Assessing Performance Characteristics of Sediment Basins Constructed in Franklin County, Alabama

by

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ABSTRACT

The objective of the research project was to monitor the performance of newly designed sediment basins that were constructed on the ALDOT 502 project in Franklin County. The project included four tasks: (1) assess performance characteristics of sediment basins on the 502 project, (2) collect cost data and perform a literature review, (3) perform a survey of the current state-of-the-practice, and (4) prepare project reports. All tasks proposed have been completed. Through completing the study, the following conclusions have been developed:

- A field-scale data collection plan to monitor and evaluate sediment basin performance was developed and implemented using ISCO 6712 portable automatic stormwater samplers, flow modules, a rain gauge, and weirs.
- Sediment basin 4 on the 502 project did effectively remove sediments at the early stage of the construction when the basin's influent most likely contained relative large percent of large-size sediment particles. For example, sediment basin 4 removed 97.9% and 83.7% of sediments generated by rainfall events on 11/16/2011 and 12/5/2011.
- A floating skimmer allowed for effluent to be discharged uniformly and slowly, providing longer detention time for sediments to settle in the basin. Data analyses on decay (reduction) coefficients for total suspended solids (TSS) and turbidity allowed us to quantify the sediment-settling rate of soils on the 502 project in Franklin County, AL.

- Appropriate PAM (or floc log) added into inflow is crucial to aid sediment settling and reduce turbidity of effluent. For example, the performance of basin 4 was superior for the rainfall event on 11/16/2011 when correct PAM was used in the inflow channel than the performance for the rainfall event on 12/5/2011 when the wrong PAM was used.
- Rainfall events with subsequent high rainfall intensity impulses generated high turbidity inflows from the construction site and suddenly increased in-basin turbidity that could be several times higher than turbidity of water already in the basin.
- Resuspension of settled sediments significantly increased in-basin sediment concentration and turbidity when the basin has experienced a number of rainfall events with large amount of settled sediments inside basin.
- An under-designed sediment basin (from a volumetric standpoint) more frequently allowed highly turbid sediment-laden runoff to directly flow over the emergency spillway to the downstream receiving water body.

Based upon the results of the data collected and observed site conditions throughout the research period, the following recommendations are provided to ALDOT to improve sediment basin design and installation to maximize performance efficiency and cost effectiveness:

- Use at least 3,600 cubic feet per acre draining to the basin from the contributing area to size the sediment basin.
- Increase the number of PAM floc logs placed at the bottom of inflow channel to properly dose for the average flow rate of 2-yr 24-hr runoff. The number of floc logs should be based on the manufacturer recommended dosage and the expected inflow rate of stormwater runoff.

- Consider increasing the number of floc logs placed on the sides of inflow channel to dose for the average flow rate of 2-yr or 10-yr 24-hr runoff. These storms will have higher water depths, resulting in a greater amount of inflow, therefore requiring a higher dosage of PAM.
- The height of the baffles, once installed, should match the full depth of the sediment basin, including the additional freeboard depth used by the emergency spillway.

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CHAPTER ONE

INTRODUCTION

The discharge of sediment-laden stormwater runoff from construction sites has proven to be a substantial environmental liability in regards to water quality degradation, second only to pathogens (USEPA 2005). Stormwater, a form of nonpoint source pollution (NPS), is a result of rainfall that flows from various land surfaces, often transporting natural and non-natural pollutants and discharges into lakes, rivers, and other water bodies. Based upon the amount of stormwater runoff at any particular time, it can increase the likelihood of erosion and sedimentation when occurring over disturbed land areas, such as construction sites. Environmental concerns stem from implications that sediment-laden stormwater runoff is responsible for fish kills, degradation of aquatic habitats, and capacity reduction of navigable waterways (Novotny 1999). In an effort to provide a level of protection for natural resources in the U.S., federal and state regulations maintain that construction site owners and operators are to manage stormwater runoff in a way that prevents NPS pollution from occurring. The Clean Water Act was passed by Congress in 1987, establishing a national program focusing on the control of nonpoint sources of water pollution in Section 319. Since that time, every state has adopted sediment management programs to assist in controlling and reducing NPS pollution (USEPA 2003). However, the National Water Quality Inventory reported in 2000 that sedimentation impairs 84,503 river and stream miles, with construction site sedimentation runoff rates 10 to 20 times greater than those of agricultural runoff, and about 1,000 to 2,000 times greater than those of forest land runoff (USEPA 2005). It has been estimated that between 2 and 6 billion tons of eroded soil are deposited into U.S. water bodies yearly (Line and White 2001). Much of this sediment-laden runoff could have been mitigated through the use of effective erosion and sediment control programs and practices, and have generated demands to provide better methods for controlling erosion and sediment on construction sites.

In 2008, the U.S. Environmental Protection Agency (USEPA) proposed a numeric limit of 13 nephelometric turbidity units (NTU) for construction site stormwater runoff. However, in November of 2009 the USEPA backed off the stringent 13 NTU limit to a more relaxed standard of 280 NTU – 40 CFR 450.22(a) and (b) (USEPA 2009). This change came in response to a flood of comments suggesting that the 13 NTU limit would represent less than the background levels at some sites and would be nearly impossible to meet. The new policy required: (1) in 18 months (August 2011), construction sites 20 acres or larger will be required to monitor and meet numeric discharge limits, and (2) in four years (August 2014), construction sites 10 acres or larger will be required to monitor and meet the 280 NTU numeric discharge limits. This was the first time that the USEPA has imposed national monitoring requirements and enforceable numeric limitations on construction site stormwater discharges (USEPA 2009). In November 2010, the USEPA posted a Federal Register notice advising that an indefinite stay would be placed on the numeric effluent turbidity limitation of 280 NTU and associated requirements effective on January 4, 2011. This action was necessary so that the USEPA could reconsider the record basis for calculating the numeric effluent limitation (USEPA 2010). The USEPA issued another notice in the Federal Register in January 2012 requesting additional performance data of best management practices (BMPs) used in controlling turbidity on construction sites (USEPA 2012).

1.1 Background

Though the EPA has stayed the proposed numeric effluent limitation, the construction industry is still concerned with the implications of the new rules. In an effort to comply with USEPA regulations and maintain an average effluent discharge of 280 NTU from construction sites, many construction agencies employ structural and nonstructural BMPs that are aimed at reducing NPS pollutants to receiving water bodies. One of the most common practices employed on larger construction sites are sediment basins. Sediment basins are considered a structural measure used on sites with earth disturbances (e.g., cut and fill sections) to minimize the amount of sediment leaving a site and entering receiving water bodies (Bidelspach and Jarrett 2004). Specifically, the Alabama Department of Transportation (ALDOT) commonly uses sediment basins where it is practical on highway construction projects. Much of the design of sediment basins used on ALDOT sites originates from the Alabama Soil and Water Conservation Committee's (ASWCC) "*Handbook for Erosion Control, Sediment Control, and Stormwater Management on Construction Site and Urban Areas*," (a.k.a., the Alabama Handbook) that provides a general guidance on sediment basin design. In the past, ALDOT highway construction sites have used a traditional sediment basin design by the Alabama Handbook published in 2006. These basins use an 18" diameter, perforated riser pipe as the primary outlet structure as shown in Figure 1.1. The riser pipe also contained an opening at the top to act as an emergency spillway under extreme rainfall events. This technique has proven to be an inefficient method of dewatering a sediment basin due to the fact that it dewaters the basin from the entire height of the water column.

In an effort to improve the performance of sediment basins being used on highway construction projects and meet the new EPA regulations, ALDOT preferred to update the design provided in the 2006 Alabama Handbook and move to a newer, more efficient sediment basin design. Routine stormwater inspections after rainfall events found that water would seldom reach the top opening of the perforated riser pipe, thus indicating that water was not being retained for a sufficient period of time to allow for suspended sediment particles to settle out. This resulted in turbid water being discharged into nearby creeks. The newly designed sediment basin, as documented in the 2009 Alabama Handbook, uses a Faircloth® skimmer as the primary dewatering device with a rock-lined emergency spillway for extreme rainfall events. The new basin design also uses polyacrylamide (PAM), as well as a sump, rock ditch check, and rip-rap lined inflow channel. An optimal length-to-width ratio and depth is also considered in the new sediment basin design in order to maximize turbidity reduction efficiency and promoting the settlement of suspended sediment.

Figure 1.1: Example of the 2006 sediment basin design with a perforated riser pipe.

1.2 Research Objectives

In order to provide ALDOT with an improved sediment basin design that remains cost efficient, certain objectives must be met by this research. The primary objectives of this research are to:

(1) Assess the performance characteristics of a temporary sediment basin on a highway construction site in Franklin County, AL.

(2) Examine differences between various sediment basin design practices.

(3) Perform a cost-benefit analysis to evaluate the cost effectiveness of the various sediment basin designs and features.

The specific tasks that will be performed to accomplish the abovementioned research objectives include:

(1) Collect rainfall data and stormwater samples from inflow, in-basin, and outflow.

(2) Perform lab analysis on collected samples for NTU and TSS levels.

(3) Sample retained sediment and perform gradation analysis.

(4) Determine sediment basin efficiency based on performance characteristics, sediment basin configuration, and data results.

This study is to provide a comprehensive analysis on how newly designed sediment basins function under various rainfall events and at different stages of construction activities. Results of this research are to provide practical and implementable criteria along with standardized design guidelines for determining the applicability, need, and improved installation practices of sediment basins to be used on ALDOT highway construction sites.

1.3 Organization of Thesis

This thesis is divided into six chapters. Following this chapter, *Chapter* 2: *Literature Review* examines the body of knowledge pertaining to research and experiments conducted to evaluate sediment basins as a whole, as well as different characteristic features of different types of sediment basins. This chapter discusses the designs, procedures, and experimental results that were presented in previous research efforts. Also discussed are advantages and disadvantages of different modifications and features used in conjunction with sediment basins. *Chapter* 3: *State of the Practice Survey, Development, and Results* gives an overall summary on a nationwide survey conducted as a part of this research effort to assess the state-of-the-practice regarding the use of sediment basins by other state highway agencies. *Chapter 4: Means and Methods of Data Collection* outlines the design, methods, and procedures used in the data collection and analysis applied in this research. This chapter includes details on the design of an integrated stormwater sampling system, rainfall monitoring, stormwater sample analysis procedures, and sediment sample collection and analysis procedures. *Chapter* 5*: Data Results and Discussion*, presents the performance results generated from rainfall events monitored at the sediment basin. *Chapter* 6*: Conclusions and Recommendations*, provides insight on the use and performance of sediment basins, as well as specific features used with sediment basins, as a BMP combination used to reduce the amount of turbidity in effluent discharge from highway construction sites. This chapter also provides recommendations for future research analyzing the proper installation and maintenance procedures of PAM floc logs being used with sediment basin inflow channels.

