDL | 0.0008 | 18 | 0.0002 | 0.0017 | 0.0141 | BDL | 0.0012 | 0.0693 |
| 5/17/2012 | **D-10** | **2** | 0.0685 | 2.877 | 0.0022 | BDL | BDL | 0.005 | 0.0038 | 0.0159 | 16.15 | 0.0135 | 0.0181 | 0.0099 | 0.0054 | 0.8222 | 0.0569 |
| 10/13/2011 | **D-27** | **1** | 0.0145 | 0.3867 | 0.0011 | 0.0009 | 0.0008 | BDL | 0.0122 | 0.0734 | 0.9011 | BDL | 0.0055 | BDL | 0.0046 | 0.1047 | N/A |
| 10/13/2011 | **D-27** | **2** | 0.0146 | 0.3628 | 0.0022 | 0.0003 | 0.0003 | BDL | 0.0083 | 0.0524 | 0.8259 | BDL | 0.0043 | BDL | 0.0033 | 0.0928 | N/A |
| 10/25/2011 | **D-27** | **1** | BDL | 1.762 | 0.013 | BDL | BDL | BDL | 0.0047 | 0.0358 | 4.349 | 0.0063 | 0.057 | BDL | 0.0049 | 0.3369 | BDL |

| Date | Sample | Rep | Ag3280 | Al3944 | As1972 | Be3131 | Cd2265 | Co2307 | Cr2843 | Cu3247 | Fe2598 | Ni2316 | Pb2203 | Se2062 | V_2908 | Zn2138 | Mo3170 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10/25/2011 | **D-27** | **2** | BDL | 1.729 | BDL | BDL | BDL | BDL | 0.0088 | 0.0358 | 4.362 | 0.0062 | 0.0549 | BDL | 0.0003 | 0.3109 | BDL |
| 11/23/2011 | **D-27** | **1** | BDL | 2.224 | 0.0026 | BDL | BDL | BDL | 0.0026 | 0.0058 | 0.9891 | 0.0017 | 0.016 | BDL | 0.0021 | 0.1119 | BDL |
| 11/23/2011 | **D-27** | **2** | BDL | 2.13 | BDL | BDL | BDL | BDL | 0.0031 | 0.0106 | 0.9312 | 0.0007 | 0.0142 | BDL | 0.0007 | 0.1074 | BDL |
| 1/27/2012 | **D-27** | **1** | BDL | 0.0707 | 0.0043 | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL |
| 1/27/2012 | **D-27** | **2** | BDL | 0.1076 | 0.0043 | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | 0.0031 | BDL | BDL |
| 2/23/2012 | **D-27** | **1** | 0.0431 | 0.0601 | 0.0029 | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | 0.0032 | 0.0848 |
| 2/23/2012 | **D-27** | **2** | 0.0386 | 0.041 | 0.0053 | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | 0.0004 | 0.0078 |
| 3/26/2012 | **D-27** | **1** | BDL | 0.5357 | 0.0001 | BDL | BDL | BDL | 0.0014 | 0.0024 | 0.7377 | BDL | 0.002 | BDL | BDL | 0.0358 | BDL |
| 3/26/2012 | **D-27** | **2** | 0.0239 | 1.711 | 0.0051 | BDL | BDL | BDL | 0.0012 | 0.0031 | 4.352 | 0.0017 | 0.0023 | BDL | BDL | 0.2005 | 0.0091 |
| 4/24/2012 | **D-27** | **1** | 0.0203 | 3.686 | 0.0054 | BDL | BDL | BDL | 0.0068 | 0.0292 | 6.88 | 0.0041 | 0.0123 | BDL | 0.0053 | 0.2302 | 0.0741 |
| 4/24/2012 | **D-27** | **2** | 0.0328 | 3.676 | 0.0038 | BDL | BDL | BDL | 0.0058 | 0.0288 | 6.892 | 0.0039 | 0.011 | BDL | 0.001 | 0.2276 | BDL |
| 5/5/2012 | **D-27** | **1** | 0.0615 | 0.2094 | BDL | BDL | 0.0008 | 0.0058 | 0.0025 | BDL | 39.45 | 0.0103 | 0.0032 | 0.0491 | 0.001 | 0.0065 | 0.223 |
| 5/5/2012 | **D-27** | **2** | 0.0609 | 0.2288 | 0.0056 | BDL | 0.0008 | 0.0061 | 0.008 | BDL | 40.95 | 0.0101 | 0.0045 | 0.029 | 0.0045 | 0.0047 | 0.1625 |
| 5/17/2012 | **D-27** | **1** | 0.0289 | 5.053 | 0.0027 | BDL | BDL | 0.0052 | 0.0018 | 0.0186 | 5.129 | 0.0057 | 0.0367 | BDL | 0.0042 | 0.2259 | 0.0069 |
| 5/17/2012 | **D-27** | **2** | 0.0507 | 0.7919 | 0.0055 | BDL | 0.0024 | 0.0447 | 0.0034 | BDL | 57.98 | 0.0194 | 0.0059 | 0.0192 | BDL | 0.2633 | 0.1928 |
| 4/11/2012 | **D-9** | **1** | 0.0155 | 1.589 | 0.0021 | BDL | BDL | BDL | 0.0114 | 0.0825 | 4.331 | 0.0106 | 0.0147 | BDL | BDL | 0.6268 | BDL |
| 4/11/2012 | **D-9** | **2** | 0.0361 | 1.291 | BDL | BDL | BDL | BDL | BDL | 0.012 | 3.977 | 0.0012 | 0.0083 | BDL | BDL | 0.356 | BDL |
| 4/24/2012 | **D-9** | **1** | 0.0158 | 1.543 | 0.0007 | BDL | BDL | BDL | BDL | 0.0283 | 2.082 | BDL | 0.0049 | BDL | BDL | 0.2781 | BDL |
| 4/24/2012 | **D-9** | **2** | 0.0217 | 1.528 | 0.0012 | BDL | BDL | BDL | 0.0032 | 0.0259 | 2.069 | BDL | 0.0038 | BDL | BDL | 0.2768 | 0.016 |
| 10/13/2011 | **F-4** | **1** | 0.0105 | 1.258 | 0.0082 | 0.0005 | 0.001 | BDL | 0.0076 | 0.0683 | 3.356 | BDL | 0.0105 | 0.0084 | 0.0105 | 0.3479 | N/A |
| 10/13/2011 | **F-4** | **2** | 0.0108 | 1.419 | 0.0066 | 0.0002 | 0.0011 | BDL | 0.0105 | 0.0677 | 3.523 | BDL | 0.0144 | BDL | 0.008 | 0.3357 | N/A |
| 10/25/2011 | **F-4** | **1** | BDL | 2.223 | 0.0006 | BDL | BDL | BDL | 0.0102 | 0.0555 | 5.054 | 0.0055 | 0.0367 | BDL | 0.0049 | 0.3506 | BDL |
| 10/25/2011 | **F-4** | **2** | BDL | 2.208 | 0.0041 | BDL | BDL | BDL | 0.0063 | 0.0241 | 5.582 | 0.0545 | 0.0311 | BDL | 0.0076 | 0.4637 | 0.0132 |
| 11/23/2011 | **F-4** | **1** | BDL | 0.0296 | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | 0.0749 | BDL |
| 11/23/2011 | **F-4** | **2** | BDL | 0.0239 | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | 0.0686 | BDL |
| 1/27/2012 | **F-4** | **1** | 0.0001 | 0.1612 | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | 0.0018 | BDL | BDL | BDL |

| Date | Sample | Rep | Ag3280 | Al3944 | As1972 | Be3131 | Cd2265 | Co2307 | Cr2843 | Cu3247 | Fe2598 | Ni2316 | Pb2203 | Se2062 | V_2908 | Zn2138 | Mo3170 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1/27/2012 | **F-4** | **2** | BDL | 0.1488 | BDL | BDL | BDL | BDL | BDL | BDL | 0.0284 | BDL | BDL | BDL | BDL | 0.0032 | BDL |
| 2/23/2012 | **F-4** | **1** | 0.0147 | 1.517 | BDL | BDL | BDL | BDL | 0.0062 | 0.0034 | 2.12 | BDL | 0.0087 | BDL | BDL | 0.0907 | 0.0108 |
| 2/23/2012 | **F-4** | **2** | 0.0077 | 1.493 | 0.006 | BDL | BDL | BDL | 0.0078 | 0.007 | 2.124 | BDL | 0.0086 | BDL | BDL | 0.0904 | BDL |
| 3/26/2012 | **F-4** | **1** | 0.0141 | 0.2798 | 0.0051 | BDL | BDL | BDL | 0.0025 | BDL | 0.3142 | BDL | 0.0021 | BDL | BDL | 0.0448 | BDL |
| 3/26/2012 | **F-4** | **2** | 0.0024 | 0.2827 | 0.0028 | BDL | BDL | BDL | 0.0026 | BDL | 0.3018 | BDL | 0.0017 | BDL | BDL | 0.0462 | BDL |
| 4/11/2012 | **F-4** | **1** | 0.0423 | 0.1606 | 0.0029 | BDL | BDL | BDL | BDL | BDL | 5.412 | BDL | 0.002 | BDL | BDL | 0.0177 | 0.0057 |
| 4/11/2012 | **F-4** | **2** | 0.0614 | 0.1462 | 0.0044 | BDL | BDL | BDL | 0.0014 | BDL | 5.271 | BDL | 0.0021 | 0.0006 | BDL | 0.022 | 0.0271 |
| 4/24/2012 | **F-4** | **1** | 0.0351 | 2.869 | 0.0023 | BDL | BDL | BDL | 0.0101 | 0.0101 | 5.026 | 0.0034 | 0.0261 | BDL | BDL | 0.3871 | BDL |
| 4/24/2012 | **F-4** | **2** | 0.0279 | 2.855 | 0.0035 | BDL | BDL | BDL | 0.0167 | 0.0089 | 5.124 | 0.0034 | 0.0273 | BDL | 0.0011 | 0.3892 | BDL |
| 5/5/2012 | **F-4** | **1** | 0.0575 | 0.1142 | BDL | BDL | BDL | BDL | 0.0008 | BDL | BDL | BDL | BDL | BDL | 0 | 0.0174 | BDL |
| 5/5/2012 | **F-4** | **2** | 0.0561 | 0.0926 | BDL | BDL | BDL | BDL | BDL | 0.0015 | BDL | BDL | BDL | BDL | BDL | 0.0311 | 0.022 |
| 10/13/2011 | **G-2** | **1** | 0.0076 | 10.56 | 0.0089 | 0.0015 | 0.0095 | BDL | 0.0225 | 0.1949 | 21.75 | BDL | 0.0531 | 0.0395 | 0.0287 | 1.419 | N/A |
| 10/13/2011 | **G-2** | **2** | 0.0089 | 7.008 | 0.0037 | 0.0014 | 0.005 | BDL | 0.0148 | 0.0816 | 15.44 | BDL | 0.0282 | 0.0221 | 0.0177 | 0.8866 | N/A |
| 10/25/2011 | **G-2** | **1** | BDL | 0.3923 | BDL | BDL | BDL | BDL | BDL | 0.004 | 0.7941 | BDL | 0.0194 | BDL | 0.0005 | 0.1125 | BDL |
| 10/25/2011 | **G-2** | **2** | BDL | 0.4138 | BDL | BDL | BDL | BDL | BDL | 0.0046 | 0.7712 | BDL | 0.0203 | BDL | 0.0014 | 0.1258 | BDL |
| 11/23/2011 | **G-2** | **1** | BDL | 1.136 | BDL | BDL | BDL | BDL | 0.0001 | 0.0006 | 1.215 | 0.0143 | 0.0009 | BDL | 0.0014 | 0.0922 | BDL |
| 11/23/2011 | **G-2** | **2** | BDL | 1.12 | BDL | BDL | BDL | BDL | BDL | 0.0015 | 1.227 | 0.0144 | 0.0009 | BDL | 0.0015 | 0.0911 | 0.0108 |
| 1/27/2012 | **G-2** | **1** | BDL | 0.0696 | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | 0.0092 | BDL | 0.0038 | BDL |
| 1/27/2012 | **G-2** | **2** | BDL | 0.0653 | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | 0.0021 | BDL |
| 2/23/2012 | **G-2** | **1** | 0.0302 | 1.433 | 0.0029 | BDL | BDL | BDL | 0.0018 | 0.0099 | 2.295 | BDL | 0.0063 | BDL | BDL | 0.0986 | 0.0114 |
| 2/23/2012 | **G-2** | **2** | 0.0226 | 1.409 | 0.0012 | BDL | BDL | BDL | 0.0024 | 0.011 | 2.364 | BDL | 0.0061 | BDL | BDL | 0.0972 | BDL |
| 3/26/2012 | **G-2** | **1** | BDL | 0.0271 | 0.0048 | BDL | BDL | BDL | BDL | BDL | 0.1401 | BDL | BDL | BDL | BDL | 0.0468 | 0.0391 |
| 3/26/2012 | **G-2** | **2** | 0.0089 | 0.0135 | 0.0024 | BDL | BDL | BDL | 0.0024 | BDL | 0.0557 | BDL | BDL | BDL | BDL | 0.05 | BDL |
| 4/11/2012 | **G-2** | **1** | 0.0249 | 0.9183 | 0.0051 | BDL | BDL | BDL | 0.0064 | 0.0164 | 1.217 | 0.0014 | 0.0049 | BDL | 0.0007 | 0.1016 | BDL |
| 4/11/2012 | **G-2** | **2** | 0.0197 | 0.9459 | 0.0034 | BDL | BDL | BDL | 0.0088 | 0.0188 | 1.212 | 0.0014 | 0.0053 | BDL | 0.0009 | 0.1027 | BDL |
| 4/24/2012 | **G-2** | **1** | 0.0017 | 0.2182 | 0.0011 | BDL | BDL | BDL | BDL | BDL | 0.2294 | BDL | 0.0005 | BDL | BDL | 0.0338 | BDL |

| Date | Sample | Rep | Ag3280 | Al3944 | As1972 | Be3131 | Cd2265 | Co2307 | Cr2843 | Cu3247 | Fe2598 | Ni2316 | Pb2203 | Se2062 | V_2908 | Zn2138 | Mo3170 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4/24/2012 | G-2 | 2 | 0.0049 | 0.2054 | 0.0017 | BDL | BDL | BDL | BDL | 0.0016 | 0.2255 | BDL | BDL | BDL | BDL | 0.0331 | BDL |
| 5/5/2012 | G-2 | 1 | 0.0531 | 0.0987 | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | 0.0221 | 0.032 |
| 5/5/2012 | G-2 | 2 | 0.0487 | 0.7252 | 0.0015 | BDL | BDL | BDL | BDL | 0.0037 | 6.53 | 0.004 | 0.0054 | 0.0024 | BDL | 0.2037 | 0.0526 |
| 5/17/2012 | G-2 | 1 | 0.0237 | 0.8874 | 0.0251 | BDL | 0 | BDL | BDL | 0.0478 | 1.477 | BDL | BDL | 1.019 | BDL | 0.2605 | BDL |
| 5/17/2012 | G-2 | 2 | 0.0244 | 0.858 | BDL | BDL | BDL | BDL | 0.0067 | 0.0359 | 1.46 | 0.0107 | 0.0088 | BDL | 0.0142 | 0.2752 | 0.0033 |
| 11/23/2011 | Rain | 1 | BDL | 0.0354 | BDL | BDL | BDL | BDL | BDL | BDL | 0.0173 | BDL | BDL | BDL | BDL | 0.0515 | 0.0216 |
| 11/23/2011 | Rain | 2 | BDL | 0.0482 | BDL | BDL | BDL | BDL | BDL | 0.0007 | 0.0317 | BDL | BDL | BDL | BDL | 0.0555 | BDL |
| 1/27/2012 | Rain | 1 | BDL | 0.0506 | BDL | BDL | BDL | BDL | BDL | BDL | 0.4423 | BDL | BDL | BDL | 0.0022 | 0.042 | BDL |
| 1/27/2012 | Rain | 2 | BDL | 0.0218 | BDL | BDL | BDL | BDL | BDL | BDL | 0.0007 | BDL | BDL | BDL | BDL | 0.0269 | BDL |
| 2/23/2012 | RAIN | 1 | 0.0118 | 0.1405 | 0.003 | BDL | BDL | BDL | 0.0025 | BDL | 0.1043 | BDL | BDL | BDL | BDL | 0.0297 | 0.0124 |
| 2/23/2012 | RAIN | 2 | 0.0108 | 0.0837 | 0.0008 | BDL | BDL | BDL | 0.0014 | BDL | 0.0922 | BDL | BDL | BDL | BDL | 0.0293 | BDL |
| 4/24/2012 | RAIN | 1 | BDL | 0.0738 | -0.0029 | BDL | BDL | BDL | BDL | BDL | 0.0623 | BDL | BDL | BDL | BDL | 0.0296 | BDL |
| 4/24/2012 | RAIN | 2 | 0.0068 | 0.0767 | 0.0007 | BDL | BDL | BDL | BDL | BDL | 0.0464 | BDL | BDL | BDL | BDL | 0.0296 | BDL |
| 5/5/2012 | RAIN | 1 | BDL | 0.0536 | BDL | BDL | BDL | BDL | BDL | 0.0022 | BDL | BDL | BDL | BDL | BDL | 0.019 | 0.0369 |
| 5/5/2012 | Rain | 2 | BDL | 0.0329 | 0.0021 | BDL | BDL | BDL | BDL | 0.0018 | BDL | BDL | BDL | BDL | BDL | 0.0062 | 0.0072 |
| 11/23/2011 | B-24 1 ppm SPI | | 0.0884 | 1.092 | 1.089 | 1.084 | 0.9685 | 1.053 | 0.9489 | 0.9849 | 0.9726 | 1.028 | 1.031 | 1.039 | 0.9702 | 1.107 | 1.153 |
| 5/5/2012 | C-1 1ppm SPK | | 0.9761 | 1.204 | 0.9637 | 0.9523 | 0.882 | 0.8929 | 0.9177 | 0.9728 | 5.553 | 0.8841 | 0.8808 | 0.8177 | 0.9784 | 0.9196 | 0.8255 |
| 3/26/2012 | C-20 1 PPM SPIK | | 0.7377 | 1.142 | 0.9617 | 1.026 | 0.8797 | 0.9228 | 0.8669 | 0.916 | 1.095 | 0.8972 | 0.9137 | 0.8942 | 0.8691 | 0.975 | 1.033 |
| 5/17/2012 | C-20 1ppm SPK | | 0.9583 | 7.021 | 0.946 | 0.9324 | 0.8295 | 0.8427 | 0.9289 | 1.033 | 3.945 | 0.8342 | 0.6839 | 0.841 | 0.971 | 1.214 | 0.8969 |
| 1/27/2012 | C-31 1 ppm SPIK | | 1.519 | 1.236 | 1.044 | 1.003 | 0.6907 | 0.7454 | 0.897 | 0.9708 | 1.097 | 0.7061 | 0.6149 | 0.8375 | 0.9297 | 0.9557 | 1.093 |
| 2/23/2012 | C-46 1 PPM SPIK | | 0.3831 | 5.345 | 0.9471 | 0.9932 | 0.9177 | 0.9495 | 0.8806 | 0.9205 | 4.378 | 0.9369 | 0.9912 | 0.9206 | 0.8752 | 1.055 | 0.9459 |
| 4/11/2012 | D-10 1 PPM SPK | | 0.6414 | 2.998 | 0.9551 | 1.016 | 0.8432 | 0.8936 | 0.852 | 0.9142 | 5.509 | 0.8664 | 0.8933 | 0.8876 | 0.8686 | 1.227 | 1.049 |
| 4/24/2012 | D-27 1 PPM SPK | | 0.9765 | 4.525 | 0.9491 | 0.9942 | 0.8583 | 0.9083 | 0.8525 | 0.9136 | 7.707 | 0.8913 | 0.911 | 0.8834 | 0.8587 | 1.129 | 0.9786 |
| 10/13/2011 | G-2 2ppm spike | | 2.657 | 9.043 | 2.721 | 2.155 | 2.758 | 2.447 | 2.483 | 2.586 | 17.22 | 2.582 | 2.531 | 3.313 | 2.622 | 4.171 | N/A |
| 10/25/2011 | G-2 1 ppm SPIK | | 0.6699 | 1.4 | 1.12 | 1.084 | 1.013 | 1.111 | 0.9549 | 1.01 | 1.752 | 1.087 | 1.101 | 1.12 | 0.9626 | 1.217 | 1.146 |

## APPENDIX N

Raw data calculations for bacteria.

| Date | Sample | Volume of Water Used (mL) | Count/Observations | Per 100 mL | Average |
|---|---|---|---|---|---|
| 10/13/2011 | A-28 | 0.1 | 30 | 30000 | 30000 |
| 10/13/2011 | A-28 | 1 | 120 | 12000 | |
| 10/13/2011 | A-28 | 10 | TNTC | TNTC | |
| 10/13/2011 | A-28 | 50 | TNTC | TNTC | |
| 10/13/2011 | A-28 | 100 | TNTC | TNTC | |
| 10/25/2011 | A-28 | 0.1 | 10 | 10000 | *1500 |
| 10/25/2011 | A-28 | 1 | 15 | 1500 | |
| 10/25/2011 | A-28 | 10 | TNTC blue, pink | TNTC | |
| 10/25/2011 | A-28 | 50 | TNTC blue, pink | TNTC | |
| 10/25/2011 | A-28 | 100 | TNTC blue | TNTC | |
| 10/13/2011 | B-24 | 0.1 | 95 | 95000 | *95000 |
| 10/13/2011 | B-24 | 1 | TNTC | TNTC | |
| 10/13/2011 | B-24 | 10 | TNTC | TNTC | |
| 10/13/2011 | B-24 | 50 | TNTC | TNTC | |
| 10/13/2011 | B-24 | 100 | TNTC | TNTC | |
| 10/25/2011 | B-24 | 0.1 | 2 | 2000 | 162.3333 |
| 10/25/2011 | B-24 | 1 | 5 | 500 | |
| 10/25/2011 | B-24 | 10 | 38 | 380 | |
| 10/25/2011 | B-24 | 50 | 40 | 80 | |
| 10/25/2011 | B-24 | 100 | 27 | 27 | |
| 2/24/2012 | B-24 | 0.1 | 0 | 0 | *1700 |
| 2/24/2012 | B-24 | 1 | 17 | 1700 | |
| 2/24/2012 | B-24 | 10 | 0 | 0 | |
| 2/24/2012 | B-24 | 50 | TNTC/284 | TNTC | |
| 3/26/2012 | B-24 | 0.1 | 12 | 12000 | *12000 |
| 3/26/2012 | B-24 | 1 | TNTC | TNTC | |
| 3/26/2012 | B-24 | 10 | 3 | 30 | |
| 3/26/2012 | B-24 | 50 | 0 | 0 | |
| 4/24/2012 | B-24 | 0.1 | 92 | 92000 | 2540 |
| 4/24/2012 | B-24 | 1 | 43 | 4300 | |
| 4/24/2012 | B-24 | 10 | 78 | 780 | |
| 4/24/2012 | B-24 | 25 | 97 | 388 | |
| 5/5/2012 | B-24 | 0.1 | 47 | 47000 | 47000 |
| 5/5/2012 | B-24 | 1 | TNTC | TNTC | |
| 5/5/2012 | B-24 | 10 | TNTC (edge) | TNTC | |
| 5/5/2012 | B-24 | 25 | TNTC (edge) | TNTC | |
| 5/17/2012 | B-24 | 0.01 | 156 | 1560000 | 2730 |

| Date | Sample | Volume of Water Used (mL) | Count/Observations | Per 100 mL | Average |
|---|---|---|---|---|---|
| 5/17/2012 | B-24 | 0.1 | TNTC | TNTC | |
| 5/17/2012 | B-24 | 1 | 49 | 4900 | |
| 5/17/2012 | B-24 | 5 | 28 | 560 | |
| 10/14/2011 | C-1 | 0.1 | TNTC blue | TNTC | TNTC |
| 10/14/2011 | C-1 | 1 | TNTC pink | TNTC | |
| 10/14/2011 | C-1 | 10 | TNTC pink | TNTC | |
| 10/14/2011 | C-1 | 50 | TNTC pink | TNTC | |
| 10/14/2011 | C-1 | 100 | TNTC pink | TNTC | |
| 10/25/2011 | C-1 | 0.1 | 19 | 19000 | 2500 |
| 10/25/2011 | C-1 | 1 | 25 | 2500 | |
| 10/25/2011 | C-1 | 10 | 1 quadrant blue, TNTC pink | TNTC | |
| 10/25/2011 | C-1 | 50 | TNTC blue | TNTC | |
| 10/25/2011 | C-1 | 100 | TNTC blue | TNTC | |
| 2/24/2012 | C-1 | 0.1 | 0 | 0 | *100 |
| 2/24/2012 | C-1 | 1 | 2 | 200 | |
| 2/24/2012 | C-1 | 10 | 10 | 100 | |
| 2/24/2012 | C-1 | 50 | TNTC/26 | TNTC | |
| 2/24/2012 | C-1 | 100 | TNTC/19 | TNTC | |
| 3/26/2012 | C-1 | 0.1 | 26 | 26000 | 26000 |
| 3/26/2012 | C-1 | 1 | 0 | 0 | |
| 3/26/2012 | C-1 | 10 | 0 | 0 | |
| 3/26/2012 | C-1 | 50 | 0 | 0 | |
| 4/11/2012 | C-1 | 0.1 | 6 | 6000 | *1500 |
| 4/11/2012 | C-1 | 1 | 15 | 1500 | |
| 4/11/2012 | C-1 | 10 | TNTC | TNTC | |
| 4/11/2012 | C-1 | 50 | TNTC | TNTC | |
| 4/24/2012 | C-1 | 0.1 | 121 | 121000 | 281 |
| 4/24/2012 | C-1 | 1 | 87 | 8700 | |
| 4/24/2012 | C-1 | 10 | 39 | 390 | |
| 4/24/2012 | C-1 | 25 | 43 | 172 | |
| 5/5/2012 | C-1 | 0.1 | 48 | 48000 | 24250 |
| 5/5/2012 | C-1 | 1 | 154 | 15400 | |
| 5/5/2012 | C-1 | 10 | 50 | 500 | |
| 5/5/2012 | C-1 | 25 | 81 | 324 | |
| 5/17/2012 | C-1 | 0.01 | 56 | 560000 | 153725 |
| 5/17/2012 | C-1 | 0.1 | 49 | 49000 | |
| 5/17/2012 | C-1 | 1 | 45 | 4500 | |
| 5/17/2012 | C-1 | 5 | 70 | 1400 | |
| 2/24/2012 | C-20 | 0.1 | 0 | 0 | *1600 |

| Date | Sample | Volume of Water Used (mL) | Count/Observations | Per 100 mL | Average |
|---|---|---|---|---|---|
| 2/24/2012 | C-20 | 1 | 16 | 1600 | |
| 2/24/2012 | C-20 | 10 | 9 | 90 | |
| 2/24/2012 | C-20 | 50 | TNTC/8 | TNTC | |
| 3/26/2012 | C-20 | 0.1 | 56 | 56000 | 30850 |
| 3/26/2012 | C-20 | 1 | 57 | 5700 | |
| 3/26/2012 | C-20 | 10 | 16 | 160 | |
| 3/26/2012 | C-20 | 50 | 18 | 36 | |
| 4/11/2012 | C-20 | 0.1 | 9 | 9000 | 6100 |
| 4/11/2012 | C-20 | 1 | 61 | 6100 | |
| 4/11/2012 | C-20 | 10 | TNTC | TNTC | |
| 4/11/2012 | C-20 | 50 | TNTC | TNTC | |
| 4/24/2012 | C-20 | 0.1 | 51 | 51000 | 25680 |
| 4/24/2012 | C-20 | 1 | tntc edge (tntc pink) | TNTC | |
| 4/24/2012 | C-20 | 10 | 36 | 360 | |
| 4/24/2012 | C-20 | 25 | 11 | 44 | |
| 5/5/2012 | C-20 | 0.1 | 92 | 92000 | 92000 |
| 5/5/2012 | C-20 | 1 | 14 | 1400 | |
| 5/5/2012 | C-20 | 10 | 2 | 20 | |
| 5/5/2012 | C-20 | 25 | TNTC pink | TNTC | |
| 5/17/2012 | C-20 | 0.01 | 2 | 20000 | 2400 |
| 5/17/2012 | C-20 | 0.1 | 0 | 0 | |
| 5/17/2012 | C-20 | 1 | 24 | 2400 | |
| 5/17/2012 | C-20 | 5 | 17 | 340 | |
| 10/13/2011 | C-31 | 0.1 | TNTC | TNTC | TNTC |
| 10/13/2011 | C-31 | 1 | TNTC | TNTC | |
| 10/13/2011 | C-31 | 10 | TNTC | TNTC | |
| 10/13/2011 | C-31 | 50 | TNTC | TNTC | |
| 10/13/2011 | C-31 | 100 | TNTC | TNTC | |
| 10/25/2011 | C-31 | 0.1 | TNTC pink | TNTC | TNTC |
| 10/25/2011 | C-31 | 1 | TNTC blue | TNTC | |
| 10/25/2011 | C-31 | 10 | TNTC blue & pink | TNTC | |
| 10/25/2011 | C-31 | 50 | TNTC blue | TNTC | |
| 10/25/2011 | C-31 | 100 | TNTC blue | TNTC | |
| 2/24/2012 | C-31 | 0.1 | 2 | 2000 | 90 |
| 2/24/2012 | C-31 | 1 | 3 | 300 | |
| 2/24/2012 | C-31 | 10 | 9 | 90 | |
| 2/24/2012 | C-31 | 50 | 0 | 0 | |
| 3/26/2012 | C-31 | 0.1 | 56 | 56000 | 56000 |
| 3/26/2012 | C-31 | 1 | 0 | 0 | |