CHAPTER TWO

LITERATURE REVIEW

Construction activities are major contributors of suspended solids and sediments to surface waters, often times carrying sediment loads as high as 2,000 times more than wooded lands and 10 to 20 times greater than agricultural lands (Bhardwaj and McLaughlin 2008). Sediment has been widely recognized as one of the leading pollutant of surface waters. Sediment has been generally accepted as the most prevalent pollutant in rivers and streams of the U.S. in terms of volume (Line and White 2001). In the U.S. alone, between 2 and 6 billion tons of eroded-soil are deposited in water bodies yearly (Bidelspach, Jarrett et al. 2004; Bhardwaj and McLaughlin 2008). Urban erosion-related pollutants have imposed a net damage cost that has been estimated to range between $192 million to $2 billion per year (Line and White 2001; Bhardwaj, McLaughlin et al. 2008). Turbidities of water being discharged from construction sites range from hundreds to thousands of NTU. Millions of tons of eroded soil end up in rivers, lakes, and reservoirs (Bidelspach, Jarrett et al. 2004). Suspended solids (SS) in surface waters have become a serious problem that detrimentally affect aquatic biota, facilitate transport of heavy metals and organic and inorganic pollutants, and decrease the aesthetic value of lakes and rivers (Bhardwaj, McLaughlin et al. 2008). The increase in nutrients carried by sediment can stimulate algae growth and, consequently, accelerate eutrophication (Bidelspach, Jarrett et al. 2004).

Federal and state regulations require developers to design erosion and sediment control programs for construction sites. Specifically, the USEPA issued the National Pollutant

Discharge Elimination System (NPDES) General Permit for Discharges from Construction Activities, becoming effective on February 16, 2012. These USEPA regulations state that any land disturbance activity that covers a minimum of one acre must submit an erosion and sedimentation control plan to the USEPA. This erosion and sediment control plan must include structural and/or nonstructural best management practices (BMPs) that are aimed at reducing nonpoint source (NPS) pollutants to receiving waters (Bhardwaj and McLaughlin 2008). Non-structural BMPs focus on preserving open space, protecting natural systems, and incorporating existing landscape features such as wetlands and stream corridors into a site plan to manage stormwater at its source, whereas structural BMPs are actually based on natural or man-made systems and rely upon vegetation and soil mechanisms in order to perform as intended. The use of these mitigation techniques is not meant to replace the use of non-structural BMPs, but rather to work in tandem with these planning and design-based approaches to minimize unavoidable impacts.

Sedimentation basins (or more commonly, sediment basins) are a structural BMP used on earth disturbance sites to minimize the amount of sediment leaving a site and entering receiving waters (Bidelspach and Jarrett 2004). Sediment basins are impoundment structures designed to receive sediment-laden stormwater runoff and provide an opportunity for the removal of suspended sediment. This process is achieved by detaining the water long enough for the suspended sediment to settle from the water under the influence of gravity before the water is discharged to the uncontrolled environment (Fennessey and Jarrett 1997; Millen, Jarrett et al. 1997). Sediment basins are commonly used for controlling sediment loss from construction and mining sites (Millen, Jarrett et al. 1997).

Sediment and detention ponds have shown high removal efficiencies for suspended solids and thereby for heavy metals and organic compounds (Bentzen, Larsen et al. 2009). The removal efficiency of sedimentation control devices depends on factors such as the intensity and duration of storm events, topography and extent of construction sites, soil type, the amount of vegetative cover, and the system of practices implemented (Line and White 2001).

2.1 Sediment Basin Practices

A few major parameters must be carefully considered when designing a sediment basin. One such parameter is the sizing of the basin. The usual methods of regulating sediment basins are through performance standards, which specify effluent concentrations, and/or hydraulic design standards (Millen, Jarrett et al. 1997). According to hydraulic standards, sufficient volume must be provided to store the sediment-laden runoff water so that the suspended sediment has time to settle from the water (Millen, Jarrett et al. 1997; Bidelspach, Jarrett et al. 2004).

2.1.1 *Design Storm*

To size a basin properly, one must determine the particular design storm event that is being considered for the site. The most common storm events that are factored into sediment basin design are 2, 5, 10, 25, 50, and 100 year (return period) storms (Hershfield 1961). These storms are determined by the National Oceanic and Atmospheric Administration (NOAA) for each state taking into account the storm durations (i.e., 30 min, 1, 2, 3, 6, 12, or, 24-hr) and the probability of that storm occurring, based on historical data. A storm event return period is defined by Equation 2.1 (Pitt, Clark et al. 2007).

$$T = \frac{1}{P} \tag{2.1}$$

where,

T = return period (years)

P = % probability of an event occurring in a given year (i.e. 50% = 0.5)

For example, P = 50% when T = 2 years means that the probability that a two-year storm event will be equal to or exceeded in any year is 50%.

Using the precipitation depths, provided by NOAA, for the nearest location to the sediment basin, the volume of runoff generated for the design storm can be calculated; thus, a basin volume is determined. The typical storm used for the design of sediment basins is a 2-year, 24-hour storm. In Franklin County, Alabama, a 2-year, 24-hour storm has a rainfall depth of 3.91 inches.

2.1.2 *Runoff Volume*

To properly calculate the runoff volume for the design storm, it is necessary to select or use appropriate methods to compute effective rainfall depth after considering various rainfall losses. There are many factors affecting rainfall losses for converting rainfall into runoff. The major factors affecting runoff are rainfall, antecedent moisture content, surface cover, and soils (Pitt, Clark et al. 2007). According to previous standards, a sediment basin is to have sufficient volume to capture 0.5 inch of runoff per acre of disturbed area, which is equivalent to 1,800 ft^3/acre of disturbed area (NCDOT 2006). This standard, adopted by the state of Alabama, has recently been increased to 3,600 ft^3/acre of disturbed area, or 1.0 inch of runoff per acre of disturbed area for sediment basins that serve an area with 10 or more disturbed acres at one time

(Kalainesan, Neufeld et al. 2008). The one inch of runoff could be produced by different design rainfall depths falling on contributing areas with different antecedent moisture contents, surface covers, and soil types. Many different methods of computing runoff volume, runoff hydrograph, and peak discharge have been developed. For the first step in sizing a sediment basin, an estimate of runoff volume, in mm or inches, is needed. Volumetric runoff coefficient R_v (Pitt, Clark et al. 2007; Dhakal, Fang et al. 2012) and NRCS curve number (SCS 1973) can be used to compute runoff or effective rainfall for small watersheds such as construction sites. Thronson (1973) presented the following equation (2.2) to estimate the erosion potential runoff for individual rains, when complete intensity information is not available (Thronson 1973; Pitt, Clark et al. 2007):

$$\boldsymbol{R = \frac{19.25P^{2.2}}{(dur)^{0.4672}}} \qquad \textbf{(2.2)}$$

where,

R = erosive potential
P = rain depth (inches)
dur = rain duration (hours)

To properly calculate the runoff volume for the design storm, the contributing watershed area for the sediment basin must also be calculated. To correctly determine the contributing watershed area for a sediment basin, a watershed delineation must be established. There are five steps in creating a watershed delineation (Pitt, Clark et al. 2007):

- Using topographical quad sheets of the area surrounding the proposed sediment basin, trace the main drainage pathways upstream from the point of interest (i.e., the sediment basin).

- Trace the drainage pathways marked on the topographic map that are draining away from the area.
- Extend the drainage ways along obvious drainage pathways, such as gullies or ravines, and locate the peaks along ridges between the drainage systems with a large dot in the center of enclosed contours.
- Starting at the sediment basin connect the peaks between the drainage systems along the ridges to delineate the watershed boundary, making sure that the boundary line only crosses the topographical lines at 90° angles.
- Based on a site survey, make modifications to the watershed boundary to consider construction modifications to the landscape that may differ from the topographical quad sheets. Then calculate the total area enclosed by the watershed boundary.

2.1.3 *Time of Concentration*

Ensuring that the proper sizing of the basin has been determined based on runoff hydrographs before and after the development and flow routing through the basin, a rainfall-runoff model is necessary to generate runoff hydrographs flowing into the basin. Many stormwater simulation models or methods have been developed (Viessman and Lewis 2003), for example: the modified rational method, SCS TR-20 method, SCS TR-55 tabular hydrograph method, SCS TR-55 graphical method, U.S. Army Corps of Engineers HEC-1/HEC-HMS (Pitt, Clark et al. 2007). To implement various rainfall-runoff models, the designer must then calculate the time of concentration (TOC) for the watershed area. Time of concentration is defined as the total time for water to travel from the most remote point (MRP) to the point of interest (POI). This is important because the time of concentration affects the peak and shape of the hydrograph of the inflow to the sediment basin, often changing based on the stage of construction (Pitt, Clark et al. 2007). There are two methods of estimating the TOC (tc): (1) the Kirpich Method or (2) Segmental Method. The Kirpich Method is defined by Equation (2.3), and the Segmental Method (TR-55) is defined using Equation 2.3 thru Equation 2.6 (Pitt, Clark et al. 2007):

$$t_c = \frac{\left[\frac{L^3}{H}\right]^{0.385}}{128} \qquad \textbf{(2.3)}$$

where,

t_c = time of concentration (minutes)
L = length of drainage pathway (ft)
H = elevation difference (ft)

The Kirpich Method is typically useful for estimating t_c from small drainage basins that are dominated by channel flow and is typically limited to watersheds with a drainage area of 200 acres or less (Pitt, Clark et al. 2007). Recently Fang et al. (2008) used Kirpich Method to determine t_c in 90 Texas watersheds and concluded that Kirpich Method can be used in watersheds much larger than 200 acres (Fang, Thompson et al. 2008).

The Segmental Method (TR-55) is also popularly called as NRCS velocity method. Time of concentration of a watershed is equal to the sum of the runoff travel times (t_{ti}) along the flow path:

$$\boldsymbol{t_c = \sum_{i=1}^{n} t_{t_i}} \qquad \textbf{(2.4)}$$

where,

i = type of flow path

and the flow path may include sheet flow (Equation 2.5), shallow concentrated flow (Equation 2.6), or channel flow (Equation 2.7).

$$t_{t_s} = \frac{0.42(nL)^{0.8}}{{P_2}^{0.5}S^{0.4}} \quad \textbf{(2.5)}$$

where,

n	=	Manning's roughness coefficient
L	=	length of sheet flow (ft) < 150 ft
P_2	=	rainfall depth at a 2-year return period
S	=	average ground slope

$$t_{t_{sc}} = \frac{L}{60V} \quad \textbf{(2.6)}$$

where,

L	=	length of shallow concentrated flow (ft)
V	=	velocity (ft/s)

$$t_{t_c} = \frac{Ln}{89.4R^{2/3}S^{1/2}} \quad \textbf{(2.7)}$$

where,

L	=	length of channel flow (ft)
n	=	Manning's roughness coefficient
R	=	hydraulic radius (ft)
S	=	slope

The Segmental Method separates flow into three segments: sheet flow (Equation 2.5), shallow concentrated flow (Equation 2.6), and channel flow (Equation 2.7). The time of concentration (Equation 2.4) is equal to the sum of the travel times calculated for each segment (Pitt, Clark et al. 2007). There are possible large variations on time of concentration estimated using the Segmental Method depending on the designer experience on applying the method (Fang, Thompson et al. 2007).

2.1.4 ***Stormwater Runoff Rate***

With the time of concentration calculated, the peak runoff rate and volume can be calculated. Two common methods for these calculations are the Rational Method for calculating peak runoff rate and the Soil-Cover Complex for calculating peak runoff rate and runoff volume (Pitt, Clark et al. 2007). The Rational Method is an empirical formula used for computing peak rates of runoff that has been used in urban areas for more than 100 years and is defined by Equation 2.8. The Rational Method is typically limited to areas of 20 acres or less that do not vary in surface character or have branched drainage systems.

$$Q = CiA \qquad \textbf{(2.8)}$$

where,

Q = peak runoff rate in (cubic feet per second)

C = rate-based runoff coefficient

i = average rainfall intensity (inches/hr), for a storm duration equal to t_c

A = drainage area (acres)

The runoff coefficient, C, is determined using engineering judgment in combination with Table 2.1 thru Table 2.2.