| Date | Sample | Volume of Water Used (mL) | Count/Observations | Per 100 mL | Average |
|---|---|---|---|---|---|
| 3/26/2012 | C-31 | 10 | 0 | 0 | |
| 3/26/2012 | C-31 | 50 | 0 | 0 | |
| 4/11/2012 | C-31 | 0.1 | 2 | 2000 | 2300 |
| 4/11/2012 | C-31 | 1 | 23 | 2300 | |
| 4/11/2012 | C-31 | 10 | TNTC | TNTC | |
| 4/11/2012 | C-31 | 50 | TNTC | TNTC | |
| 4/24/2012 | C-31 | 0.1 | tntc | TNTC | TNTC |
| 4/24/2012 | C-31 | 1 | tntc | TNTC | |
| 4/24/2012 | C-31 | 10 | tntc | TNTC | |
| 4/24/2012 | C-31 | 25 | tntc | TNTC | |
| 5/5/2012 | C-31 | 0.1 | 55 | 55000 | 18610.67 |
| 5/5/2012 | C-31 | 1 | 140 | 14000 | |
| 5/5/2012 | C-31 | 10 | 66 | 660 | |
| 5/5/2012 | C-31 | 25 | 43 | 172 | |
| 5/17/2012 | C-31 | 0.01 | 75 | 750000 | 750000 |
| 5/17/2012 | C-31 | 0.1 | 94 | 94000 | |
| 5/17/2012 | C-31 | 1 | TNTC (edge), TNTC pink | TNTC | |
| 5/17/2012 | C-31 | 5 | 96 | 1920 | |
| 10/14/2011 | C-46 | 0.1 | 37 | 37000 | 19750 |
| 10/14/2011 | C-46 | 1 | 25 | 2500 | |
| 10/14/2011 | C-46 | 10 | TNTC pink | TNTC | |
| 10/14/2011 | C-46 | 50 | (did not drain) | N/A | |
| 10/14/2011 | C-46 | 100 | (did not drain) | N/A | |
| 10/25/2011 | C-46 | 0.1 | 4 | 4000 | *1800 |
| 10/25/2011 | C-46 | 1 | 18 | 1800 | |
| 10/25/2011 | C-46 | 10 | TNTC blue, pink | TNTC | |
| 10/25/2011 | C-46 | 50 | TNTC blue, pink | TNTC | |
| 10/25/2011 | C-46 | 100 | TNTC blue, pink | TNTC | |
| 2/24/2012 | C-46 | 0.1 | 49 | 49000 | 49000 |
| 2/24/2012 | C-46 | 1 | TNTC | TNTC | |
| 2/24/2012 | C-46 | 10 | TNTC | TNTC | |
| 2/24/2012 | C-46 | 50 | TNTC | TNTC | |
| 3/26/2012 | C-46 | 0.1 | 23 | 23000 | 8823.333 |
| 3/26/2012 | C-46 | 1 | 31 | 3100 | |
| 3/26/2012 | C-46 | 10 | 37 | 370 | |
| 3/26/2012 | C-46 | 50 | 1 | 2 | |
| 5/5/2012 | C-46 | 0.1 | 88 | 88000 | *88000 |
| 5/5/2012 | C-46 | 1 | TNTC edge | TNTC | |
| 5/5/2012 | C-46 | 10 | TNTC edge | TNTC | |

| Date | Sample | Volume of Water Used (mL) | Count/Observations | Per 100 mL | Average |
|---|---|---|---|---|---|
| 5/5/2012 | C-46 | 25 | TNTC edge | TNTC | |
| 10/14/2011 | C-47 | 0.1 | 15 | 15000 | 15000 |
| 10/14/2011 | C-47 | 1 | TNTC pink | TNTC | |
| 10/14/2011 | C-47 | 10 | TNTC blue | TNTC | |
| 10/14/2011 | C-47 | 50 | TNTC pink | TNTC | |
| 10/14/2011 | C-47 | 100 | TNTC blue | TNTC | |
| 10/25/2011 | C-47 | 0.1 | TNTC blue | TNTC | 2500 |
| 10/25/2011 | C-47 | 1 | 25 | 2500 | |
| 10/25/2011 | C-47 | 10 | TNTC pink | TNTC | |
| 10/25/2011 | C-47 | 50 | TNTC blue | TNTC | |
| 10/25/2011 | C-47 | 100 | TNTC both | TNTC | |
| 2/24/2012 | C-47 | 0.1 | 3 | 3000 | 580 |
| 2/24/2012 | C-47 | 1 | 12 | 1200 | |
| 2/24/2012 | C-47 | 10 | 58 | 580 | |
| 2/24/2012 | C-47 | 50 | TNTC/55 | TNTC | |
| 3/26/2012 | C-47 | 0.1 | 80 | 80000 | 27736.67 |
| 3/26/2012 | C-47 | 1 | 30 | 3000 | |
| 3/26/2012 | C-47 | 10 | 21 | 210 | |
| 3/26/2012 | C-47 | 50 | 3 | 6 | |
| 4/11/2012 | C-47 | 0.1 | 3 | 3000 | *3000 |
| 4/11/2012 | C-47 | 1 | 7 | 700 | |
| 4/11/2012 | C-47 | 10 | TNTC | TNTC | |
| 4/11/2012 | C-47 | 50 | TNTC | TNTC | |
| 4/24/2012 | C-47 | 0.1 | 43 | 43000 | 24050 |
| 4/24/2012 | C-47 | 1 | 51 | 5100 | |
| 4/24/2012 | C-47 | 10 | 19 | 190 | |
| 4/24/2012 | C-47 | 25 | 9 | 36 | |
| 5/5/2012 | C-47 | 0.1 | 45 | 45000 | 45000 |
| 5/5/2012 | C-47 | 1 | 120 | 12000 | |
| 5/5/2012 | C-47 | 10 | TNTC | TNTC | |
| 5/5/2012 | C-47 | 25 | TNTC | TNTC | |
| 2/24/2012 | D-10 | 0.1 | 0 | 0 | 260 |
| 2/24/2012 | D-10 | 1 | 7 | 700 | |
| 2/24/2012 | D-10 | 10 | 42 | 420 | |
| 2/24/2012 | D-10 | 50 | 50 | 100 | |
| 4/11/2012 | D-10 | 0.1 | 9 | 9000 | 7500 |
| 4/11/2012 | D-10 | 1 | 75 | 7500 | |
| 4/11/2012 | D-10 | 10 | TNTC | TNTC | |
| 4/11/2012 | D-10 | 50 | TNTC | TNTC | |

| Date | Sample | Volume of Water Used (mL) | Count/Observations | Per 100 mL | Average |
|---|---|---|---|---|---|
| 4/24/2012 | D-10 | 0.1 | 72 | 72000 | 26100 |
| 4/24/2012 | D-10 | 1 | 60 | 6000 | |
| 4/24/2012 | D-10 | 10 | 90 | 900 | |
| 4/24/2012 | D-10 | 25 | 75 | 300 | |
| 5/5/2012 | D-10 | 0.1 | 55 | 55000 | 18605.33 |
| 5/5/2012 | D-10 | 1 | 196 | 19600 | |
| 5/5/2012 | D-10 | 10 | 66 | 660 | |
| 5/5/2012 | D-10 | 25 | 39 | 156 | |
| 5/17/2012 | D-10 | 0.01 | 17 | 170000 | 21000 |
| 5/17/2012 | D-10 | 0.1 | 21 | 21000 | |
| 5/17/2012 | D-10 | 1 | TNTC (edge), TNTC pink | TNTC | |
| 5/17/2012 | D-10 | 5 | 85 | 1700 | |
| 10/13/2011 | D-27 | 0.1 | 8 | 8000 | 3493.333 |
| 10/13/2011 | D-27 | 1 | 19 | 1900 | |
| 10/13/2011 | D-27 | 10 | 58 | 580 | |
| 10/13/2011 | D-27 | 50 | TNTC | TNTC | |
| 10/13/2011 | D-27 | 100 | TNTC | TNTC | |
| 10/25/2011 | D-27 | 0.1 | 34 | 34000 | 34000 |
| 10/25/2011 | D-27 | 1 | TNTC blue/pink | TNTC | |
| 10/25/2011 | D-27 | 10 | TNTC blue | TNTC | |
| 10/25/2011 | D-27 | 50 | TNTC blue | TNTC | |
| 10/25/2011 | D-27 | 100 | TNTC blue | TNTC | |
| 2/24/2012 | D-27 | 0.1 | 10 | 10000 | 3400 |
| 2/24/2012 | D-27 | 1 | 34 | 3400 | |
| 2/24/2012 | D-27 | 10 | | 0 | |
| 2/24/2012 | D-27 | 50 | TNTC/3 | TNTC | |
| 3/26/2012 | D-27 | 0.1 | 16 | 16000 | 420 |
| 3/26/2012 | D-27 | 1 | 96 | 9600 | |
| 3/26/2012 | D-27 | 10 | 42 | 420 | |
| 3/26/2012 | D-27 | 50 | 2 | 4 | |
| 4/24/2012 | D-27 | 0.1 | 67 | 67000 | 67000 |
| 4/24/2012 | D-27 | 1 | 15 | 1500 | |
| 4/24/2012 | D-27 | 10 | 11 | 110 | |
| 4/24/2012 | D-27 | 25 | 89 | 356 | |
| 5/5/2012 | D-27 | 0.1 | 120 | 120000 | 2242 |
| 5/5/2012 | D-27 | 1 | 44 | 4400 | |
| 5/5/2012 | D-27 | 10 | 4 | 40 | |
| 5/5/2012 | D-27 | 25 | 21 | 84 | |
| 5/17/2012 | D-27 | 0.01 | 20 | 200000 | 77000 |

| Date | Sample | Volume of Water Used (mL) | Count/Observations | Per 100 mL | Average |
|---|---|---|---|---|---|
| 5/17/2012 | D-27 | 0.1 | 27 | 27000 | |
| 5/17/2012 | D-27 | 1 | 40 | 4000 | |
| 5/17/2012 | D-27 | 5 | 6 | 120 | |
| 4/11/2012 | D-9 | 0.1 | 3 | 3000 | 2600 |
| 4/11/2012 | D-9 | 1 | 26 | 2600 | |
| 4/11/2012 | D-9 | 10 | 268 | 2680 | |
| 4/11/2012 | D-9 | 50 | TNTC | TNTC | |
| 4/24/2012 | D-9 | 0.1 | 26 | 26000 | 15800 |
| 4/24/2012 | D-9 | 1 | 56 | 5600 | |
| 4/24/2012 | D-9 | 10 | 97 | 970 | |
| 4/24/2012 | D-9 | 25 | 163 | 652 | |
| 10/13/2011 | F-4 | 0.1 | 35 | 35000 | 20150 |
| 10/13/2011 | F-4 | 1 | 53 | 5300 | |
| 10/13/2011 | F-4 | 10 | TNTC, pink | TNTC | |
| 10/13/2011 | F-4 | 50 | TNTC | TNTC | |
| 10/13/2011 | F-4 | 100 | TNTC | TNTC | |
| 10/25/2011 | F-4 | 0.1 | TNTC pink | TNTC | 49 |
| 10/25/2011 | F-4 | 1 | TNTC blue | TNTC | |
| 10/25/2011 | F-4 | 10 | TNTC blue | TNTC | |
| 10/25/2011 | F-4 | 50 | TNTC blue | TNTC | |
| 10/25/2011 | F-4 | 100 | 49 | 49 | |
| 2/24/2012 | F-4 | 0.1 | 0 | 0 | *20 |
| 2/24/2012 | F-4 | 1 | 0 | 0 | |
| 2/24/2012 | F-4 | 10 | 2 | 20 | |
| 2/24/2012 | F-4 | 50 | TNTC/10 | TNTC | |
| 3/26/2012 | F-4 | 0.1 | 21 | 21000 | 10745 |
| 3/26/2012 | F-4 | 1 | 146 | 14600 | |
| 3/26/2012 | F-4 | 10 | 49 | 490 | |
| 3/26/2012 | F-4 | 50 | 9 | 18 | |
| 4/11/2012 | F-4 | 0.1 | 5 | 5000 | 2900 |
| 4/11/2012 | F-4 | 1 | 29 | 2900 | |
| 4/11/2012 | F-4 | 10 | TNTC | TNTC | |
| 4/11/2012 | F-4 | 50 | TNTC | TNTC | |
| 4/24/2012 | F-4 | 0.1 | 31 | 31000 | 8862 |
| 4/24/2012 | F-4 | 1 | 36 | 3600 | |
| 4/24/2012 | F-4 | 10 | 62 | 620 | |
| 4/24/2012 | F-4 | 25 | 57 | 228 | |
| 5/5/2012 | F-4 | 0.1 | 6 | 6000 | 5700 |
| 5/5/2012 | F-4 | 1 | 57 | 5700 | |

| Date | Sample | Volume of Water Used (mL) | Count/Observations | Per 100 mL | Average |
|---|---|---|---|---|---|
| 5/5/2012 | F-4 | 10 | 210 | 2100 | |
| 5/5/2012 | F-4 | 25 | TNTC green | TNTC | |
| 10/13/2011 | G-2 | 0.1 | 10 | 10000 | 8000 |
| 10/13/2011 | G-2 | 1 | 60 | 6000 | |
| 10/13/2011 | G-2 | 10 | 152 | 1520 | |
| 10/13/2011 | G-2 | 50 | TNTC | TNTC | |
| 10/13/2011 | G-2 | 100 | TNTC | TNTC | |
| 10/25/2011 | G-2 | 0.1 | 21 | 21000 | 5921 |
| 10/25/2011 | G-2 | 1 | 25 | 2500 | |
| 10/25/2011 | G-2 | 10 | TNTC blue, pink | TNTC | |
| 10/25/2011 | G-2 | 50 | 52 | 104 | |
| 10/25/2011 | G-2 | 100 | 80 | 80 | |
| 2/24/2012 | G-2 | 0.1 | 0 | 0 | *12 |
| 2/24/2012 | G-2 | 1 | 0 | 0 | |
| 2/24/2012 | G-2 | 10 | 1 | 10 | |
| 2/24/2012 | G-2 | 50 | 6 | 12 | |
| 3/26/2012 | G-2 | 0.1 | 2 | 2000 | 1287.333 |
| 3/26/2012 | G-2 | 1 | 30 | 3000 | |
| 3/26/2012 | G-2 | 10 | 76 | 760 | |
| 3/26/2012 | G-2 | 50 | 51 | 102 | |
| 4/11/2012 | G-2 | 0.1 | 0 | 0 | 270 |
| 4/11/2012 | G-2 | 1 | 2 | 200 | |
| 4/11/2012 | G-2 | 10 | 27 | 270 | |
| 4/11/2012 | G-2 | 50 | TNTC | TNTC | |
| 4/24/2012 | G-2 | 0.1 | 1 | 1000 | *1000 |
| 4/24/2012 | G-2 | 1 | 1 | 100 | |
| 4/24/2012 | G-2 | 10 | 6 | 60 | |
| 4/24/2012 | G-2 | 25 | 5 | 20 | |
| 5/5/2012 | G-2 | 0.1 | 1 | 1000 | 410 |
| 5/5/2012 | G-2 | 1 | 4 | 400 | |
| 5/5/2012 | G-2 | 10 | 41 | 410 | |
| 5/5/2012 | G-2 | 25 | 100 | 400 | |
| 5/17/2012 | G-2 | 0.01 | 17 | 170000 | 25250 |
| 5/17/2012 | G-2 | 0.1 | 45 | 45000 | |
| 5/17/2012 | G-2 | 1 | 55 | 5500 | |
| 5/17/2012 | G-2 | 5 | 84 | 1680 | |
| 2/24/2012 | Rain | 0.1 | 0 | 0 | |
| 2/24/2012 | Rain | 1 | 0 | 0 | |
| 2/24/2012 | Rain | 10 | 0 | 0 | |

| Date | Sample | Volume of Water Used (mL) | Count/Observations | Per 100 mL | Average |
|---|---|---|---|---|---|
| 2/24/2012 | Rain | 50 | 0 | 0 | |
| 3/26/2012 | Rain | 0.1 | 4 | 4000 | 2800 |
| 3/26/2012 | Rain | 1 | 28 | 2800 | |
| 3/26/2012 | Rain | 10 | 112 | 1120 | |
| 3/26/2012 | Rain | 50 | TNTC | | |
| 4/11/2012 | Rain | 0.1 | 0 | 0 | |
| 4/11/2012 | Rain | 1 | 0 | 0 | |
| 4/11/2012 | Rain | 10 | 0 | 0 | |
| 4/11/2012 | Rain | 50 | 0 | 0 | |
| 4/24/2012 | Rain | 0.1 | 11 | 11000 | |
| 4/24/2012 | Rain | 1 | 34 | 3400 | |
| 4/24/2012 | Rain | 10 | 54 | 540 | |
| 4/24/2012 | Rain | 25 | 83 | 332 | |
| 5/5/2012 | Rain | 0.1 | 0 | 0 | TNTC |
| 5/5/2012 | Rain | 1 | red TNTC | TNTC | |
| 5/5/2012 | Rain | 10 | red TNTC | TNTC | |
| 5/5/2012 | Rain | 25 | red TNTC | TNTC | |
| 10/13/2011 | Rain 10-13 | 10 | 3 | 30 | |
| 10/13/2011 | Rain 10-13 | 50 | 0 | 0 | |
| 10/14/2011 | Rain 10-14 | 10 | 16 pink | N/A | |
| 10/14/2011 | Rain 10-14 | 50 | 38 pink, 1 pink mold | N/A | |
| 10/25/2011 | Rain 10-25 | 10 | TNTC pink | TNTC | |
| 10/25/2011 | Rain 10-25 | 50 | TNTC blue | TNTC | |
| 2/24/2012 | D.I. | 1 | 0 | 0 | |
| 2/24/2012 | D.I. | 2 | 0 | 0 | |
| 2/24/2012 | D.I. | 3 | 0 | 0 | |
| 2/24/2012 | D.I. | 4 | 0 | 0 | |
| 2/24/2012 | D.I. | 5 | 0 | 0 | |
| 3/26/2012 | D.I. | 1 | 0 | 0 | |
| 3/26/2012 | D.I. | 2 | 0 | 0 | |
| 3/26/2012 | D.I. | 3 | 0 | 0 | |
| 3/26/2012 | D.I. | 4 | 0 | 0 | |
| 4/11/2012 | D.I. | 1 | 0 | 0 | |
| 4/11/2012 | D.I. | 2 | 0 | 0 | |
| 4/11/2012 | D.I. | 3 | 0 | 0 | |
| 4/11/2012 | D.I. | 4 | 0 | 0 | |
| 4/24/2012 | D.I. | 1 | 0 | 0 | |
| 4/24/2012 | D.I. | 2 | 0 | 0 | |
| 4/24/2012 | D.I. | 3 | 0 | 0 | |

| Date | Sample | Volume of Water Used (mL) | Count/Observations | Per 100 mL | Average |
|---|---|---|---|---|---|
| 4/24/2012 | D.I. | 4 | 0 | 0 | |
| 5/5/2012 | D.I. | 1 | 0 | 0 | |
| 5/5/2012 | D.I. | 2 | 0 | 0 | |
| 5/5/2012 | D.I. | 3 | 0 | 0 | |
| 5/5/2012 | D.I. | 4 | 0 | 0 | |
| 5/17/2012 | D.I. | 1 | 0 | 0 | |
| 5/17/2012 | D.I. | 2 | 0 | 0 | |
| 5/17/2012 | D.I. | 3 | 0 | 0 | |
| 5/17/2012 | D.I. | 4 | 0 | 0 | |
| 10/13/2011 | Blank | 20 | 0 | 0 | |
| 10/13/2011 | Blank | 20 | 0 | 0 | |
| 10/13/2011 | Blank | 20 | 0 | 0 | |
| 10/13/2011 | Blank | 20 | 0 | 0 | |
| 10/14/2011 | Blank | 20 | 13 pink | N/A | |
| 10/14/2011 | Blank | 20 | 28 pink | N/A | |
| 10/14/2011 | Blank | 20 | 21 pink | N/A | |
| 10/14/2011 | Blank | 20 | 6 pink | N/A | |
| 10/25/2011 | Blank (20 mL D.I.) | 20 | 120 tiny pink | N/A | |
| 10/25/2011 | Blank (20 mL D.I.) | 20 | 120 tiny pink | N/A | |
| 10/25/2011 | Blank (20 mL D.I.) | 20 | 120 tiny pink | N/A | |
| 10/25/2011 | Blank (20 mL D.I.) | 20 | 120 tiny pink | N/A | |

## APPENDIX O

Colilert tubes results.

| Date | Sample | Tube # | Total Coliforms | E.Coli |
|---|---|---|---|---|
| 10/13/2011 | A-28 | 1 | negative | negative |
| 10/13/2011 | A-28 | 2 | negative | negative |
| 10/25/2011 | A-28 | 1 | positive | positive |
| 10/25/2011 | A-28 | 2 | positive | positive |
| 10/13/2011 | B-24 | 1 | negative | negative |
| 10/13/2011 | B-24 | 2 | negative | negative |
| 10/25/2011 | B-24 | 1 | positive | negative |
| 10/25/2011 | B-24 | 2 | positive | negative |
| 1/27/2012 | B-24 | 1 | positive | positive |
| 1/27/2012 | B-24 | 2 | positive | positive |
| 1/27/2012 | B-24 | 3 | positive | positive |
| 1/27/2012 | B-24 | 4 | positive | negative |
| 1/27/2012 | B-24 | 5 | positive | negative |
| 2/24/2012 | B-24 | 1 | positive | negative |
| 2/24/2012 | B-24 | 2 | positive | negative |
| 3/26/2012 | B-24 | 1 | positive | positive |
| 3/26/2012 | B-24 | 2 | positive | positive |
| 4/24/2012 | B-24 | 1 | positive | positive |
| 4/24/2012 | B-24 | 2 | positive | positive |
| 5/5/2012 | B-24 | 1 | positive | positive |
| 5/5/2012 | B-24 | 2 | positive | positive |
| 5/17/2012 | B-24 | 1 | positive | positive |
| 5/17/2012 | B-24 | 2 | positive | positive |
| 10/14/2011 | C-1 | 1 | negative | negative |
| 10/14/2011 | C-1 | 2 | negative | negative |
| 10/25/2011 | C-1 | 1 | positive | positive |
| 10/25/2011 | C-1 | 2 | positive | negative |
| 1/27/2012 | C-1 | 1 | positive | positive |
| 1/27/2012 | C-1 | 2 | positive | positive |
| 1/27/2012 | C-1 | 3 | positive | positive |
| 1/27/2012 | C-1 | 4 | positive | positive |
| 1/27/2012 | C-1 | 5 | positive | positive |
| 2/24/2012 | C-1 | 1 | positive | negative |
| 2/24/2012 | C-1 | 2 | positive | negative |
| 3/26/2012 | C-1 | 1 | positive | positive |
| 3/26/2012 | C-1 | 2 | positive | positive |
| 4/11/2012 | C-1 | 1 | positive | positive |
| 4/11/2012 | C-1 | 2 | positive | positive |

| Date | Sample | Tube # | Total Coliforms | E.Coli |
|---|---|---|---|---|
| 4/24/2012 | C-1 | 1 | positive | positive |
| 4/24/2012 | C-1 | 2 | positive | negative |
| 5/5/2012 | C-1 | 1 | positive | positive |
| 5/5/2012 | C-1 | 2 | positive | positive |
| 5/17/2012 | C-1 | 1 | positive | negative |
| 5/17/2012 | C-1 | 2 | positive | negative |
| 1/27/2012 | C-20 | 1 | positive | positive |
| 1/27/2012 | C-20 | 2 | positive | positive |
| 1/27/2012 | C-20 | 3 | positive | positive |
| 1/27/2012 | C-20 | 4 | positive | positive |
| 1/27/2012 | C-20 | 5 | positive | positive |
| 2/24/2012 | C-20 | 1 | positive | negative |
| 2/24/2012 | C-20 | 2 | positive | negative |
| 3/26/2012 | C-20 | 1 | positive | positive |
| 3/26/2012 | C-20 | 2 | positive | positive |
| 4/11/2012 | C-20 | 1 | positive | positive |
| 4/11/2012 | C-20 | 2 | positive | positive |
| 4/24/2012 | C-20 | 1 | positive | positive |
| 4/24/2012 | C-20 | 2 | positive | positive |
| 5/5/2012 | C-20 | 1 | positive | positive |
| 5/5/2012 | C-20 | 2 | positive | positive |
| 5/17/2012 | C-20 | 1 | positive | positive |
| 5/17/2012 | C-20 | 2 | positive | positive |
| 10/13/2011 | C-31 | 1 | negative | negative |
| 10/13/2011 | C-31 | 2 | negative | negative |
| 10/25/2011 | C-31 | 1 | positive | negative |
| 10/25/2011 | C-31 | 2 | positive | negative |
| 1/27/2012 | C-31 | 1 | positive | negative |
| 1/27/2012 | C-31 | 2 | positive | negative |
| 1/27/2012 | C-31 | 3 | positive | negative |
| 1/27/2012 | C-31 | 4 | positive | negative |
| 1/27/2012 | C-31 | 5 | positive | negative |
| 2/24/2012 | C-31 | 1 | positive | negative |
| 2/24/2012 | C-31 | 2 | positive | negative |
| 3/26/2012 | C-31 | 1 | positive | positive |
| 3/26/2012 | C-31 | 2 | positive | positive |
| 4/11/2012 | C-31 | 1 | positive | positive |
| 4/11/2012 | C-31 | 2 | positive | positive |
| 4/24/2012 | C-31 | 1 | positive | negative |
| 4/24/2012 | C-31 | 2 | positive | negative |