Table 2.1: *C* values for use in Rational Method (Chukwuma, Edwards et al. 1979)

Vegetation	Runoff Coefficient, C		
Slope	Sandy Loam[1]	Clay and Silt Loam[2]	Tight Clay[3]
Forest			
0-5% slope	0.10	0.30	0.40
5-10% slope	0.25	0.35	0.50
10-30% slope	0.30	0.50	0.60
Pasture			
0-5% slope	0.10	0.30	0.40
5-10% slope	0.16	0.36	0.55
10-30% slope	0.22	0.42	0.60
Cultivated			
0-5% slope	0.30	0.50	0.60
5-10% slope	0.40	0.60	0.70
10-30% slope	0.52	0.72	0.82

[1]Equivalent to Soil-Cover-Complex Hydrologic Soil Group A.
[2]Equivalent to Soil-Cover-Complex Hydrologic Soil Group B and C.
[3]Equivalent to Soil-Cover-Complex Hydrologic Soil Group D.

Table 2.2: C values for use in Rational Method (Thompson 2007)

Land Use	Runoff Coefficient, C	Land Use	Runoff Coefficient, C
Business:		*Lawns:*	
Downtown Areas	0.70 – 0.95	Sandy Soil, Flat, 2%	0.05 – 0.10
Neighborhood Areas	0.50 – 0.70	Sandy Soil, Avg, 2-7%	0.10 – 0.15
Residential:		Sandy Soil, Steep, 7%	0.15 – 0.20
Single Family Areas	0.30 – 0.50	Heavy Soil, Flat, 2%	0.13 – 0.17
Multi-Unit Detached	0.40 – 0.60	Heavy Soil, Avg, 2-7%	0.18 – 0.22
Multi-Unit Attached	0.60 – 0.75	Heavy Soil, Steep, 7%	0.25 – 0.35
Suburban	0.20 – 0.40	*Agricultural Land:*	
Industrial:		Bare Packed Soil	
Light Areas	0.50 – 0.80	Smooth	0.30 – 0.60
Heavy Areas	0.60 – 0.90	Rough	0.20 – 0.50
Parks, Cemeteries	0.10 – 0.25	Cultivated Rows	
Playgrounds	0.20 – 0.35	Heavy Soil, No Crop	0.30 – 0.60
Railroad Yard Areas	0.20 – 0.40	Heavy Soil, With Crop	0.20 – 0.50
Unimproved Areas	0.10 – 0.30	Sandy Soil, No Crop	0.20 – 0.40
Streets:		Sandy Soil With Crop	0.10 – 0.25
Asphalt	0.70 – 0.95	Pasture	
Concrete	0.80 – 0.95	Heavy Soil	0.15 – 0.45
Brick	0.70 – 0.85	Sandy Soil	0.05 – 0.25
Drives and Walks	0.75 – 0.85	Woodlands	0.05 – 0.25
Roofs	0.75 – 0.85		

When determining a C value for the watershed area, the area might be divided into multiple categories. In this scenario, a weighted C value needs to be calculated. To determine a weighted C value, determine multiple C values for the watershed area according to the best fit land use. Multiply the area of land (in acres) by its corresponding C value (giving you CA). Sum the CA values together and divide them by the total area of the watershed. This will give the designer a weighted C value, as shown in Equation 2.9.

$$C = \frac{\sum C_i A_i}{A} \quad \textbf{(2.9)}$$

where,

C = weighted C Value

C_i = C value of subarea i

A_i = area of subarea i (acres)

A = total drainage area (acres)

The Rational Method is useful for small, isolated portions of a construction site; however, the Rational Method is not an aerial distribution of rainfall intensity, and many errors have been reported in the use of the Rational Method, making it difficult to verify (Pitt, Clark et al. 2007). For this reason, the Soil-Cover-Complex Method (a.k.a. SCS, NRCS, TR-55, TR-20) is used more often. The most common of the various types of the Soil-Cover-Complex Method is TR-55. With TR-55, only the following site characteristics are needed: drainage area (Equation 2.10), curve number or CN (Equation 2.11), and time of concentration, t_c (Equation 2.4) (Pitt, Clark et al. 2007). Using this information, it is possible to develop a hydrograph for a specific design storm.

$$A = A_1 + A_2 + \cdots + A_i \quad \textbf{(2.10)}$$

where,

A = total drainage area (acres)

A_i = area of subarea i (acres)

$$CN = \frac{1}{A}[A_1(CN_1) + A_2(CN_2) + \cdots + A_i(CN_i)] \quad \textbf{(2.11)}$$

where,

CN = overall curve number

CN_i = subarea curve number (from Table 1.3)

A = total drainage area (acres)

A_i = area of subarea i (acres)

Table 2.3: Typical curve number values for TR-55 (Pitt, Clark et al. 2007)

Urban Areas Land Use Description/Treatment[0]	Hydrologic Condition	Hydrologic Soil Group A	 B	 C	 D
Resedential[1]					
Average Lot Size:	Average % Imperviousness[2]				
1/8 acre or less	65	77	85	90	92
1/4 acre	38	61	75	83	87
1/3 acre	30	57	72	81	86
1/2 acre	25	54	70	80	85
1 acre	20	51	68	79	84
Paved parking lots, roofs, driveways, etc.[3]		98	98	98	98
Streets and roads					
Paved with curbs and storm sewers[2]		98	98	98	98
Gravel		76	85	89	91
Dirt		72	82	87	89
Commercial and business areas (85% imperviousness)		89	92	94	95
Industrial districts (72% imperviousness)		81	88	91	93
Open spaces, lawns, parks, golf courses, cemeteries, etc.					
Good condition: grass cover on 75% or more of area		39	61	74	80
Fair condition: grass cover on 50 to 75% of the area		49	69	79	84
Poor condition: grass cover on less than 50% of the area		68	79	86	89
Western Desert Urban Areas					
Natural desert landscaping (pervious areas only)[4]		63	77	85	88
Artificial desert landscaping (impervious weed barrier, desert shrub with 1 to 2 inch sand or gravel mulch and basin borders)		96	96	96	96
Developing Urban Areas					
Newly developing areas (pervious areas only, no vegetation)		77	86	91	94

Non-Urban Areas Cover Description[0]	Hydrologic Condition	Curve Numbers for Hydrologic Soil Group A	 B	 C	 D
Pasture, grassland, or range – continuous forage for grazing[5]	Poor	68	79	86	89
	Fair	49	69	79	84
	Good	39	61	74	80
Meadow – continuous grass, protected from grazing and generally mowed for hay	-	30	58	71	78
Brush – brush-weed-grass mixture with brush the major element[6]	Poor	48	67	77	83
	Fair	35	56	70	77
	Good	30	48	65	73
Woods-grass combination (orchard or tree farm)[7]	Poor	57	73	83	86
	Fair	43	65	76	82
	Good	32	58	72	79
Woods[8]	Poor	45	66	77	83
	Fair	36	60	73	79
	Good	34	55	70	77
Farsteads – buildings, lanes, driveways, and surrounding lots.	-	59	74	82	86

[0]Average runoff condition, and $I_a = 0.2S$.
[1]Curve numbers are computed assuming the runoff from the house and driveway is directed toward the street with a minimum of roof water directed to lawns where additional infiltration could occur. Impervious areas have a CN of 98 and pervious space considered equivalent to open space in good hydrologic condition.
[2]The remaining pervious areas (lawn) are considered to be in good pasture condition for these curve numbers.
[3]In some warmer climates of the country, a curve number of 95 may be used.
[4]Composite curve numbers for natural desert landscaping should be computed using the following figures based on the impervious area percentage and the pervious area *CN*. The pervious area *CN*s are assumed equivalent to desert shrub in poor hydrologic condition.
[5]Poor: < 50% ground cover or heavily grazed with no mulch.
Fair: 50 to 75% ground cover and not heavily grazed.
Good: > 75% ground cover and lightly or only occasionally grazed.
[6]Poor: < 50% ground cover.
Fair: 50 to 75% ground cover.
Good: > 75% ground cover.
[7]*CN*s shown were computed for areas with 50% woods and 50% grass (pasture cover). Other combinations of conditions may be computed from the *CN*s for woods and pasture.
[8]Poor: Forrest litter, small trees, and brush are destroyed by heavy grazing or regular burning.
Fair: Woods are grazed, but not burned, and some forest litter covers the soil.
Good: Woods are protected from grazing, and litter and brush adequately cover the soil.

2.2 Sediment Storage

Sufficient volume must also be provided to store the sediment collected, in addition to the runoff volume (Bidelspach, Jarrett et al. 2004). Several factors need to be considered when determining the amount of sediment eroded in a given watershed area such as climate, soil characteristics, land shape, and land use (Pitt, Clark et al. 2007). Sizing a basin solely on the 1,800 or 3,600 ft^3/acre standard procedure sometimes results in insufficient sediment volume in the basin leading to sediment resuspension and release through the basin outlet, increasing the concentration of particulate contaminants leaving the basin (Kalainesan, Neufeld et al. 2009). In order to properly size the basin, a quantity estimation of the sediment volume for the total contributing area for rainfall runoff must be determined by applying the Revised Universal Soil Loss Equation, or RUSLE (Kalainesan, Neufeld et al. 2009). RUSLE can be used to calculate the sediment yield from a sediment basin's watershed area, and thus, determine the sediment storage volume and associated frequency of sediment removal for the basin. RUSLE is a set of mathematical relationships that estimate average annual soil loss and sediment yields resulting from inter-rill and rill erosion. It was derived from the theory of erosion processes, using more than 10,000 plot-years of data from natural rainfall simulation plots (Kalainesan, Neufeld et al. 2009). RUSLE is mathematically defined by Equation 2.12 (Pitt, Clark et al. 2007; Kalainesan, Neufeld et al. 2008; Kalainesan, Neufeld et al. 2009) .

$$A = R * K * LS * C * P \qquad \textbf{(2.12)}$$

where,

A = annual erosion rate, (tons/acre-year, tons/m^2-year)

R = rainfall factor (rain energy)

(ton-acre-hour/acre-foot-ton-inch, ton-m^2-hour/m^3-kN-cm)

K = soil erodibility factor

LS = length–slope factor, (ft/ft, m/m)

C = cover management factor

P = supporting practices factor

The latest version of RUSLE is RUSLE2, a Windows-based program that has a user friendly graphical user interface and can be applied to complex slope configurations including cut and fill slopes – typical of highway construction sites (Kalainesan, Neufeld et al. 2009). RUSLE2 can be used to estimate soil loss from construction sites, mined land, and reclaimed land, in addition to agricultural land. Applications that relate RUSLE2 to construction sites are assessment of hill slope configurations, obtaining erosion-control or erosion-reduction credit for the surface rock fragment covers, and analyses of the effects of straw mulch, random roughness, and changes through time due to mulch decomposition and deterioration of the surface roughness due to rainfall (Pitt, Clark et al. 2007; Kalainesan, Neufeld et al. 2009).