| Date | Sample | Tube # | Total Coliforms | E.Coli |
|---|---|---|---|---|
| 5/5/2012 | C-31 | 1 | positive | positive |
| 5/5/2012 | C-31 | 2 | positive | positive |
| 5/17/2012 | C-31 | 1 | positive | positive |
| 5/17/2012 | C-31 | 2 | positive | positive |
| 10/14/2011 | C-46 | 1 | negative | negative |
| 10/14/2011 | C-46 | 2 | negative | negative |
| 10/25/2011 | C-46 | 1 | positive | negative |
| 10/25/2011 | C-46 | 2 | positive | negative |
| 1/27/2012 | C-46 | 1 | positive | negative |
| 1/27/2012 | C-46 | 2 | positive | negative |
| 1/27/2012 | C-46 | 3 | positive | negative |
| 1/27/2012 | C-46 | 4 | positive | positive |
| 1/27/2012 | C-46 | 5 | positive | positive |
| 2/24/2012 | C-46 | 1 | positive | negative |
| 2/24/2012 | C-46 | 2 | positive | negative |
| 3/26/2012 | C-46 | 1 | positive | positive |
| 3/26/2012 | C-46 | 2 | positive | negative |
| 5/5/2012 | C-46 | 1 | positive | positive |
| 5/5/2012 | C-46 | 2 | positive | positive |
| 10/14/2011 | C-47 | 1 | negative | negative |
| 10/14/2011 | C-47 | 2 | negative | negative |
| 10/25/2011 | C-47 | 1 | positive | positive |
| 10/25/2011 | C-47 | 2 | positive | positive |
| 1/27/2012 | C-47 | 1 | positive | positive |
| 1/27/2012 | C-47 | 2 | positive | positive |
| 1/27/2012 | C-47 | 3 | positive | positive |
| 1/27/2012 | C-47 | 4 | positive | positive |
| 1/27/2012 | C-47 | 5 | positive | positive |
| 2/24/2012 | C-47 | 1 | positive | negative |
| 2/24/2012 | C-47 | 2 | negative | negative |
| 3/26/2012 | C-47 | 1 | positive | positive |
| 3/26/2012 | C-47 | 2 | positive | negative |
| 4/11/2012 | C-47 | 1 | positive | negative |
| 4/11/2012 | C-47 | 2 | positive | positive |
| 4/24/2012 | C-47 | 1 | positive | negative |
| 4/24/2012 | C-47 | 2 | positive | negative |
| 5/5/2012 | C-47 | 1 | positive | positive |
| 5/5/2012 | C-47 | 2 | positive | positive |
| 1/27/2012 | D-10 | 1 | positive | positive |
| 1/27/2012 | D-10 | 2 | positive | positive |

| Date | Sample | Tube # | Total Coliforms | E.Coli |
|---|---|---|---|---|
| 1/27/2012 | D-10 | 3 | positive | positive |
| 1/27/2012 | D-10 | 4 | positive | positive |
| 1/27/2012 | D-10 | 5 | positive | negative |
| 2/24/2012 | D-10 | 1 | positive | negative |
| 2/24/2012 | D-10 | 2 | positive | positive |
| 4/11/2012 | D-10 | 1 | positive | positive |
| 4/11/2012 | D-10 | 2 | positive | positive |
| 4/24/2012 | D-10 | 1 | positive | negative |
| 4/24/2012 | D-10 | 2 | positive | negative |
| 5/5/2012 | D-10 | 1 | positive | positive |
| 5/5/2012 | D-10 | 2 | positive | positive |
| 5/17/2012 | D-10 | 1 | positive | positive |
| 5/17/2012 | D-10 | 2 | positive | positive |
| 10/13/2011 | D-27 | 1 | positive | positive |
| 10/13/2011 | D-27 | 2 | negative | negative |
| 10/25/2011 | D-27 | 1 | positive | positive |
| 10/25/2011 | D-27 | 2 | positive | positive |
| 1/27/2012 | D-27 | 1 | positive | negative |
| 1/27/2012 | D-27 | 2 | positive | negative |
| 1/27/2012 | D-27 | 3 | positive | negative |
| 1/27/2012 | D-27 | 4 | positive | negative |
| 1/27/2012 | D-27 | 5 | positive | negative |
| 2/24/2012 | D-27 | 1 | positive | negative |
| 2/24/2012 | D-27 | 2 | positive | negative |
| 3/26/2012 | D-27 | 1 | positive | positive |
| 3/26/2012 | D-27 | 2 | positive | positive |
| 4/24/2012 | D-27 | 1 | positive | negative |
| 4/24/2012 | D-27 | 2 | positive | negative |
| 5/5/2012 | D-27 | 1 | positive | positive |
| 5/5/2012 | D-27 | 2 | positive | positive |
| 5/17/2012 | D-27 | 1 | positive | positive |
| 5/17/2012 | D-27 | 2 | positive | positive |
| 4/11/2012 | D-9 | 1 | positive | negative |
| 4/11/2012 | D-9 | 2 | positive | positive |
| 4/24/2012 | D-9 | 1 | positive | positive |
| 4/24/2012 | D-9 | 2 | positive | positive |
| 10/13/2011 | F-4 | 1 | negative | negative |
| 10/13/2011 | F-4 | 2 | negative | negative |
| 10/25/2011 | F-4 | 1 | positive | positive |
| 10/25/2011 | F-4 | 2 | positive | positive |

| Date | Sample | Tube # | Total Coliforms | E.Coli |
|---|---|---|---|---|
| 1/27/2012 | F-4 | 1 | positive | negative |
| 1/27/2012 | F-4 | 2 | positive | negative |
| 1/27/2012 | F-4 | 3 | positive | negative |
| 1/27/2012 | F-4 | 4 | positive | negative |
| 1/27/2012 | F-4 | 5 | positive | negative |
| 2/24/2012 | F-4 | 1 | positive | negative |
| 2/24/2012 | F-4 | 2 | negative | negative |
| 3/26/2012 | F-4 | 1 | positive | negative |
| 3/26/2012 | F-4 | 2 | positive | negative |
| 4/11/2012 | F-4 | 1 | positive | positive |
| 4/11/2012 | F-4 | 2 | positive | positive |
| 4/24/2012 | F-4 | 1 | positive | negative |
| 4/24/2012 | F-4 | 2 | positive | negative |
| 5/5/2012 | F-4 | 1 | positive | positive |
| 5/5/2012 | F-4 | 2 | positive | positive |
| 10/13/2011 | G-2 | 1 | negative | negative |
| 10/13/2011 | G-2 | 2 | negative | negative |
| 10/25/2011 | G-2 | 1 | positive | positive |
| 10/25/2011 | G-2 | 2 | positive | positive |
| 1/27/2012 | G-2 | 1 | positive | positive |
| 1/27/2012 | G-2 | 2 | positive | positive |
| 1/27/2012 | G-2 | 3 | positive | positive |
| 1/27/2012 | G-2 | 4 | positive | positive |
| 1/27/2012 | G-2 | 5 | positive | positive |
| 2/24/2012 | G-2 | 1 | positive | negative |
| 2/24/2012 | G-2 | 2 | positive | negative |
| 3/26/2012 | G-2 | 1 | positive | positive |
| 3/26/2012 | G-2 | 2 | positive | positive |
| 4/11/2012 | G-2 | 1 | positive | negative |
| 4/11/2012 | G-2 | 2 | positive | positive |
| 4/24/2012 | G-2 | 1 | positive | negative |
| 4/24/2012 | G-2 | 2 | positive | negative |
| 5/5/2012 | G-2 | 1 | positive | negative |
| 5/5/2012 | G-2 | 2 | positive | negative |
| 5/17/2012 | G-2 | 1 | positive | negative |
| 5/17/2012 | G-2 | 2 | positive | negative |
| 1/27/2012 | Rain | 1 | negative | negative |
| 1/27/2012 | Rain | 2 | negative | negative |
| 1/27/2012 | Rain | 3 | negative | negative |
| 1/27/2012 | Rain | 4 | negative | negative |

| Date | Sample | Tube # | Total Coliforms | E.Coli |
|---|---|---|---|---|
| 1/27/2012 | Rain | 5 | negative | negative |
| 2/24/2012 | Rain | 1 | negative | negative |
| 2/24/2012 | Rain | 2 | negative | negative |
| 3/26/2012 | Rain | 1 | positive | positive |
| 3/26/2012 | Rain | 2 | positive | negative |
| 4/11/2012 | Rain | 1 | slightly yellow | negative |
| 4/11/2012 | Rain | 2 | slightly yellow | negative |
| 4/24/2012 | Rain | 1 | positive | negative |
| 4/24/2012 | Rain | 2 | positive | negative |
| 5/5/2012 | Rain | 1 | positive | negative |
| 5/5/2012 | Rain | 2 | positive | negative |
| 10/13/2011 | Rain 10-13 | | negative | negative |
| 10/14/2011 | Rain 10-14 | | negative | negative |
| 10/25/2011 | Rain 10-25 | | positive | negative |
| 10/13/2011 | Blank | 1 | negative | negative |
| 10/13/2011 | Blank | 2 | negative | negative |
| 10/25/2011 | Blank | 1 | negative | negative |
| 10/25/2011 | Blank | 2 | negative | negative |
| 1/27/2012 | D.I. | 1 | negative | negative |
| 1/27/2012 | D.I. | 2 | negative | negative |
| 2/24/2012 | D.I. | 1 | negative | negative |
| 2/24/2012 | D.I. | 2 | negative | negative |
| 3/26/2012 | D.I. | 1 | negative | negative |
| 3/26/2012 | D.I. | 2 | negative | negative |
| 4/11/2012 | D.I. | 1 | negative | negative |
| 4/11/2012 | D.I. | 2 | negative | negative |
| 4/24/2012 | D.I. | 1 | negative | negative |
| 4/24/2012 | D.I. | 2 | negative | negative |
| 5/5/2012 | D.I. | 1 | positive | negative |
| 5/5/2012 | D.I. | 2 | negative | negative |
| 5/17/2012 | D.I. | 1 | negative | negative |
| 5/17/2012 | D.I. | 2 | negative | negative |

## APPENDIX P

Raw data calculations for biochemical oxygen demand.

| Date | Site | Volume of water used (mL) | D1 | D2 | D1-D2 | D-B | P | $BOD_5$ | Average |
|---|---|---|---|---|---|---|---|---|---|
| 10/25/2011 | A-28 | 50 | 7.8 | 6.34 | 1.46 | 0.97 | 0.17 | 5.82 | 5.61 |
| 10/25/2011 | A-28 | 100 | 7.33 | 5.04 | 2.29 | 1.8 | 0.33 | 5.4 | |
| 10/25/2011 | A-28 | 200 | 6.31 | 1.94 | 4.37 | 3.88 | 0.67 | 5.82 | |
| 11/23/2011 | A-28 | 50 | 8.64 | 7.01 | 1.63 | 1.27 | 0.17 | 7.62 | 8.58 |
| 11/23/2011 | A-28 | 100 | 9.04 | 6.09 | 2.95 | 2.59 | 0.33 | 7.77 | |
| 11/23/2011 | A-28 | 200 | 9.98 | 3.35 | 6.63 | 6.27 | 0.67 | 9.405 | |
| 10/25/2011 | B-24 | 50 | 7.9 | 6.49 | 1.41 | 1.32 | 0.17 | 7.92 | 6.6 |
| 10/25/2011 | B-24 | 100 | 7.55 | 5.87 | 1.68 | 2.3 | 0.33 | 6.9 | |
| 10/25/2011 | B-24 | 200 | 6.76 | 3.78 | 2.98 | 4.2 | 0.67 | 6.3 | |
| 11/23/2011 | B-24 | 50 | 9.08 | 7.5 | 1.58 | 1.22 | 0.17 | 7.32 | 4.725 |
| 11/23/2011 | B-24 | 100 | 8.56 | 6.74 | 1.82 | 1.46 | 0.33 | 4.38 | |
| 11/23/2011 | B-24 | 200 | 10.05 | 6.54 | 3.51 | 3.15 | 0.67 | 4.725 | |
| 1/27/2012 | B-24 | 50 | 8.77 | 7.2 | 1.57 | 0.97 | 0.17 | 5.82 | 4.41 |
| 1/27/2012 | B-24 | 75 | 8.92 | 7.23 | 1.69 | 1.09 | 0.25 | 4.36 | |
| 1/27/2012 | B-24 | 100 | 9.07 | 7 | 2.07 | 1.47 | 0.33 | 4.41 | |
| 2/24/2012 | B-24 | 50 | 8.44 | 5.83 | 2.61 | 2.3 | 0.17 | 13.8 | 12.01 |
| 2/24/2012 | B-24 | 75 | 8.67 | 5.46 | 3.21 | 2.9 | 0.25 | 11.6 | |
| 2/24/2012 | B-24 | 100 | 8.87 | 5.01 | 3.86 | 3.55 | 0.33 | 10.65 | |
| 3/26/2012 | B-24 | 50 | 7.93 | 0.19 | 7.74 | 6.34 | 0.17 | 38.04 | > 38.04 |
| 3/26/2012 | B-24 | 75 | 7.28 | 0.07 | 7.21 | 5.81 | 0.25 | 23.24 | |
| 3/26/2012 | B-24 | 100 | 6.69 | 0.08 | 6.61 | 5.21 | 0.33 | 15.63 | |
| 4/24/2012 | B-24 | 50 | 8.05 | 4.66 | 3.39 | 1.62 | 0.17 | 9.72 | 10.66 |
| 4/24/2012 | B-24 | 75 | 7.55 | 3.34 | 4.21 | 2.44 | 0.25 | 9.76 | |
| 4/24/2012 | B-24 | 100 | 7.18 | 1.24 | 5.94 | 4.17 | 0.33 | 12.51 | |