In addition to sufficient volume being provided for sediment-laden stormwater runoff, the shape of a sediment basin also plays a key role in the overall performance of sediment basins (Bidelspach, Jarrett et al. 2004). Basin geometry is an important design parameter in maintaining higher sediment retention efficiencies (Millen, Jarrett et al. 1997). The reduced efficiency of many basins is often due to short circuiting and dead-space within the basins (Millen, Jarrett et al. 1997; Bidelspach, Jarrett et al. 2004; Glenn and Bartell 2008). It has been identified that short circuiting is a common hydraulic phenomena that is important to sediment basin performance, and occurs in cases where inflow arrives at the basin outlet without mixing with the entire basin volume (Madaras and Jarrett 2000). Short circuiting occurs as the concentrated flow enters the basin and creates a high velocity zone through the basin to the outlet without mixing with the entire basin volume (Madaras and Jarrett 2000; Thaxton and McLaughlin 2005; Glenn and Bartell 2008). Dead storage is the stagnant portion of a basin that does not contribute to the mean flow on the basin and is not effective in the overall sedimentation process, but can be used as a means of energy dissipation for basin inflow (Griffin, Barfield et al. 1985). In an effort to promote settling and reduce the negative effects of short circuiting and dead storage, the USEPA recommends that the ratio of the length of flow path to the effective width be greater than 2:1 (Madaras and Jarrett 2000). Studies in 1985 confirmed this logic when they found that the length-to-width ratios should be greater than 2:1 to minimize dead storage by increasing the flow path length (Griffin, Barfield et al. 1985). In addition, Griffin et al. (1985) also confirmed that short basins have a 10% greater dead storage volume than that of long basins. Surface area is one of the most important design considerations for sediment removal (Pitt, Clark et al. 2007). It has also been noted in previous studies that basin surface area should not be compromised in efforts to increase basin length, thus basins should not get deeper and longer (Madaras and Jarrett 2000). To ensure structural stability, a typical sediment basin is currently constructed with tapered side walls, and because of this, the area of the basin varies depending on the depth of the runoff in the basin (Kalainesan, Neufeld et al. 2008).

2.3 Detention Time

Another factor that is important to consider in the design of sediment basins is the amount of detention time the sediment basin maintains. Basin detention time is the time required for steady-state flow to entirely displace the basin volume. In theory, it is also the amount of time each fluid particle stays in the basin – or in the specific case of a sediment basin, the amount of time required for the smallest settleable particle to be detained (Madaras and Jarrett 2000). Removal of pollutants in a detention pond is considered to be a function of its detention time (Hossain, Alam et al. 2005). Requiring a minimum detention period ensures a minimum opportunity for removal of suspended sediment (Jarrett 1993). Research by Bidelspach (2004) observed that the sediment captured and sediment retention efficiency of sediment basins increased as the detention time increased, with as much sediment retention efficiency as 98% over a seven day detention period. However, researchers have found that designing a sediment basin based on detention time alone is not effective due to numerous other factors that affect efficiency (Bidelspach, Jarrett et al. 2004). Another research effort in 1999 discovered that one day detention time results for a Pennsylvania sediment basin retaining sediment from an A-horizon Hagerstown silt-loam showed a significant increase in efficiency with successive runoff events, while three day detention time results did not. This increase in efficiency for one day retention, however, was due to the resuspension of sediments within the basin upon the start of successive inflow events during the three day detention time (Edwards, Shannon et al. 1999).

2.4 Sediment Basin Performance

The efficiency of a sediment basin is based entirely on the performance of the sediment basin. A poorly performing sediment basin does not necessarily mean that the poor performance of the basin originated from a poor design. The ability of a sediment basin to remove suspended solids can be a function of pollutant concentration in the runoff, runoff volume, storm duration and its intensity, time between storms (i.e., antecedent dry period), and surrounding land uses (Barrett, Malina et al. 1998). Beyond design, there are several characteristics of sediment basins that have a large effect on the performance, or sediment removal efficiency, of the basin. These characteristics include various types of inflow control devices, particle settling agents, the use of baffles, erosion control and basin stability practices, and outflow control devices.

2.4.1 *Inflow Control Devices*

Inflow control devices include various types of check dams. Check dams are designed to impound flow in channels, thus reducing the velocity of water flowing through the channel. Check dams are often constructed of rock, gravel bags, sandbags, fiber rolls, or other reusable products (McLaughlin and McCaleb 2010). Previous studies have shown that wooden check dams in a tailwater ditch ponded water and reduced flow velocities – decreasing erosion in the transition area where vineyard furrows met the ditch by water flowing into deeper water rather than on the soil surface (Leib, Redulla et al. 2005). The location of a check dam has been shown to be an important management decision that determines the effectiveness of sediment trapping (Hassanli, Nameghi et al. 2009). McLaughlin and McCaleb (2010) found turbidity within channels to be significantly reduced with excelsior wattles compared to rock, with the rock covered with an intermediate excelsior blanket. The drawback to fiber roll check dams is that they lack the strength against high velocity flows and ultimately fail, where rock check dams are more readily able to provide adequate strength against such flow rates (Pitt, Clark et al. 2007).

2.5 Sediment Removal

The mechanism in wet ponds for removing suspended solids from stormwater is simply gravitational settling (Comings, Booth et al. 2000). A single particle in clear, quiescent water will settle with a constant velocity (Zhou and McCorquodale 1992). This is known as Stoke’s velocity, according to Stoke’s Law, which is defined in Equation 2.13 (Pitt, Clark et al. 2007) below, where particle size is directly related to settling velocity using appropriate shape factors, specific gravity, and viscosity values (Zhou and McCorquodale 1992).

$$F = 6(\pi)R\mu v_s \qquad \textbf{(2.13)}$$

where,

F	=	frictional force acting on the interface between the fluid and the particle (N)
R	=	radius of the sphere (m)
μ	=	dynamic viscosity (N s/m^2)
v_s	=	particle's settling velocity

Water runoff on construction projects may contain very fine suspended sediments, too small to settle under normal conditions. Smaller particles, as shown in Table 1.4, are more susceptible to re-suspension due to position on the basin floor (e.g., last to settle), as well as size and mass (Madaras and Jarrett 2000).

Table 2.4: Settling velocities (V_s) for suspended particles (Specific Gravity = 2.65) in water at different temperatures, as calculated by Stoke's Law (Fifield 2004)

Diameter	Settling Velocity in Centimeters per Second					
(MM)	0°C	5°C	10°C	15°C	20°C	Particle
0.01	0.005	0.006	0.007	0.008	0.009	Fine Silt
0.02	0.020	0.023	0.027	0.031	0.035	Median Silt
0.03	0.044	0.052	0.060	0.069	0.078	
0.04	0.078	0.092	0.107	0.122	0.139	Coarse Silt
0.05	0.122	0.143	0.167	0.191	0.217	
0.06	0.176	0.207	0.240	0.275	0.313	
0.07	0.239	0.281	0.327	0.375	0.426	Very Fine Sand
0.08	0.312	0.367	0.427	0.490	0.556	
0.09	0.395	0.465	0.540	0.620	0.704	
0.110	0.488	0.574	0.667	0.765	0.869	
0.11	0.590	0.694	0.807	0.926	1.051	
0.12	0.703	0.826	0.960	1.101	1.251	
0.13	0.825	0.970	1.127	1.293	1.468	Fine Sand
0.14	0.956	1.125	1.307	1.499	1.703	
0.15	1.098	1.291	1.501	1.721	1.955	
0.16	1.249	1.469	1.707	1.958	2.224	
0.17	1.410	1.658	1.928	2.211	2.511	
0.18	1.581	1.859	2.161	2.478	2.815	
0.19	1.761	2.072	2.408	2.761	3.136	
0.20	1.952	2.295	2.668	3.060	3.475	
°F	32	41	50	59	68	

2.5.1 *Flocculant Additives*

Bhardwaj et al. (2008) observed that neither TSS nor turbidity was reduced in the open stilling basin (with no baffles) at 1.5 hr and 24 hr detention times, suggesting that the suspended materials were very resistant to settling in a basin, such as basins typically used for that purpose. This being the case, it was discovered that clay and silt fractions are the greatest contributors to turbidity of runoff (Bhardwaj and McLaughlin 2008). Chemical treatments using coagulants or flocculants promote the process of suspended sediment bonding together to enhance settling. Many coagulants such as gypsum, molding plaster, and calcium chloride ($CaCl_2$) are all effective for reducing turbidities in either stormwaters or wastewater operations (Bhardwaj and McLaughlin 2008). However, to get these coagulants to be effective, high dosages must be used

– eventually discharging into natural bodies of water. These natural bodies of water must then be meticulously monitored for pH effects or ions (SO_4^{-2}, Cl^{-1}, etc.) being released, which can cause dramatic negative impacts to marine biology in the receiving waters (Bhardwaj, McLaughlin et al. 2008).

2.5.1.1 Polyacrylamide

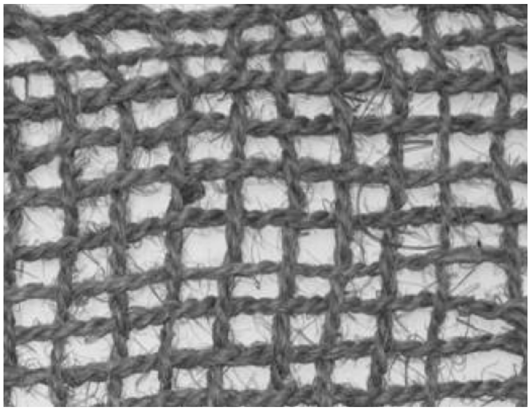
When particle settling agents are used in combination with a sediment basin, the product typically being referred to is polyacrylamide (PAM). PAM has been found to be an effective chemical flocculant without causing aquatic toxicity at typical treatment concentrations (Bhardwaj and McLaughlin 2008). PAM is a high molecular weight synthetic polymer that can be manufactured to have a variety of chain lengths and to be anionic, nonionic, or cationic in net charge (Bhardwaj and McLaughlin 2008). The preferred form of PAM is the anionic form due to its low aquatic toxicity, and because it binds to suspended sediment largely through rapid and irreversible cation bridging, pulling it together into flocs (Bhardwaj and McLaughlin 2008). The resulting flocculation process from PAM usage can reduce suspended sediment concentrations by up to 99%, depending on the sediment mineralogy (McLaughlin and Bartholomew 2007). Results of previous studies have shown that PAM reduced sediment and total phosphorus losses from irrigation furrows by 50% to 80% by both reducing soil erosion and increasing infiltration (Bjorneberg and Lentz 2005). Physically, PAM comes in three different forms: granular (powder), emulsion, and gel bars or logs (Pitt, Clark et al. 2007). PAM powder is typically applied manually or automatically with a broadcast spreader in a pound-per-acre distribution, where amounts vary depending on soil type. When applied to a construction site sediment basin, PAM is typically applied either in granular or solid form. Solid PAM blocks (or floc logs), also known as passive PAM dosing, were shown to reduce turbidity significantly, relative to untreated water, and granular PAM had similar results (Bhardwaj and McLaughlin 2008). One disadvantage of the use of floc logs is that the exact dosage of PAM is unknown; however, passive PAM dosing is a viable, low cost option because passing water over a solid block requires no power (Bhardwaj and McLaughlin 2008). Bhardwaj et al. (2008) found that both active (granular) and passive (floc log) PAM dosing reduced the turbidity of the water by up to 88%, with turbidity levels <50 NTU in discharges.