| Date | Site | Volume of water used (mL) | D1 | D2 | D1-D2 | D-B | P | BOD$_5$ | Average |
|---|---|---|---|---|---|---|---|---|---|
| 5/5/2012 | B-24 | 50 | 8.08 | 5.01 | 3.07 | 2.55 | 0.17 | 15.3 | 15.93 |
| 5/5/2012 | B-24 | 75 | 7.93 | 3.27 | 4.66 | 4.14 | 0.25 | 16.56 | |
| 5/5/2012 | B-24 | 100 | 7.66 | 0.06 | 7.6 | 7.08 | 0.33 | 21.24 | |
| 5/17/2012 | B-24 | 10 | 7.44 | 4.42 | 3.02 | 1.82 | 0.03 | 54.6 | 55.32 |
| 5/17/2012 | B-24 | 25 | 7.16 | 1.29 | 5.87 | 4.67 | 0.08 | 56.04 | |
| 5/17/2012 | B-24 | 50 | 6.61 | 0.07 | 6.54 | 5.34 | 0.17 | 32.04 | |
| 10/25/2011 | C-1 | 50 | 7.46 | 3.95 | 3.51 | 3.02 | 0.17 | 18.12 | 14.17 |
| 10/25/2011 | C-1 | 100 | 6.68 | 2.78 | 3.9 | 3.41 | 0.33 | 10.23 | |
| 10/25/2011 | C-1 | 200 | 5.04 | 0.09 | 4.95 | 4.46 | 0.67 | 6.69 | |
| 11/23/2011 | C-1 | 50 | 8.42 | 1.01 | 7.41 | 7.05 | 0.17 | 42.3 | 42.3 |
| 11/23/2011 | C-1 | 100 | 8.52 | 0.03 | 8.49 | 8.13 | 0.33 | | |
| 11/23/2011 | C-1 | 200 | 8.81 | 0.03 | 8.78 | 8.42 | 0.67 | | |
| 1/27/2012 | C-1 | 50 | 8.86 | 6.75 | 2.11 | 1.51 | 0.17 | 9.06 | 9.51 |
| 1/27/2012 | C-1 | 75 | 9.02 | 6.05 | 2.97 | 2.37 | 0.25 | 9.48 | |
| 1/27/2012 | C-1 | 100 | 9.17 | 5.24 | 3.93 | 3.33 | 0.33 | 9.99 | |
| 2/24/2012 | C-1 | 50 | 8.31 | 4.46 | 3.85 | 3.54 | 0.17 | 21.24 | 21.90 |
| 2/24/2012 | C-1 | 75 | 8.52 | 2.61 | 5.91 | 5.6 | 0.25 | 22.4 | |
| 2/24/2012 | C-1 | 100 | 8.71 | 1.04 | 7.67 | 7.36 | 0.33 | 22.08 | |
| 3/26/2012 | C-1 | 50 | 7.98 | 0.59 | 7.39 | 5.99 | 0.17 | 35.94 | > 35.94 |
| 3/26/2012 | C-1 | 75 | 7.29 | 0.09 | 7.2 | 5.8 | 0.25 | 23.2 | |
| 3/26/2012 | C-1 | 100 | 6.63 | 0.08 | 6.55 | 5.15 | 0.33 | 15.45 | |
| 4/11/2012 | C-1 | 50 | 9.07 | 1.9 | 7.17 | 7.8 | 0.17 | 46.8 | 46.8 |
| 4/11/2012 | C-1 | 75 | 9.33 | 0.12 | 9.21 | 9.84 | 0.25 | 39.36 | |
| 4/11/2012 | C-1 | 100 | 9.57 | 0.1 | 9.47 | 10.1 | 0.33 | 30.3 | |
| 4/24/2012 | C-1 | 50 | 7.72 | 3.15 | 4.57 | 2.8 | 0.17 | 16.8 | 16.8 |

| Date | Site | Volume of water used (mL) | D1 | D2 | D1-D2 | D-B | P | $BOD_5$ | Average |
|---|---|---|---|---|---|---|---|---|---|
| 4/24/2012 | C-1 | 75 | 6.95 | 0.48 | 6.47 | 4.7 | 0.25 | 18.8 | |
| 4/24/2012 | C-1 | 100 | 6.19 | 0.06 | 6.13 | 4.36 | 0.33 | 13.08 | |
| 5/5/2012 | C-1 | 50 | 7.87 | 2.46 | 5.41 | 4.89 | 0.17 | 29.34 | 29.34 |
| 5/5/2012 | C-1 | 75 | 7.52 | 0.06 | 7.46 | 6.94 | 0.25 | 27.76 | |
| 5/5/2012 | C-1 | 100 | 7.12 | 0.06 | 7.06 | 6.54 | 0.33 | 19.62 | |
| 5/17/2012 | C-1 | 10 | 7.27 | 1.69 | 5.58 | 4.38 | 0.03 | 131.4 | 131.4 |
| 5/17/2012 | C-1 | 25 | 7.02 | 0.06 | 6.96 | 5.76 | 0.08 | 69.12 | |
| 5/17/2012 | C-1 | 50 | 6.47 | 0.07 | 6.4 | 5.2 | 0.17 | 31.2 | |
| 11/23/2011 | C-20 | 50 | 7.91 | 0.11 | 7.8 | 7.44 | 0.17 | 44.64 | > 44.64 |
| 11/23/2011 | C-20 | 100 | 7.36 | 0.04 | 7.32 | 6.96 | 0.33 | 20.88 | |
| 11/23/2011 | C-20 | 200 | 6.21 | 0.03 | 6.18 | 5.82 | 0.67 | 8.73 | |
| 1/27/2012 | C-20 | 50 | 8.89 | 7.43 | 1.46 | 0.86 | 0.17 | 5.16 | < 4.17 |
| 1/27/2012 | C-20 | 75 | 9.08 | 7.3 | 1.78 | 1.18 | 0.25 | 4.72 | |
| 1/27/2012 | C-20 | 100 | 9.28 | 7.29 | 1.99 | 1.39 | 0.33 | 4.17 | |
| 2/24/2012 | C-20 | 50 | 8.3 | 4.83 | 3.47 | 3.16 | 0.17 | 18.96 | 19.35 |
| 2/24/2012 | C-20 | 75 | 8.43 | 3.14 | 5.29 | 4.98 | 0.25 | 19.92 | |
| 2/24/2012 | C-20 | 100 | 8.62 | 1.92 | 6.7 | 6.39 | 0.33 | 19.17 | |
| 3/26/2012 | C-20 | 50 | 7.86 | 4.03 | 3.83 | 2.43 | 0.17 | 14.58 | 14.53 |
| 3/26/2012 | C-20 | 75 | 7.28 | 2.26 | 5.02 | 3.62 | 0.25 | 14.48 | |
| 3/26/2012 | C-20 | 100 | 6.74 | 0.49 | 6.25 | 4.85 | 0.33 | 14.55 | |
| 4/11/2012 | C-20 | 50 | 8.93 | 0.12 | 8.81 | 9.44 | 0.17 | 56.64 | > 56.64 |
| 4/11/2012 | C-20 | 75 | 9.09 | 0.09 | 9 | 9.63 | 0.25 | 38.52 | |
| 4/11/2012 | C-20 | 100 | 9.23 | 0.09 | 9.14 | 9.77 | 0.33 | 29.31 | |
| 4/24/2012 | C-20 | 50 | 7.42 | 0.06 | 7.36 | 5.59 | 0.17 | 33.54 | > 33.54 |
| 4/24/2012 | C-20 | 75 | 6.64 | 0.07 | 6.57 | 4.8 | 0.25 | 19.2 | |
| 4/24/2012 | C-20 | 100 | 6 | 0.05 | 5.95 | 4.18 | 0.33 | 12.54 | |

| Date | Site | Volume of water used (mL) | D1 | D2 | D1-D2 | D-B | P | $BOD_5$ | Average |
|---|---|---|---|---|---|---|---|---|---|
| 5/5/2012 | C-20 | 50 | 7.01 | 0.06 | 6.95 | 6.43 | 0.17 | 38.58 | > 38.58 |
| 5/5/2012 | C-20 | 75 | 6.21 | 0.1 | 6.11 | 5.59 | 0.25 | 22.36 | |
| 5/5/2012 | C-20 | 100 | 5.25 | 0.06 | 5.19 | 4.67 | 0.33 | 14.01 | |
| 5/17/2012 | C-20 | 10 | 7.3 | 2.09 | 5.21 | 4.01 | 0.03 | 120.3 | 120.3 |
| 5/17/2012 | C-20 | 25 | 7.04 | 0.06 | 6.98 | 5.78 | 0.08 | 69.36 | |
| 5/17/2012 | C-20 | 50 | 6.42 | 0.06 | 6.36 | 5.16 | 0.17 | 30.96 | |
| 10/25/2011 | C-31 | 50 | 7.22 | 0.06 | 7.16 | 6.67 | 0.17 | 40.02 | > 40.02 |
| 10/25/2011 | C-31 | 100 | 5.92 | 0.03 | 5.89 | 5.4 | 0.33 | 16.2 | |
| 10/25/2011 | C-31 | 200 | 3.32 | 0.07 | 3.25 | 2.76 | 0.67 | 4.14 | |
| 11/23/2011 | C-31 | 50 | 8.19 | 4.68 | 3.51 | 3.15 | 0.17 | 18.9 | 18.93 |
| 11/23/2011 | C-31 | 100 | 7.99 | 1.31 | 6.68 | 6.32 | 0.33 | 18.96 | |
| 11/23/2011 | C-31 | 200 | 7.65 | 0.04 | 7.61 | 7.25 | 0.67 | 10.87 | |
| 1/27/2012 | C-31 | 50 | 8.78 | 0.06 | 8.72 | 8.12 | 0.17 | 48.72 | > 48.72 |
| 1/27/2012 | C-31 | 75 | 8.9 | 0.06 | 8.84 | 8.24 | 0.25 | 32.96 | |
| 1/27/2012 | C-31 | 100 | 9.03 | 0.05 | 8.98 | 8.38 | 0.33 | 25.14 | |
| 2/24/2012 | C-31 | 50 | 8.34 | 5.33 | 3.01 | 2.7 | 0.17 | 16.2 | 16.44 |
| 2/24/2012 | C-31 | 75 | 8.49 | 4.15 | 4.34 | 4.03 | 0.25 | 16.12 | |
| 2/24/2012 | C-31 | 100 | 8.66 | 2.68 | 5.98 | 5.67 | 0.33 | 17.01 | |
| 3/26/2012 | C-31 | 50 | 8.04 | 0.08 | 7.96 | 6.56 | 0.17 | 39.36 | > 39.36 |
| 3/26/2012 | C-31 | 75 | 7.26 | 0.08 | 7.18 | 5.78 | 0.25 | 23.12 | |
| 3/26/2012 | C-31 | 100 | 6.6 | 0.06 | 6.54 | 5.14 | 0.33 | 15.42 | |
| 4/11/2012 | C-31 | 50 | 9.05 | 0.1 | 8.95 | 9.58 | 0.17 | 57.48 | > 57.48 |
| 4/11/2012 | C-31 | 75 | 9.18 | 0.11 | 9.07 | 9.7 | 0.25 | 38.8 | |
| 4/11/2012 | C-31 | 100 | 9.29 | 0.11 | 9.18 | 9.81 | 0.33 | 29.43 | |
| 4/24/2012 | C-31 | 50 | 7.76 | 0.04 | 7.72 | 5.95 | 0.17 | 35.7 | > 35.7 |
| 4/24/2012 | C-31 | 75 | 7.01 | 0.06 | 6.95 | 5.18 | 0.25 | 20.72 | |

| Date | Site | Volume of water used (mL) | D1 | D2 | D1-D2 | D-B | P | $BOD_5$ | Average |
|---|---|---|---|---|---|---|---|---|---|
| 4/24/2012 | C-31 | 100 | 6.28 | 0.06 | 6.22 | 4.45 | 0.33 | 13.35 | |
| 5/5/2012 | C-31 | 50 | 7.08 | 0.07 | 7.01 | 6.49 | 0.17 | 38.94 | > 38.94 |
| 5/5/2012 | C-31 | 75 | 6.27 | 0.05 | 6.22 | 5.7 | 0.25 | 22.8 | |
| 5/5/2012 | C-31 | 100 | 5.51 | 0.07 | 5.44 | 4.92 | 0.33 | 14.76 | |
| 5/17/2012 | C-31 | 10 | 7.24 | 0.07 | 7.17 | 5.97 | 0.03 | 179.1 | > 179.1 |
| 5/17/2012 | C-31 | 25 | 6.93 | 0.08 | 6.85 | 5.65 | 0.08 | 67.8 | |
| 5/17/2012 | C-31 | 50 | 6.36 | 0.07 | 6.29 | 5.09 | 0.17 | 30.54 | |
| 10/25/2011 | C-46 | 50 | 7.63 | 4.92 | 2.71 | 2.22 | 0.17 | 13.32 | 13.29 |
| 10/25/2011 | C-46 | 100 | 7.17 | 2.26 | 4.91 | 4.42 | 0.33 | 13.26 | |
| 10/25/2011 | C-46 | 200 | 6.26 | 0.06 | 6.2 | 5.71 | 0.67 | 8.565 | |
| 11/23/2011 | C-46 | 50 | 8.36 | 5.63 | 2.73 | 2.37 | 0.17 | 14.22 | 14.22 |
| 11/23/2011 | C-46 | 100 | 8.46 | 0.56 | 7.9 | 7.54 | 0.33 | 22.62 | |
| 11/23/2011 | C-46 | 200 | 8.62 | 0.04 | 8.58 | 8.22 | 0.67 | 12.33 | |
| 1/27/2012 | C-46 | 50 | 8.71 | 7.25 | 1.46 | 0.86 | 0.17 | 5.16 | 4.44 |
| 1/27/2012 | C-46 | 75 | 8.76 | 6.94 | 1.82 | 1.22 | 0.25 | 4.88 | |
| 1/27/2012 | C-46 | 100 | 8.8 | 6.72 | 2.08 | 1.48 | 0.33 | 4.44 | |
| 2/24/2012 | C-46 | 50 | 8.39 | 6.57 | 1.82 | 1.51 | 0.17 | 9.06 | 9.83 |
| 2/24/2012 | C-46 | 75 | 8.55 | 5.8 | 2.75 | 2.44 | 0.25 | 9.76 | |
| 2/24/2012 | C-46 | 100 | 8.7 | 5.09 | 3.61 | 3.3 | 0.33 | 9.9 | |
| 3/26/2012 | C-46 | 50 | 8.64 | 4.25 | 4.39 | 2.99 | 0.17 | 17.94 | 18.07 |
| 3/26/2012 | C-46 | 75 | 8.35 | 2.4 | 5.95 | 4.55 | 0.25 | 18.2 | |
| 3/26/2012 | C-46 | 100 | 8.13 | 0.77 | 7.36 | 5.96 | 0.33 | 17.88 | |
| 5/5/2012 | C-46 | 50 | 7.22 | 0.07 | 7.15 | 6.63 | 0.17 | 39.78 | > 39.78 |
| 5/5/2012 | C-46 | 75 | 6.41 | 0.05 | 6.36 | 5.84 | 0.25 | 23.36 | |
| 5/5/2012 | C-46 | 100 | 5.67 | 0.06 | 5.61 | 5.09 | 0.33 | 15.27 | |
| 10/25/2011 | C-47 | 50 | 7.3 | 0.08 | 7.22 | 6.73 | 0.17 | 40.38 | > 40.38 |