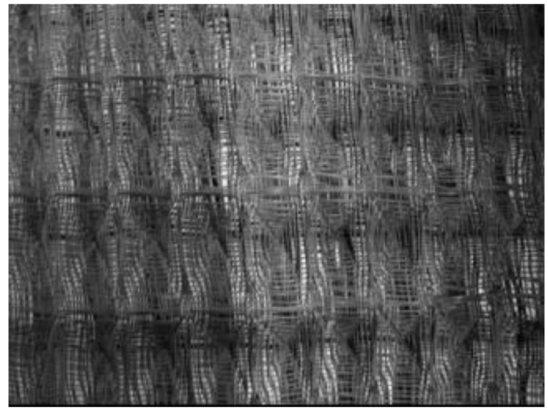
2.5.1.2 Natural Flocculants

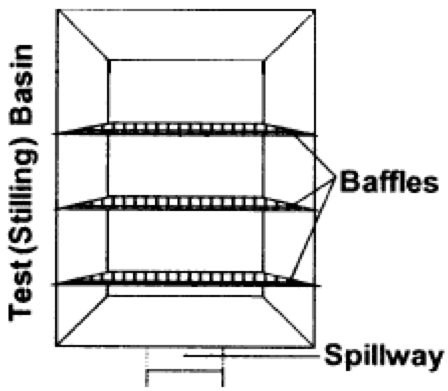
In comparison with PAM, natural polymer-based flocculants have received much more attention in water treatment since they are believed to be highly efficient, inexpensive, biodegradable, and environmentally friendly materials (Lu, Shang et al. 2011). Research on natural flocculants, including starch, chitosan, cellulose, konjac glucomannan, and alginate, has been given more attention due to their characteristics compared with the traditional polyacrylamide flocculants (Yang, Shang et al. 2011). Chitosan, one of the most promising candidates, is one of the high-performance natural polysaccharide materials derived from the deacetylation of natural chitin, which is the second most abundant natural polymer in the world (Lu, Shang et al. 2011). The high reactivity of chitosan for sorption is due to several mechanisms: 1) the high content of –OH groups makes the polymer hydrophilic and contributes to chelation effects; 2) the high content of amine groups provides cationic charge at acidic pH, since the intrinsic pK_a (acid dissociation constant) of amine groups on chitosan is close to 6.5; 3) the amine groups can bind cationic metals through the electron doublet, especially at pH close to or greater than the pK_a (Roussy, Van Vooren et al. 2005). Practical application has been limited due to its insolubility in water with neutral or high pH (Yang, Shang et al. 2011). To improve its performance, a great deal of effort has been put forth to develop suitable procedures for the preparation of water-soluble chitosan derivatives (Lu, Shang et al. 2011), such as amphoteric chitosan based flocculants (Yang, Shang et al. 2011). Reasoning for this is because amphoteric chitosan is more effective due to its improved performance and wider range of applications, which not only improve solubility in all pH ranges but also provides better salt tolerance for treating different kinds of water as a result of the dual characteristics of both anionic and cationic groups (Yang, Shang et al. 2011). Chemical modified chitosan-based flocculants, such as PAM grafted chitosan, bear more effective flocculating properties, which overcome many disadvantages of chitosan itself (Zhang, Shang et al. 2010). Among various methods, graft polymerization is a conventional and useful method, and this reaction introduces synthetic functional polymers as side chains to the backbone of chitosan (Lu, Shang et al. 2011). It was found that chitosan-graft-polyacrylamide flocculants had increased solubility due to the fact that the ordered structure of chitosan is destroyed by the grafting chain, and the long-side PAM chain is beneficial to bridging flocculation and improved the flocculating performance (Zhang, Shang et al. 2010).

2.5.2 *Baffles*

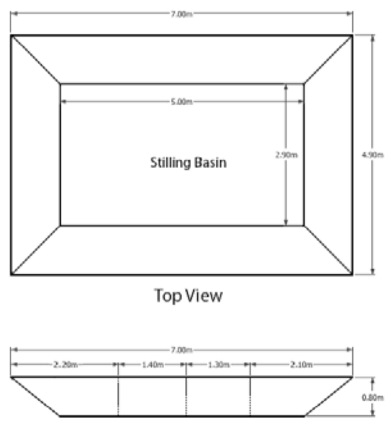
Another particle settling element commonly used in sediment basins are baffles. Baffles are commonly used as energy dissipaters and play an important role in providing particles an increased opportunity to settle by reducing turbulence, which contributes to prolonged suspension in the water column (Bhardwaj and McLaughlin 2008). Baffles of various types and designs, shown in Figure 2.1, can be installed within a basin to dissipate flow energy and lengthen the flow path, providing suspended particles an increased settling opportunity (Bidelspach, Jarrett et al. 2004; Bhardwaj, McLaughlin et al. 2008).


(a) Coir net


(b) Pyramat



(c) Baffle configuration



(d) Baffle Spacing

Figure 2.1: Different materials and configurations being used for sediment basin baffles. (Bhardwaj, McLaughlin et al. 2008)

It has been demonstrated that turbulence likely maintains particles in suspension much longer than previously expected in sediment basins (Millen, Jarrett et al. 1997; Bhardwaj and McLaughlin 2008). Baffles are also used to increase the hydraulically effective width, creating a more uniform flow pattern in the basin (Bhardwaj and McLaughlin 2008). Baffles increase hydraulic efficiency, when suitably configured to the basin (Tamayol, Firoozabadi et al. 2008). In a recent study, a short baffle was placed near the inlet of the sediment basin at an angle of 60 degrees, and dead volume was found to decrease to 6% with a longer actual residence time which was 79% of the theoretically calculated residence time (Hossain, Alam et al. 2005). The best position of baffles within sediment basins is somewhere in the circulation zone to spoil this circulation region (Tamayol, Firoozabadi et al. 2008). Extensive testing at a research site with a perforated riser pipe documented a 1.6% efficiency increase in efficiency using porous baffles, 94.6% efficiency, versus non-baffled basins, 93% efficiency. In addition, research was also performed at the same test site with porous baffles and a skimmer; however, no conclusive increase was noted because so much sediment was trapped in the basin that the skimmer became mired in the sediment and the porous baffles were nearly buried (Line and White 2001). Porous baffles have been suggested to reduce turbulence and improve sediment capture in sediment basins (Thaxton, Calantoni et al. 2004; Thaxton and McLaughlin 2005). Studies by Bhardwaj et al. (2008) observed that the introduction of porous baffles produced a pattern of high TSS near the surface within a sediment basin, but showed little improvement after the first three sampling points (immediately after each baffle). Thaxton and McLaughlin (2005) found that jute/coir baffles had 30% reduction in TSS and 40% reduction in turbidity, largely outperforming baffles made of silt fence or triple-layer tree protection by 20 to 40%. Due to the small size and nature of some suspended particles in stormwater runoff on construction sites, the decrease in turbulence due to baffles does not have a significant effect on their settling, especially without chemical treatment for flocculation (Bhardwaj, McLaughlin et al. 2008). This was confirmed by Thaxton and McLaughlin (2005) when they found that the improvement in hydraulics that porous baffles produce is not sufficient to settle the fine fraction. Baffles produce a more dramatic drop in TSS (26%) as opposed to the drop in turbidity (19%) with PAM treatment, however this is only noticeable after the first baffle and is inconsequential for further baffles (Thaxton and McLaughlin 2005; Bhardwaj and McLaughlin 2008). Similar results were found in a related study by Bhardwaj et al. (2008) where coir baffles (3, centered and spaced 20% of total length of the 2:1 basin, above) that were installed to reduce turbulence and induce plug flow had little effect except enhancing mixing and contact in the first basin cell during passive PAM treatment.

Sediment basin baffles can be made of various materials – including geotextiles, jute or coir netting, and silt fence material. Studies have shown that geotextile baffles can reduce short-circuiting and thus increases trapping effectiveness by 22%, although in an undersized pond, baffles may not significantly improve total sediment capture (Millen, Jarrett et al. 1997; Rauhofer, Jarrett et al. 2001). In an evaluation of geotextiles for sediment control, it was concluded that sediment removal from highway construction sites was due to the formation of pools behind the silt fence and not by the filtration of the geotextile material (Barrett, Malina et al. 1998). Porous baffles, such as those made of jute/coir netting and Pyramat (Propex, Inc., Chattanooga, TN) erosion control blankets, have been found to be very effective at absorbing the inflow momentum, reducing turbulent energy, and diffusing the incoming energy and flow velocity such that more of the pond volume participates in the sediment settling process (Thaxton, Calantoni et al. 2004). Evidence of optimal open space fraction (or OSF – the area occupied by open pores divided by the total area) of 5% to 10% had been suggested by Thaxton et al. (2004), but has not been further investigated. Coir netting baffles, such as the ones used by Bhardwaj et al. (2008) are made up of braided coconut fibers with typical thread diameter of 4.0 mm and OSF of 0.45 – showing a sediment trapping efficiency of 18% greater than what was observed with Pyramat that had an OSF of 0.1. Thaxton et al. (2004) used baffles made of jute germination biotextiles backed by coir fiber (jute/coir) with PAM and suggested that the baffles substantially improved flow characteristics within the basin in favor of sediment retention in comparison to silt fence and triple-layer tree protection baffles. Another type of porous baffle that has been used in previous studies is Pyramat erosion control blanket, which has a typical thread diameter of 1.0 mm and OSF of 0.1 (Bhardwaj, McLaughlin et al. 2008). Studies by Bhardwaj et al. (2008) using stockpiled soil from a construction site in Raleigh, NC showed that basins with coir baffles had 32% lower turbidity than without, but basins with Pyramat baffles had no apparent effect on turbidity compared to the control basin without baffles. This was because the coir material retained more sediment in spite of its much higher OSF due to the roughness and surface area of the coir threads, relative to the smooth plastic of the Pyramat (Bhardwaj, McLaughlin et al. 2008). Thaxton et al. (2004) measured values of flow velocities and signal-to-noise ratios that indicated the jute/coir baffles outperformed silt fence baffles by 12%, based on signal to noise ratio percentages. The jute/coir baffles registered a 40% increase in captured silt and clay over no baffles, however was only 2% more than silt fence baffles (Thaxton and McLaughlin 2005). Citing basin hydrodynamic measurements and observations in experimental work, it has been suggested that porous baffles perform better than the silt fence baffle in overall sediment trapping efficiency as the median grain size in sediment observed nearest the basin outlet was 30% lower than that observed with silt fence baffles (Thaxton, Calantoni et al. 2004). The silt fence baffles were less effective in reducing TSS and turbidity, possibly due to localized currents generated by the weirs cut into the tops of the baffles and overtopping (Thaxton and McLaughlin 2005).

2.5.3 *Basin Geometry*

The flow and geometry of a typical sediment basin create a complex combination of hydraulic processes that corrupt the ideal settling environment. The random eddies and currents accompanying turbulent flow cause scour currents in a basin. Scour currents induce forces that resuspend particles that would have otherwise settled to the bottom of the basin (Madaras and

Jarrett 2000). Previous research observed that more than 25% of sediment by volume might be lost from the basin due to resuspension (Kalainesan, Neufeld et al. 2009). To prevent particle resuspension and basin scour, as well as promote controlled infiltration, erosion control products, such as excelsior matting and filter fabric, and basin stability practices (2:1 side slopes, rip-rap slope coverage, etc.) are often used with active sediment basins. Particle re-suspension can be due to bed shear stresses that are caused by wind induced currents and waves in shallow basins (Bentzen, Larsen et al. 2009). It has been proven in past studies that high concentrations of re-suspended particles during the first 30 minutes of an influent event were caused by the inflowing water eroding and re-suspending the sediment delta left near the basin entrance from the previous event; however, as the basin's water depth continued to increase, inundating the basin floor and previously deposited sediments, the percentage of re-suspended sediment declined then remained nearly constant between 15% and 30% during the second half of the influent event (Madaras and Jarrett 2000). The majority of sediment loss from basins in past studies has been due to degradation and scouring of the basin abutment or dam (Fennessey and Jarrett 1997). Edwards et al. (1999) found that sediments accumulated only on the bottom of the basin in close proximity to the outlet, where turbulence and scouring were minimized by the temporary pool of water during simulated storm events. It was discovered in research by Madaras and Jarrett (2000) that the sediment concentrations observed within an unlined basin were significantly greater than those observed with lining. Results have clearly shown that many unlined sediment basins have infiltration rates that make an important contributor to the basin's dewatering. For lined basins or basins with infiltration rates slower than 1 mm/hr, infiltration dewatering may not be an option and a delay time dewatering device will yield retention efficiencies as high as 98% if the dewatering is delayed by seven days (Bidelspach, Jarrett et al. 2004). The difference observed by Madaras and Jarrett (2000) between sediment concentrations for the lined and unlined basins shows the impact of resuspension, which occurred due to scour during the unlined treatment but was not permitted to occur during the lined treatment of the sediment basin. The resuspension effect reveals a nearly parallel relationship of the two basins after approximately 40 minutes – where the unlined basin showed an additional sediment concentration that quickly accumulated to about 1.0 g/L above that observed in the lined basin, peaking at 1.2 g/L above the lined basin at 30 minutes, and then dissipated by approximately 40 minutes (Madaras and Jarrett 2000).

2.5.4 *Detention Time*

Requiring a minimum detention period ensures a minimum opportunity for removal of suspended sediment. On the flip side, requiring a maximum dewatering period ensures that the basin's water storage volume will be available for storing subsequent runoff events. To achieve this control, the prescription of a particular type of primary dewatering device that takes into account the size and design storm of the sediment basin is often in order. Several different principle spillway configurations have been developed to reduce effluent concentrations. Primary dewatering devices come in many different forms, including natural infiltration, rock weir spillways, riser pipes, skimmers, and delay-time controlled valves just to name a few.

Studies by Bidelspach et al. (2004) show that many sediment basins can be adequately dewatered using only infiltration of water into the soil from which the basin was constructed. Infiltration is defined as the downward entry of water into the soil. Infiltration is limited by the infiltration capacity of the soil, which is defined as a soil characteristic determining or describing the maximum rate at which water can enter the soil under specified conditions, including the presence of excess water (Brady and Weil 2010). Infiltration is defined by Equation 2.14 (Brady and Weil 2010) below:

$$i = \frac{Q}{A * t} \quad \textbf{(2.14)}$$

where,

i = infiltration or infiltrability (m/s, cm/hr, etc.)
A = area of the soil surface (m^2)
t = time (sec)

When this is possible, no other dewatering control device is needed, and no sediment discharge will occur to downstream channels and waterways unless the runoff event is larger than the basin's storage capacity. For example, in Pennsylvania, based on permeability data, between 65% and 70% of all Pennsylvania soils have a permeability < 3mm/hr in the horizons below the A horizon – thus, the concept of infiltration seems quite likely (Bidelspach, Jarrett et al. 2004).

2.5.5 ***Dewatering Devices***

The least expensive, most desirable, and most common form of dewatering a basin is through gravitational dewatering. There are a few different types of gravitational dewatering principle spillways, including risers and skimmers. There are three common types of risers used for basin dewatering as shown in Figure 2.2: (1) solid risers, (2) perforated risers, and (3) flashboard risers.

(a) Solid riser (b) Perforated riser (c) Flashboard riser

Figure 2.2: Common risers used for sediment basins.

Perforated riser principal spillways have been used extensively to control dewatering of sediment basins (Jarrett 1993). In Pennsylvania, perforated risers generally take the form of plywood boxes with multiple vertical columns of perforations, which are typically over designed and therefore produce very rapid dewatering and facilitate inadequate sediment removal (Jarrett 1993; Bidelspach, Jarrett et al. 2004). Researchers once developed the discharge characteristics of perforated inlet risers with the objective of reducing the dewatering time and found that dewatering time could be minimized by cutting larger side orifices in the riser compared to the internal orifice in the base of the riser (Jarrett 1993). Other experiments contained perforated risers that were made of 100 mm diameter PVC pipe that were designed to create two treatments: detention times of approximately one day and three days. The one day riser contained 16.5 mm diameter holes spaced 150 mm apart, while the three day riser contained 7.9 mm diameter holes spaced 150 mm apart (Edwards, Shannon et al. 1999). Flashboard risers are basically solid riser pipes that allow for the dewatering depth to be adjusted by adding or removing boards. Solid risers and flashboard risers are the least commonly used for sediment basins primarily because they are designed for use on a retention style pond (most sediment basins need to empty in a timely fashion in order to be functional for the next rain event) and require a higher level of maintenance. Millen et al. (1997) proposed the use of a skimmer as the principal spillway. This floating riser removes the basin water from the top of the water column where the highest quality effluent was expected (Bidelspach, Jarrett et al. 2004). A sediment basin equipped with a skimmer designed to dewater a construction site's two-year 24-hour rainfall event has been shown to have a sediment retention efficiency of about 90% based only on those particles < 45 μm (Millen, Jarrett et al. 1997). It has been determined that the highest effluent sediment concentration from the principal spillway occurs when the inflow hydrograph and inflow sedigraph are at a common peak (Bidelspach, Jarrett et al. 2004). Millen et al. (1997) determined that the majority of sediment loss from a basin with a skimmer occurred in the first 5 to 9 hrs after the start of the storm event.

Valves, often combined with delay-time control units, control the outflow of a sediment basin by opening to allow discharge after allowing the sediment laden runoff to sit in the basin for a predetermined time period. The facts and experimental results of Bidelspach et al. (2004) have shown that when a delay-time was introduced between the inflow and outflow hydrographs, the sediment retention efficiency of the basin, with a 24 hr dewatering time, improved 92%, 94%, and 98% for particles >45 μm when the dewatering process was delayed by 0, 12, and 168 hrs, respectively. The delay-time control unit that can be paired with valves does three things: (1) continuously sense the depth of water in the basin, (2) receive and send electronic signals, and (3) open and close the valve inserted into the skimmer arm near the water surface (Bidelspach and Jarrett 2004). Programming the delay-time control unit according to accurate logic is important and Bidelspach et al. (2004) used five functions that were programmed into the logic controller to implement the delay-time control of the valve on the skimmer in their basin. The logic controls included: (1) the first function identified the point in time when the water level in the basin rose above a preset elevation; (2) the second function shut the outflow valve (or kept the valve shut) while the basin was filling with sediment-laden stormwater runoff from an earth disturbance site; (3) the third function initiated a timer when the inflow rate was less than the user specified inflow sensitivity rate and the depth of water was greater than the sediment storage depth, or basin bottom; (4) the fourth function opened the outflow valve after the delay-time (function 3) had elapsed; (5) and the fifth function automatically opened the outflow valve when the depth of the water in the basin was within a user-set percentage of the depth to the auxiliary spillway (Bidelspach and Jarrett 2004). Due to unfortunate circumstances of catastrophic equipment failure, the delay-time control unit and valve experiment conducted by Bidelspach et al. (2004) was never completed, thus no sediment retention efficiency results were ever attained.

2.6 Conclusion

There are several factors that must be simultaneously considered when planning and designing a sediment basin for use on a construction site. In order to have a sediment basin that not only detains water, but is also used as a polishing tool, the designer of the basin should consider the size of the watershed area, soil type, stormwater volume, and effluent TSS and/or turbidity limits – just to name a few. The next chapter provides a close look at various characteristics of a sediment basin, how to measure the performance of those characteristics, and a means of analyzing the data collected to reach an overall conclusion through results.

CHAPTER THREE

STATE OF THE PRACTICE SURVEY, DEVELOPMENT, AND RESULTS

The objective of this report is to document the results from a survey conducted to determine the state-of-the-practice for sediment basin design, construction, maintenance, and inspection techniques employed by state highway agencies (SHAs) in the U.S.

The survey consisted of 68 possible questions in six categories: A. *Background and Experience*, B. *Design*, C. *Construction*, D. *Maintenance of Sediment Basins during Construction*, E. *Inspection and Monitoring*, and F. *Lessons Learned*. Most of the questions were structured in a multiple choice format. Several of the multiple choice questions allowed respondents to check more than one answer if it applied to their agency, therefore the sum of some percentages may exceed 100%. Comment boxes were included on some questions to allow respondents to further explain or clarify individual responses. The entire 68 question survey that was administered along with the raw results of the survey can be found in APPENDIX A. The survey was electronically distributed via Qualtrics® survey software (an online survey software that emails each participant a unique link to access the survey electronically) in August of 2011. A total of 37 responses (74% response rate) were received from SHAs as illustrated in Figure 3.1.

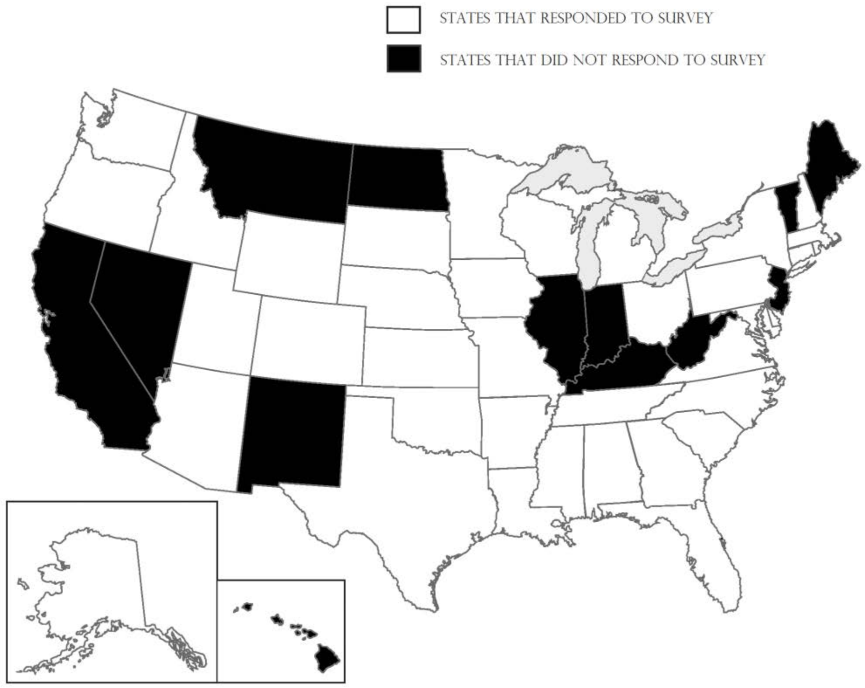


Figure 3.1: State highway agencies that responded to the survey.

The findings presented herein are based on responses received regarding each SHAs experiences with sediment basin design, construction, maintenance, and inspection techniques. The survey is part of a research project that the Highway Research Center (HRC) at Auburn University is conducting in partnership with the Alabama Department of Transportation (ALDOT) to identify issues, considerations, costs, and performance characteristics of sediment basins. The survey gathered information pertaining to sediment basin design factors, construction techniques, maintenance regimes, and inspection methods commonly employed by SHAs. The following sections will discuss the analysis and results of the survey.

3.1 Basin Usage

Sedimentation basins (or more commonly, sediment basins) are a best management practice (BMP) used on projects involving earth disturbance activities to minimize the amount of sediment leaving a site and entering receiving waters (Bidelspach and Jarrett 2004). Sediment basins are impoundment structures designed to receive sediment-laden stormwater runoff and provide an opportunity for the removal of suspended sediment. This process is achieved by detaining the water long enough for the suspended sediment to settle from the water under the influence of gravity before the water is discharged to the uncontrolled environment (Fennessey and Jarrett 1997; Millen, Jarrett et al. 1997).