| Date | Site | Volume of water used (mL) | D1 | D2 | D1-D2 | D-B | P | $BOD_5$ | Average |
|---|---|---|---|---|---|---|---|---|---|
| 10/25/2011 | C-47 | 100 | 6.38 | 0.05 | 6.33 | 5.84 | 0.33 | 17.52 | |
| 10/25/2011 | C-47 | 200 | 4.58 | 0.05 | 4.53 | 4.04 | 0.67 | 6.06 | |
| 11/23/2011 | C-47 | 50 | 8.34 | 4.66 | 3.68 | 3.32 | 0.17 | 19.92 | 19.92 |
| 11/23/2011 | C-47 | 100 | 8.38 | 0.93 | 7.45 | 7.09 | 0.33 | 21.27 | |
| 11/23/2011 | C-47 | 200 | 8.45 | 0.03 | 8.42 | 8.06 | 0.67 | 12.09 | |
| 1/27/2012 | C-47 | 50 | 8.66 | 5.53 | 3.13 | 2.53 | 0.17 | 15.18 | 15.01 |
| 1/27/2012 | C-47 | 75 | 8.75 | 4.43 | 4.32 | 3.72 | 0.25 | 14.88 | |
| 1/27/2012 | C-47 | 100 | 9.48 | 3.89 | 5.59 | 4.99 | 0.33 | 14.97 | |
| 2/24/2012 | C-47 | 50 | 8.43 | 3.65 | 4.78 | 4.47 | 0.17 | 26.82 | 23.45 |
| 2/24/2012 | C-47 | 75 | 8.58 | 2.66 | 5.92 | 5.61 | 0.25 | 22.44 | |
| 2/24/2012 | C-47 | 100 | 8.88 | 1.54 | 7.34 | 7.03 | 0.33 | 21.09 | |
| 3/26/2012 | C-47 | 50 | 8.12 | 5.59 | 2.53 | 1.13 | 0.17 | 6.78 | 6.75 |
| 3/26/2012 | C-47 | 75 | 7.53 | 4.49 | 3.04 | 1.64 | 0.25 | 6.56 | |
| 3/26/2012 | C-47 | 100 | 6.95 | 3.24 | 3.71 | 2.31 | 0.33 | 6.93 | |
| 4/11/2012 | C-47 | 50 | 9.18 | 3.6 | 5.58 | 6.21 | 0.17 | 37.26 | 35.83 |
| 4/11/2012 | C-47 | 75 | 9.46 | 1.49 | 7.97 | 8.6 | 0.25 | 34.4 | |
| 4/11/2012 | C-47 | 100 | 9.79 | 0.09 | 9.7 | 10.33 | 0.33 | 30.99 | |
| 4/24/2012 | C-47 | 50 | 7.49 | 0.06 | 7.43 | 5.66 | 0.17 | 33.96 | > 33.96 |
| 4/24/2012 | C-47 | 75 | 6.73 | 0.05 | 6.68 | 4.91 | 0.25 | 19.64 | |
| 4/24/2012 | C-47 | 100 | 5.98 | 0.05 | 5.93 | 4.16 | 0.33 | 12.48 | |
| 5/5/2012 | C-47 | 50 | 7.41 | 0.07 | 7.34 | 6.82 | 0.17 | 40.92 | > 40.92 |
| 5/5/2012 | C-47 | 75 | 6.75 | 0.06 | 6.69 | 6.17 | 0.25 | 24.68 | |
| 5/5/2012 | C-47 | 100 | 6.09 | 0.07 | 6.02 | 5.5 | 0.33 | 16.5 | |
| 11/23/2011 | D-10 | 50 | 8.3 | 5.97 | 2.33 | 1.97 | 0.17 | 11.82 | 12.70 |
| 11/23/2011 | D-10 | 100 | 8.32 | 3.43 | 4.89 | 4.53 | 0.33 | 13.59 | |
| 11/23/2011 | D-10 | 200 | 8.41 | 0.05 | 8.36 | 8 | 0.67 | 12 | |

| Date | Site | Volume of water used (mL) | D1 | D2 | D1-D2 | D-B | P | $BOD_5$ | Average |
|---|---|---|---|---|---|---|---|---|---|
| 1/27/2012 | D-10 | 50 | 8.76 | 7.58 | 1.18 | 0.58 | 0.17 | 3.48 | < 2.73 |
| 1/27/2012 | D-10 | 75 | 8.86 | 7.57 | 1.29 | 0.69 | 0.25 | 2.76 | |
| 1/27/2012 | D-10 | 100 | 8.99 | 7.48 | 1.51 | 0.91 | 0.33 | 2.73 | |
| 2/24/2012 | D-10 | 50 | 8.47 | 7.49 | 0.98 | 0.67 | 0.17 | 4.02 | < 4.53 |
| 2/24/2012 | D-10 | 75 | 8.71 | 7.08 | 1.63 | 1.32 | 0.25 | 5.28 | |
| 2/24/2012 | D-10 | 100 | 8.92 | 7.1 | 1.82 | 1.51 | 0.33 | 4.53 | |
| 4/11/2012 | D-10 | 50 | 7.87 | 0.08 | 7.79 | 8.42 | 0.17 | 50.52 | > 50.52 |
| 4/11/2012 | D-10 | 75 | 7.14 | 0.09 | 7.05 | 7.68 | 0.25 | 30.72 | |
| 4/11/2012 | D-10 | 100 | 6.39 | 0.1 | 6.29 | 6.92 | 0.33 | 20.76 | |
| 4/24/2012 | D-10 | 50 | 7.96 | 0.04 | 7.92 | 6.15 | 0.17 | 36.9 | > 36.9 |
| 4/24/2012 | D-10 | 75 | 7.25 | 0.07 | 7.18 | 5.41 | 0.25 | 21.64 | |
| 4/24/2012 | D-10 | 100 | 6.42 | 0.03 | 6.39 | 4.62 | 0.33 | 13.86 | |
| 5/5/2012 | D-10 | 50 | 7.74 | 2.74 | 5 | 4.48 | 0.17 | 26.88 | 26.88 |
| 5/5/2012 | D-10 | 75 | 7.38 | 0.16 | 7.22 | 6.7 | 0.25 | 26.8 | |
| 5/5/2012 | D-10 | 100 | 7.06 | 0.07 | 6.99 | 6.47 | 0.33 | 19.41 | |
| 5/17/2012 | D-10 | 10 | 7.39 | 1.23 | 6.16 | 4.96 | 0.03 | 148.8 | 148.8 |
| 5/17/2012 | D-10 | 25 | 7.09 | 0.07 | 7.02 | 5.82 | 0.08 | 69.84 | |
| 5/17/2012 | D-10 | 50 | 6.56 | 0.06 | 6.5 | 5.3 | 0.17 | 31.8 | |
| 10/25/2011 | D-27 | 50 | 7.53 | 0.07 | 7.46 | 6.97 | 0.17 | 41.82 | > 41.82 |
| 10/25/2011 | D-27 | 100 | 6.62 | 0.06 | 6.56 | 6.07 | 0.33 | 18.21 | |
| 10/25/2011 | D-27 | 200 | 4.83 | 0.03 | 4.8 | 4.31 | 0.67 | 6.465 | |
| 11/23/2011 | D-27 | 50 | 8.34 | 5.63 | 2.71 | 2.35 | 0.17 | 14.1 | 14.26 |
| 11/23/2011 | D-27 | 100 | 8.54 | 3.37 | 5.17 | 4.81 | 0.33 | 14.43 | |
| 11/23/2011 | D-27 | 200 | 8.87 | 0.05 | 8.82 | 8.46 | 0.67 | 12.69 | |
| 1/27/2012 | D-27 | 50 | 8.7 | 6.77 | 1.93 | 1.33 | 0.17 | 7.98 | 4.77 |
| 1/27/2012 | D-27 | 75 | 8.64 | 6.72 | 1.92 | 1.32 | 0.25 | 5.28 | |

| Date | Site | Volume of water used (mL) | D1 | D2 | D1-D2 | D-B | P | $BOD_5$ | Average |
|---|---|---|---|---|---|---|---|---|---|
| 1/27/2012 | D-27 | 100 | 8.64 | 6.45 | 2.19 | 1.59 | 0.33 | 4.77 | |
| 2/24/2012 | D-27 | 50 | 8.35 | 7.14 | 1.21 | 0.9 | 0.17 | 5.4 | 7.15 |
| 2/24/2012 | D-27 | 75 | 8.46 | 6.2 | 2.26 | 1.95 | 0.25 | 7.8 | |
| 2/24/2012 | D-27 | 100 | 8.67 | 6.19 | 2.48 | 2.17 | 0.33 | 6.51 | |
| 3/26/2012 | D-27 | 50 | 8.12 | 5.03 | 3.09 | 1.69 | 0.17 | 10.14 | 10.53 |
| 3/26/2012 | D-27 | 75 | 7.47 | 3.64 | 3.83 | 2.43 | 0.25 | 9.72 | |
| 3/26/2012 | D-27 | 100 | 6.79 | 1.48 | 5.31 | 3.91 | 0.33 | 11.73 | |
| 4/24/2012 | D-27 | 50 | 7.67 | 0.31 | 7.36 | 5.59 | 0.17 | 33.54 | > 33.54 |
| 4/24/2012 | D-27 | 75 | 6.88 | 0.06 | 6.82 | 5.05 | 0.25 | 20.2 | |
| 4/24/2012 | D-27 | 100 | 6.13 | 0.06 | 6.07 | 4.3 | 0.33 | 12.9 | |
| 5/5/2012 | D-27 | 50 | 6.94 | 0.05 | 6.89 | 6.37 | 0.17 | 38.22 | > 38.22 |
| 5/5/2012 | D-27 | 75 | 6.3 | 0.08 | 6.22 | 5.7 | 0.25 | 22.8 | |
| 5/5/2012 | D-27 | 100 | 5.55 | 0.06 | 5.49 | 4.97 | 0.33 | 14.91 | |
| 5/17/2012 | D-27 | 10 | 7.3 | 4.96 | 2.34 | 1.14 | 0.03 | 34.2 | 39.18 |
| 5/17/2012 | D-27 | 25 | 7.01 | 2.13 | 4.88 | 3.68 | 0.08 | 44.16 | |
| 5/17/2012 | D-27 | 50 | 6.52 | 0.06 | 6.46 | 5.26 | 0.17 | 31.56 | |
| 4/11/2012 | D-9 | 50 | 9.09 | 0.1 | 8.99 | 9.62 | 0.17 | 57.72 | > 57.72 |
| 4/11/2012 | D-9 | 75 | 9.29 | 0.07 | 9.22 | 9.85 | 0.25 | 39.4 | |
| 4/11/2012 | D-9 | 100 | 9.52 | 0.08 | 9.44 | 10.07 | 0.33 | 30.21 | |
| 4/24/2012 | D-9 | 50 | 7.74 | 1.21 | 6.53 | 4.76 | 0.17 | 28.56 | 28.56 |
| 4/24/2012 | D-9 | 75 | 6.93 | 0.05 | 6.88 | 5.11 | 0.25 | 20.44 | |
| 4/24/2012 | D-9 | 100 | 6.2 | 0.06 | 6.14 | 4.37 | 0.33 | 13.11 | |
| 10/25/2011 | F-4 | 50 | 7.22 | 0.27 | 6.95 | 6.46 | 0.17 | 38.76 | > 38.76 |
| 10/25/2011 | F-4 | 100 | 6.05 | 0.08 | 5.97 | 5.48 | 0.33 | 16.44 | |
| 10/25/2011 | F-4 | 200 | 3.56 | 0.06 | 3.5 | 3.01 | 0.67 | 4.515 | |
| 11/23/2011 | F-4 | 50 | 8.63 | 7.42 | 1.21 | 0.85 | 0.17 | 5.1 | 5.50 |

| Date | Site | Volume of water used (mL) | D1 | D2 | D1-D2 | D-B | P | $BOD_5$ | Average |
|---|---|---|---|---|---|---|---|---|---|
| 11/23/2011 | F-4 | 100 | 9.16 | 7.37 | 1.79 | 1.43 | 0.33 | 4.29 | |
| 11/23/2011 | F-4 | 200 | 10.27 | 6.24 | 4.03 | 3.67 | 0.67 | 5.505 | |
| 1/27/2012 | F-4 | 50 | 9.72 | 7.49 | 2.23 | 1.63 | 0.17 | 9.78 | 9.78 |
| 1/27/2012 | F-4 | 75 | 8.83 | 7.22 | 1.61 | 1.01 | 0.25 | 4.04 | |
| 1/27/2012 | F-4 | 100 | 9.02 | 7.3 | 1.72 | 1.12 | 0.33 | 3.36 | |
| 2/24/2012 | F-4 | 50 | 8.49 | 6.52 | 1.97 | 1.66 | 0.17 | 9.96 | 9.04 |
| 2/24/2012 | F-4 | 75 | 8.73 | 6.2 | 2.53 | 2.22 | 0.25 | 8.88 | |
| 2/24/2012 | F-4 | 100 | 9.02 | 5.64 | 3.38 | 3.07 | 0.33 | 9.21 | |
| 3/26/2012 | F-4 | 50 | 8.34 | 5.62 | 2.72 | 1.32 | 0.17 | 7.92 | 7.48 |
| 3/26/2012 | F-4 | 75 | 8 | 4.76 | 3.24 | 1.84 | 0.25 | 7.36 | |
| 3/26/2012 | F-4 | 100 | 7.58 | 3.79 | 3.79 | 2.39 | 0.33 | 7.17 | |
| 4/11/2012 | F-4 | 50 | 8.2 | 5 | 3.2 | 3.83 | 0.17 | 22.98 | 22.98 |
| 4/11/2012 | F-4 | 75 | 7.87 | 0.07 | 7.8 | 8.43 | 0.25 | 33.72 | |
| 4/11/2012 | F-4 | 100 | 7.52 | 0.09 | 7.43 | 8.06 | 0.33 | 24.18 | |
| 4/24/2012 | F-4 | 50 | 8.2 | 5.23 | 2.97 | 1.2 | 0.17 | 7.2 | 8.17 |
| 4/24/2012 | F-4 | 75 | 7.7 | 3.91 | 3.79 | 2.02 | 0.25 | 8.08 | |
| 4/24/2012 | F-4 | 100 | 7.37 | 2.52 | 4.85 | 3.08 | 0.33 | 9.24 | |
| 5/5/2012 | F-4 | 50 | 8.13 | 4.97 | 3.16 | 2.64 | 0.17 | 15.84 | 15.25 |
| 5/5/2012 | F-4 | 75 | 8.01 | 3.8 | 4.21 | 3.69 | 0.25 | 14.76 | |
| 5/5/2012 | F-4 | 100 | 7.87 | 2.3 | 5.57 | 5.05 | 0.33 | 15.15 | |
| 10/25/2011 | G-2 | 50 | 7.92 | 6.11 | 1.81 | -4.8 | 0.17 | -28.8 | 6.6 |
| 10/25/2011 | G-2 | 100 | 7.81 | 5.02 | 2.79 | -3.82 | 0.33 | -11.46 | |
| 10/25/2011 | G-2 | 200 | 7.61 | 2.92 | 4.69 | -1.92 | 0.67 | -2.88 | |
| 11/23/2011 | G-2 | 50 | 8.59 | 7.53 | 1.06 | 0.7 | 0.17 | 4.2 | 3.07 |
| 11/23/2011 | G-2 | 100 | 9.16 | 7.51 | 1.65 | 1.29 | 0.33 | 3.87 | |
| 11/23/2011 | G-2 | 200 | 10.19 | 7.78 | 2.41 | 2.05 | 0.67 | 3.075 | |