Sediment ponds and detention ponds have shown approximately an 85% removal efficiency of suspended solids (Petterson, German et al. 1999; Bentzen, Larsen et al. 2009). The removal efficiency of sedimentation control devices depends on factors such as the intensity and duration of storm events, topography and extent of construction sites, soil type, the amount of vegetative cover, and the system of other structural and nonstructural BMPs implemented on-site (Line and White 2001).

Of the 37 responding agencies, 4 agencies (11%) indicated that they did not use or do not have any experience with sediment basins, as shown in Figure 3.2. Thirty-three agencies (89%) did have experience, and of those, 24 agencies (73%) have a standard design drawing for sediment basins and provided a link allowing access to view. These design drawings are located in APPENDIX B.

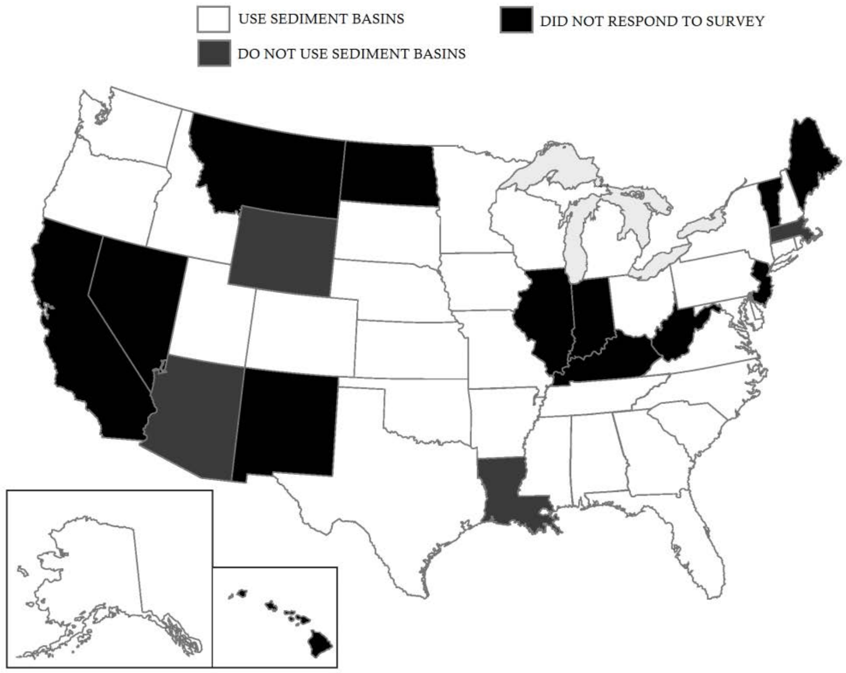


Figure 3.2: Use of sediment basins among responding agencies.

As shown in Figure 3.3, of the 33 agencies that use sediment basins, the majority reported that the average life of a sediment basin on an active construction site was 6 to 12 months (45%) followed by 1 to 2 years (30%). The responding agencies reported that sediment basins were most commonly used in areas where large amounts of earth disturbing activities typically occur such as: cut sections (85%), followed by fill sections (76%), and transition sections (73%). When terrain on a project site limits the storage capacity of a single sediment basin and additional capacity is required, SHAs consider constructing smaller sediment basins in series. Twenty-one agencies (64%) reported they either use or sometimes use basins in series. The most common method for connecting sediment basins constructed in series was by spillways (81%) and pipes (52%). Other reported means of connecting sediment basins in series included using open channels, ditches, and swales.

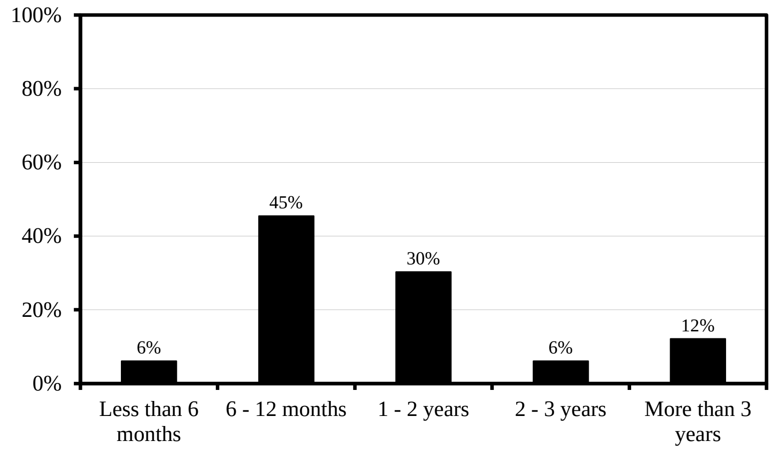


Figure 3.3: Typical design life of sediment basins used on roadway projects.

3.2 Basin Design

A few major parameters must be carefully considered when designing a sediment basin. One such parameter is the sizing of the basin. The usual methods of regulating sediment basins are through performance standards, which specify effluent concentrations, and/or hydraulic design standards (Millen, Jarrett et al. 1997). According to hydraulic standards, sufficient volume must be provided to store the sediment-laden stormwater runoff so that the suspended sediments have time to settle from the water prior to discharge (Millen, Jarrett et al. 1997; Bidelspach, Jarrett et al. 2004). According to previous design standards, the size of the basin was 1,800 cubic feet per acre of disturbed area within the contributing drainage area flowing into the basin. This provided for a sediment basin to have sufficient volume to capture 0.5 inch of runoff per acre of disturbed area (NCDOT 2006). This standard has recently been increased to 3,600 cubic feet per acre of disturbed area, or 1.0 inch of runoff per acre of disturbed area being captured for sediment basins that serve an area with 10 or more disturbed acres at one time (Kalainesan, Neufeld et al. 2008). Seventeen agencies (52%) use a minimum storage volume of 3,600 cubic feet per acre of drainage for the design of sediment basins, whereas 6 agencies

(18%) use a minimum storage volume of 1,800 cubic feet per acre. The remaining 10 agencies either have no minimum storage volume requirements or have project specific requirements based upon agency design procedures. Sizing a basin solely on the 1,800 or 3,600 cubic feet per acre standard procedure sometimes results in insufficient sediment storage volume in the basin leading to sediment resuspension and release through the basin outlet during storm events, increasing the concentration of particulate contaminants leaving the basin (Madaras and Jarrett 2000; Thaxton and McLaughlin 2005; Glenn and Bartell 2008; Kalainesan, Neufeld et al. 2009).

The Environmental Protection Agency (EPA) recommends that the ratio of the length of flow path to the effective width be greater than 2:1(Madaras and Jarrett 2000). Figure 3.4, below, illustrates the minimum and maximum length to width ratios of the 33 responding agencies.

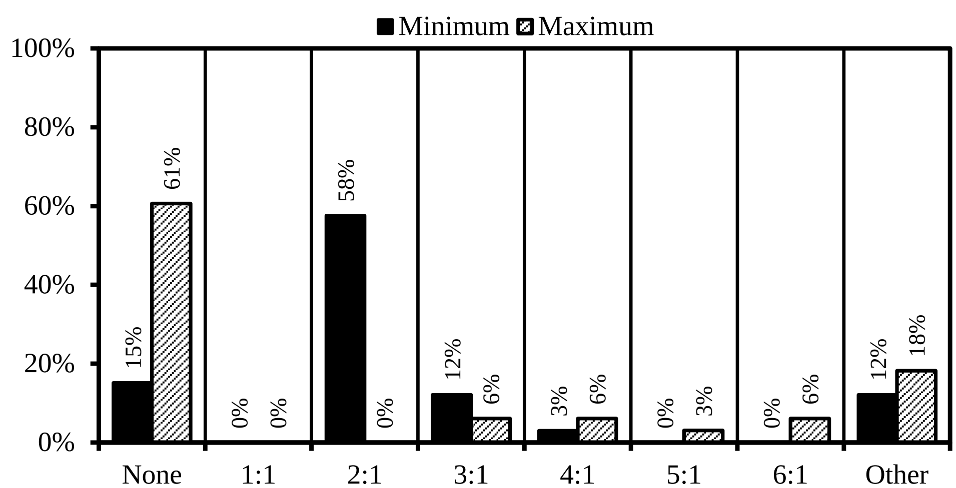


Figure 3.4: Minimum and maximum length to width ratios typically used by SHAs.

Nineteen agencies (58%) use 2:1 as their minimum length to width ratio, and 20 agencies (61%) do not have a maximum length to width ratio. Fifteen agencies (25%) neither have a minimum nor maximum depth used for the design of sediment basins. Of the responding agencies, 61%

and 67% do not have minimum nor maximum allowable slopes for the inflow channel, respectively. Based on these responses, it is apparent that most agencies do not have established standards regarding minimum or maximum values for basin depth and inflow channel slopes. Most likely these elements are considered separately based upon project specific related characteristics when designing sediment basins for use on a project.

To size a basin properly, one must determine the particular design storm event that is being considered for the site. The most common storm events that are factored into sediment basin design are 2, 5, 10, 25, 50, and 100 year storms. These storms are determined by the National Oceanic and Atmospheric Administration (NOAA) for each state taking into account the return period, the probability of that storm occurring, (i.e., 30 min, 1, 2, 3, 6, 12, or, 24-hr) based on historical data. Sixteen agencies (48%) design sediment basins for a 2-yr, 24-hr rainfall event followed by 6 agencies (18%) that use a 10-yr, 24-hr rainfall event and 6 agencies (18%) that do not size basins based on a particular storm event. Using the precipitation intensity estimates, provided by NOAA, for the nearest location to the sediment basin, the volume of runoff generated within the drainage area for the selected design storm can be calculated; and a basin volume is determined. To properly calculate the runoff volume of sediment-laden stormwater for the design storm, the contributing watershed area for the sediment basin must also be determined. Twenty agencies (61%) do not have a minimum watershed area used for sediment basin design, and 17 agencies (52%) do not have a maximum watershed area used for sediment basin design. However, most responding SHAs size sediment basins to capture runoff from disturbed areas ranging from 10 to 100 acres.

3.2.1 *Flocculants*

Flocculant additives are typically used in an area upstream of the sediment basin in the inflow channel to promote coagulation and settling of fine suspended particles. These often perform well with clayey soils and other similar soils containing very fine particles. Of the 33 agencies that have experience with sediment basins, 13 agencies (39%) use flocculant additives as shown in Figure 3.5. Typical products used as flocculant additives are polyacrylamide (PAM) floc blocks, liquid PAM concentrate, granular PAM, and Chitosan. Survey results show that 11 (85%) of the agencies that use flocculant additives prefer using PAM floc blocks.