| Date | Site | Volume of water used (mL) | D1 | D2 | D1-D2 | D-B | P | $BOD_5$ | Average |
|---|---|---|---|---|---|---|---|---|---|
| 1/27/2012 | G-2 | 50 | 8.89 | 8 | 0.89 | 0.29 | 0.17 | 1.74 | < 1.53 |
| 1/27/2012 | G-2 | 75 | 9.14 | 8.15 | 0.99 | 0.39 | 0.25 | 1.56 | |
| 1/27/2012 | G-2 | 100 | 9.36 | 8.25 | 1.11 | 0.51 | 0.33 | 1.53 | |
| 2/24/2012 | G-2 | 50 | 8.44 | 7.16 | 1.28 | 0.97 | 0.17 | 5.82 | 5.79 |
| 2/24/2012 | G-2 | 75 | 8.73 | 6.91 | 1.82 | 1.51 | 0.25 | 6.04 | |
| 2/24/2012 | G-2 | 100 | 8.98 | 6.74 | 2.24 | 1.93 | 0.33 | 5.79 | |
| 3/26/2012 | G-2 | 50 | 9.15 | 6.86 | 2.29 | 0.89 | 0.17 | 5.34 | 5.05 |
| 3/26/2012 | G-2 | 75 | 9.17 | 6.56 | 2.61 | 1.21 | 0.25 | 4.84 | |
| 3/26/2012 | G-2 | 100 | 9.19 | 6.13 | 3.06 | 1.66 | 0.33 | 4.98 | |
| 4/11/2012 | G-2 | 50 | 9.23 | 4.9 | 4.33 | 4.96 | 0.17 | 29.76 | 28.19 |
| 4/11/2012 | G-2 | 75 | 9.56 | 3.2 | 6.36 | 6.99 | 0.25 | 27.96 | |
| 4/11/2012 | G-2 | 100 | 9.95 | 1.63 | 8.32 | 8.95 | 0.33 | 26.85 | |
| 4/24/2012 | G-2 | 50 | 8.5 | 6.88 | 1.62 | -0.15 | 0.17 | -0.9 | 1.94 |
| 4/24/2012 | G-2 | 75 | 8.57 | 6.22 | 2.35 | 0.58 | 0.25 | 2.32 | |
| 4/24/2012 | G-2 | 100 | 8.68 | 6.39 | 2.29 | 0.52 | 0.33 | 1.56 | |
| 5/5/2012 | G-2 | 50 | 8.24 | 6.79 | 1.45 | 0.93 | 0.17 | 5.58 | 5.84 |
| 5/5/2012 | G-2 | 75 | 8.2 | 6.11 | 2.09 | 1.57 | 0.25 | 6.28 | |
| 5/5/2012 | G-2 | 100 | 8.15 | 5.83 | 2.32 | 1.8 | 0.33 | 5.4 | |
| 5/17/2012 | G-2 | 10 | 7.48 | 3.48 | 4 | 2.8 | 0.03 | 84 | 84 |
| 5/17/2012 | G-2 | 25 | 7.41 | 0.07 | 7.34 | 6.14 | 0.08 | 73.68 | |
| 5/17/2012 | G-2 | 50 | 7.27 | 0.08 | 7.19 | 5.99 | 0.17 | 35.94 | |
| 10/25/2011 | Glutamic Acid | 20 | 7.94 | 0.06 | 7.88 | 7.39 | 0.07 | 110.8 | |
| 11/23/2011 | Glutamic Acid | 20 | 8.16 | 0.04 | 8.12 | 7.76 | 0.07 | 116.4 | |
| 1/27/2012 | Glucose/GA | 6 | 9.56 | 5.51 | 4.05 | 3.45 | 0.02 | 172.5 | |
| 2/24/2012 | Glucose/GA | 6 | 8.1 | 4.03 | 4.07 | 3.76 | 0.02 | 188 | |
| 3/26/2012 | Glucose/GA | 6 | 9.04 | 3.55 | 5.49 | 4.09 | 0.02 | 204.5 | |

| Date | Site | Volume of water used (mL) | D1 | D2 | D1-D2 | D-B | P | $BOD_5$ | Average |
|---|---|---|---|---|---|---|---|---|---|
| 4/11/2012 | Glucose/GA | 6 | 8.72 | 3.81 | 4.91 | 5.54 | 0.02 | 277 | |
| 4/24/2012 | Glucose/GA | 6 | 8.51 | 2.82 | 5.69 | 3.92 | 0.02 | 196 | |
| 5/5/2012 | Glucose/Glutamic Acid | 6 | 8.29 | 4.18 | 4.11 | 3.59 | 0.02 | 179.5 | |
| 5/17/2012 | G/GA | 6 | 7.37 | 2.14 | 5.23 | 4.03 | 0.02 | 201.5 | |
| 10/25/2011 | Rain | 50 | 8.13 | 1.48 | 6.65 | 6.16 | 0.17 | 36.96 | 36.96 |
| 11/23/2011 | Rain | 50 | 8.47 | 5.34 | 3.13 | 2.77 | 0.17 | 16.62 | 16.90 |
| 11/23/2011 | Rain | 100 | 8.73 | 2.64 | 6.09 | 5.73 | 0.33 | 17.19 | |
| 11/23/2011 | Rain | 200 | 9.32 | 0.04 | 9.28 | 8.92 | 0.67 | 13.38 | |
| 1/27/2012 | Rain | 50 | 8.97 | 5.28 | 3.69 | 3.09 | 0.17 | 18.54 | 14.24 |
| 1/27/2012 | Rain | 75 | 9.22 | 5.54 | 3.68 | 3.08 | 0.25 | 12.32 | |
| 1/27/2012 | Rain | 100 | 9.43 | 4.87 | 4.56 | 3.96 | 0.33 | 11.88 | |
| 2/24/2012 | Rain | 50 | 8.33 | 6.42 | 1.91 | 1.6 | 0.17 | 9.6 | 9.07 |
| 2/24/2012 | Rain | 75 | 8.49 | 5.87 | 2.62 | 2.31 | 0.25 | 9.24 | |
| 2/24/2012 | Rain | 100 | 8.66 | 5.38 | 3.28 | 2.97 | 0.33 | 8.91 | |
| 3/26/2012 | Rain | 50 | 8.87 | 4.7 | 4.17 | 2.77 | 0.17 | 16.62 | 16.27 |
| 3/26/2012 | Rain | 75 | 7.94 | 2.46 | 5.48 | 4.08 | 0.25 | 16.32 | |
| 3/26/2012 | Rain | 100 | 8.16 | 1.47 | 6.69 | 5.29 | 0.33 | 15.87 | |
| 4/24/2012 | Rain | 50 | 8.33 | 1.32 | 7.01 | 5.24 | 0.17 | 31.44 | 20.49 |
| 4/24/2012 | Rain | 75 | 8.33 | 2.97 | 5.36 | 3.59 | 0.25 | 14.36 | |
| 4/24/2012 | Rain | 100 | 8.25 | 1.25 | 7 | 5.23 | 0.33 | 15.69 | |
| 5/5/2012 | Rain | 50 | 8.18 | 4.79 | 3.39 | 2.87 | 0.17 | 17.22 | 16.96 |
| 5/5/2012 | Rain | 75 | 8.12 | 3.41 | 4.71 | 4.19 | 0.25 | 16.76 | |
| 5/5/2012 | Rain | 100 | 8.03 | 1.87 | 6.16 | 5.64 | 0.33 | 16.92 | |
| 10/25/2011 | Blank | 300 | 7.93 | 7.94 | -0.01 | -0.5 | 1.00 | -0.5 | |
| 11/23/2011 | Blank | 300 | 8.2 | 8.1 | 0.1 | -0.26 | 1.00 | -0.26 | |
| 1/27/2012 | Blank | 300 | 8.44 | 8.57 | -0.7 | 1.00 | -0.7 | -0.73 | |

| Date | Site | Volume of water used (mL) | D1 | D2 | D1-D2 | D-B | P | $BOD_5$ | Average |
|---|---|---|---|---|---|---|---|---|---|
| 2/24/ 2012 | Blank | 300 | 8.1 | 8.3 | -0.2 | -0.51 | 1.00 | -0.51 | |
| 3/26/ 2012 | Blank | 300 | 9.05 | 7.93 | 1.12 | -0.28 | 1.00 | -0.28 | |
| 4/11/ 2012 | Blank | 300 | 8.75 | 10.9 7 | - 2.22 | -1.59 | 1.00 | -1.59 | |
| 4/24/ 2012 | Blank | 300 | 8.51 | 7.82 | 0.69 | -1.08 | 1.00 | -1.08 | |
| 5/5/ 2012 | Blank | 300 | 8.3 | 8.06 | 0.24 | -0.28 | 1.00 | -0.28 | |
| 5/17/ 2012 | Blank | 300 | 7.46 | 7.14 | 0.32 | -0.88 | 1.00 | -0.88 | |
| 10/25/ 2011 | Blank + Seed | 300 | 7.96 | 7.47 | 0.49 | 0 | 1.00 | 0 | |
| 11/23/ 2011 | Blank + Seed | 300 | 8.16 | 7.8 | 0.36 | 0 | 1.00 | 0 | |
| 1/27/ 2012 | Blank + Seed | 300 | 8.5 | 7.9 | 0.6 | 0 | 1.00 | 0 | |
| 3/26/ 2012 | Blank + Seed | 300 | 9.04 | 7.64 | 1.4 | 0 | 1.00 | 0 | |
| 4/24/ 2012 | Blank + Seed | 300 | 8.47 | 6.7 | 1.77 | 0 | 1.00 | 0 | |
| 5/17/ 2012 | Blank + Seed | 300 | 7.38 | 6.18 | 1.2 | 0 | 1.00 | 0 | |
| 5/5/ 2012 | Blank +Seed | 300 | 8.3 | 7.78 | 0.52 | 0 | 1.00 | 0 | |
| 2/24/ 2012 | Blank+Seed | 300 | 8.11 | 7.8 | 0.31 | 0 | 1.00 | 0 | |
| 4/11/ 2012 | Blank+Seed | 300 | 8.72 | 9.35 | - 0.63 | 0 | 1.00 | 0 | |

## APPENDIX Q

Total rain event data, where total sampled is in inches (Weather Underground, 2012).

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Date** | 10/11/2011 | 10/12/2011 | 10/13/2011 | 10/14/2012 | | | | |
| **Inches** | 0.01 | 0.07 | 0.21 | 0.08 | | | | |
| **Total Sampled** | | | 0.29 | 0.08 | | | | |
| | | | | | | | | |
| **Date** | 10/20/2011 | 10/21/2011 | 10/22/2011 | 10/23/2011 | 10/24/2011 | 10/25/2011 | | |
| **Inches** | 0.09 | 0.1 | 0 | 0.01 | 0.06 | 0.06 | | |
| **Total Sampled** | 0.32 | | | | | | | |
| | | | | | | | | |
| **Date** | 11/16/2011 | 11/17/2011 | 11/18/2011 | 11/19/2011 | 11/20/2011 | 11/21/2011 | 11/22/2011 | 11/23/2011 |
| **Inches** | 0.04 | 0 | 0 | 0 | 0.01 | 0.19 | 0.84 | 0.96 |
| **Total Sampled** | 2.04 | | | | | | | |
| | | | | | | | | |
| **Date** | 1/25/2012 | 1/26/2012 | 1/27/2012 | | | | | |
| **Inches** | 0.01 | 0.41 | 0.86 | | | | | |
| **Total Sampled** | 1.28 | | | | | | | |
| | | | | | | | | |
| **Date** | 2/22/2012 | 2/23/2012 | 2/24/2012 | | | | | |
| **Inches** | 0.02 | 0.37 | 0.05 | | | | | |
| **Total Sampled** | 0.44 | | | | | | | |
| | | | | | | | | |
| **Date** | 3/22/2012 | 3/23/2012 | 3/24/2012 | 3/25/2012 | 3/26/2012 | | | |
| **Inches** | 0 | 0.05 | 0.15 | 0 | 0 | | | |
| **Total Sampled** | 0.2 | | | | | | | |
| | | | | | | | | |
| **Date** | 4/5/2012 | 4/6/2012 | 4/7/2012 | 4/8/2012 | 4/9/2012 | 4/10/2012 | 4/11/2012 | |
| **Inches** | 0 | 0 | 0 | 0 | 0 | 0.04 | 0.1 | |
| **Total Sampled** | 0.14 | | | | | | | |
| | | | | | | | | |
| **Date** | 4/19/2012 | 4/20/2012 | 4/21/2012 | 4/22/2012 | 4/23/2012 | 4/24/2012 | | |
| **Inches** | 0 | 0 | 0.44 | 0.01 | 0 | 0 | | |
| **Total Sampled** | 0.45 | | | | | | | |
| | | | | | | | | |
| **Date** | 5/1/2012 | 5/2/2012 | 5/3/2012 | 5/4/2012 | 5/5/2012 | | | |
| **Inches** | 0.05 | 0 | 0.01 | 1.12 | 0.01 | | | |
| **Total Sampled** | 1.19 | | | | | | | |
| | | | | | | | | |
| **Date** | 5/10/2012 | 5/11/2012 | 5/12/2012 | 5/13/2012 | 5/14/2012 | 5/15/2012 | 5/16/2012 | 5/17/2012 |
| **Inches** | 0 | 0 | 0 | 0.02 | 0.02 | 0.01 | 0.04 | 0 |
| **Total Sampled** | 0.09 | | | | | | | |