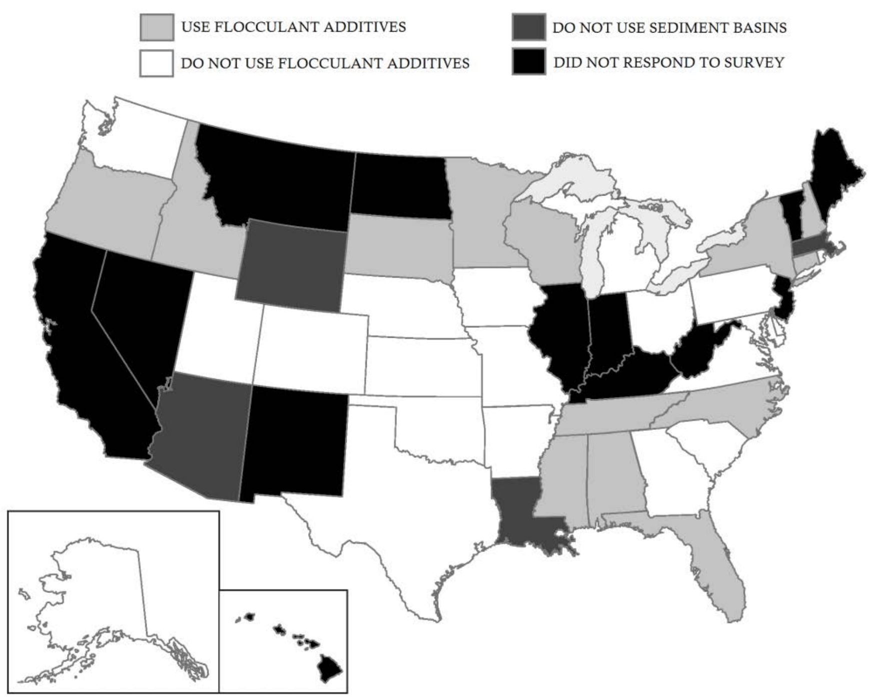


Figure 3.5: Use of flocculant additives among responding agencies.

3.2.2 *Baffles*

Baffles are used in sediment basins for multiple reasons, but primarily to dissipate energy of inflow, reduce the likelihood of short-circuiting, and promote settling when flocculants have been added to the inflow of sediment-laden stormwater runoff. The survey results show that there are 16 agencies (48%) that use baffles within sediment basins, as shown in Figure 3.6. Of the 16 agencies that use baffles, 7 agencies (44%) use silt fence material closely followed by 5 agencies (31%) that use coir fiber net material for baffles as shown in Figure 3.7. Nine agencies (56%) do not recommend a predetermined number of baffles for use within a sediment basin. The most common response for baffle spacing was that their agency has no set standard for baffle spacing (38%), closely followed by dividing the total length of the basin equally (31%). Other agencies indicated that the baffle spacing is dependent on the size and shape of the basin which is dictated by site specific constraints. The most common baffle placement selected is perpendicular to flow entering the basin (56%), while 25% of agencies install baffles perpendicular to the flow and include staggered openings in an effort to increase the flow path through the basin.

The primary reasons provided by 17 SHAs (52%) for not using baffles in sediment basins include: their agency not having standard drawings/specifications for inclusion of baffles, site specific criteria, no regulatory guidance on use, found them unnecessary, or it is optional where the contractor may elect to use if deemed necessary.

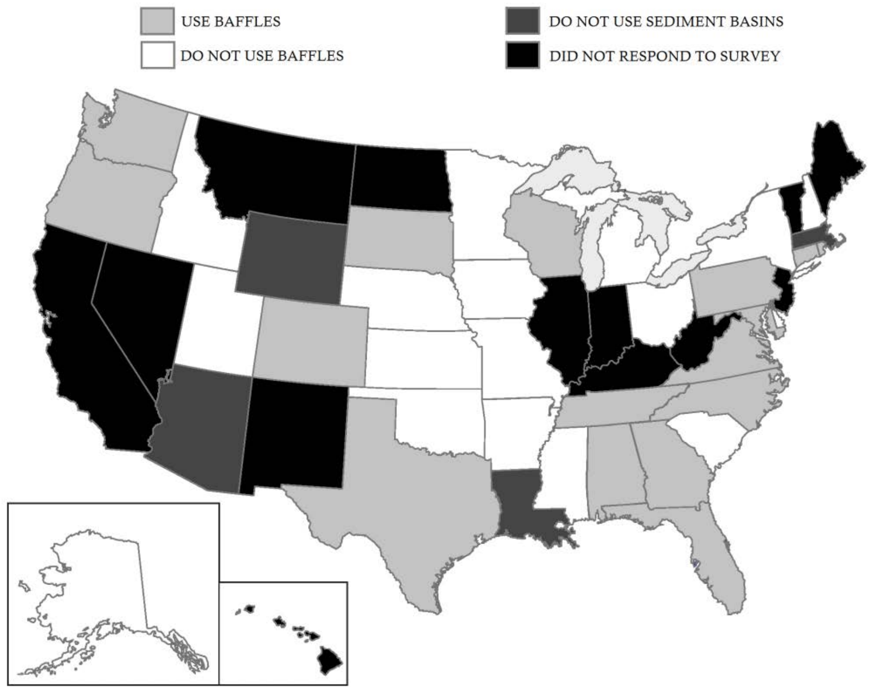
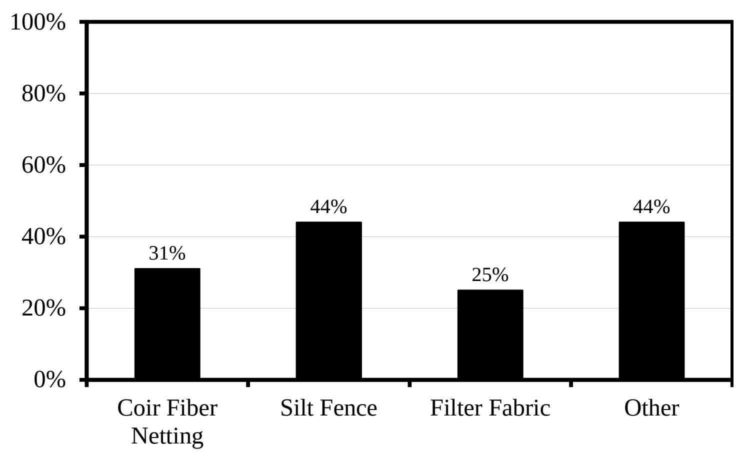


Figure 3.6: Use of baffles among responding agencies.



Note: Other types of materials include: plywood and sheeting piling, earthen or rip rap berms, wood, and concrete jersey barrier.

Figure 3.7: Types of materials used for baffles.

3.2.3 *Dewatering Devices*

Various types of dewatering devices are used to control the dewatering of sediment basins, allowing the proper residence time for suspended particles to settle before discharging the effluent. The nature of a sediment basin provides the cleanest water at the top of the water column, as gravity is allowing for suspended sediment to settle to the bottom of the basin. Therefore, dewatering devices that discharge water from the top of the water column within the basin maximize the efficiency of the sediment basin. The least expensive, most desirable, and most common form of dewatering a basin is through gravitational dewatering. Riser pipes and floating skimmers are the most common type of principle spillway that relies on gravitational dewatering. There are three common types of risers used for basin dewatering: (1) solid risers, (2) perforated risers, and (3) flashboard risers. Each dewatering device performs differently, as solid riser pipes and flashboard risers only discharge water from a fixed elevation of a fixed orifice with variable head. Perforated risers discharge water from the entire water column via perforations in the pipe at a variable rate. Floating skimmers discharge water from the top of the water column at a fixed rate with a fixed head and orifice size. As seen in Figure 3.8 the most common dewatering devices used among SHAs were perforated riser pipes (70%), spillways only (58%), floating skimmers (33%), and solid riser pipes (30%). Of the 33 agencies having experience with sediment basins, only 13 agencies (33%) use skimmers as dewatering devices as shown in Figure 3.9. Research has shown that the skimmer is the most efficient dewatering device available due to its characteristic dewatering capability from only the top of the water column (McCaleb and McLaughlin 2008). Twenty agencies (61%) specify a minimum dewatering time of 1 day or less and 24 agencies (73%) specify no maximum dewatering time in the design of sediment basins. The most common sizing of a spillway for a sediment basin is based on the flow rate for a 2-yr, 24-hr rainfall event (33%) closely followed by a 10-yr, 24-hr rainfall event (30%). Thirty agencies (91%) indicated that they do not use discharge control valves on the outlet pipes of sediment basins for increasing detention times and/or controlling effluent discharge.

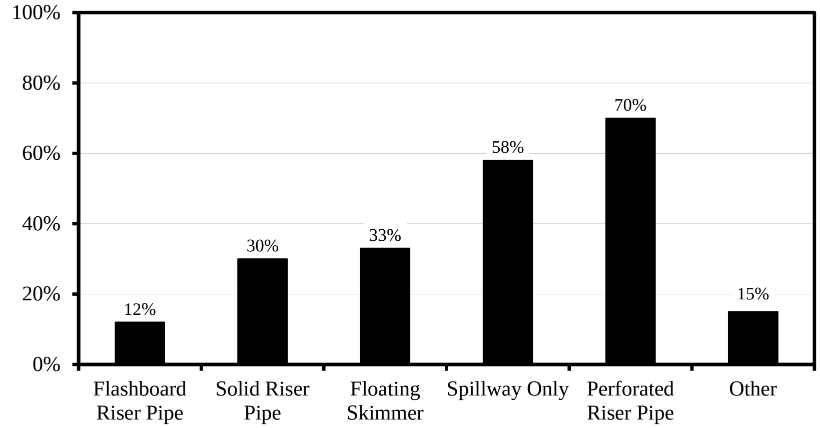


Figure 3.8: Use of dewatering devices among responding agencies.

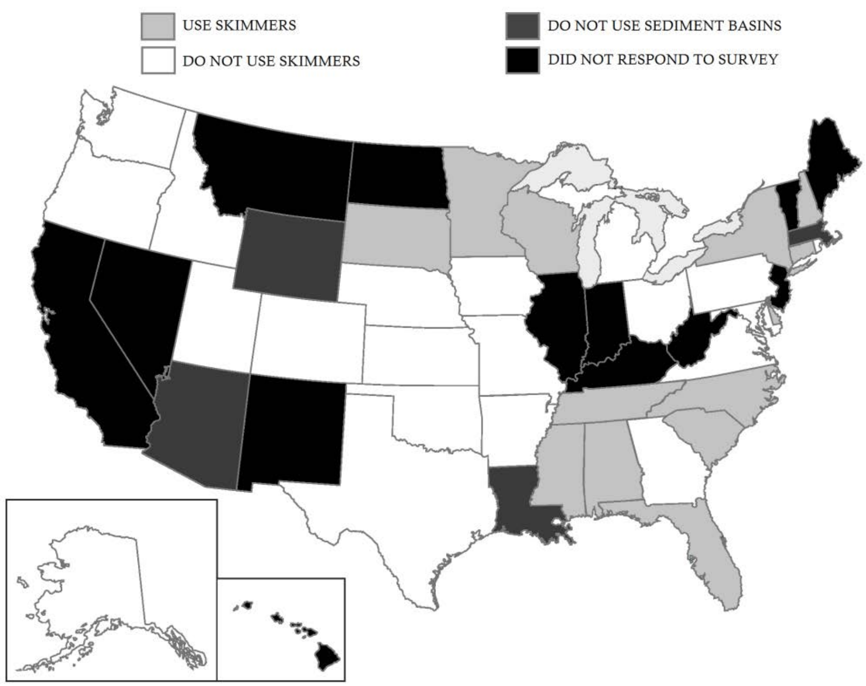


Figure 3.9: Use of skimmers among responding agencies.

3.2.4 *Combination Use of Features*

This survey has observed 7 agencies of the 33 responding (21%) across the country use flocculants, baffles, and floating skimmer devices in combination when employing sediment basins on a project in an effort to improve its efficiency. Based upon previous research conducted by McLaughlin et al. (2009), the combined use of such features can improve sediment basin efficiency by 82 to 85 percent for TSS and by 77 to 88 percent for turbidity, depending on location and site conditions. Figure 3.10 illustrates other combination of features used by SHAs responding to the survey.

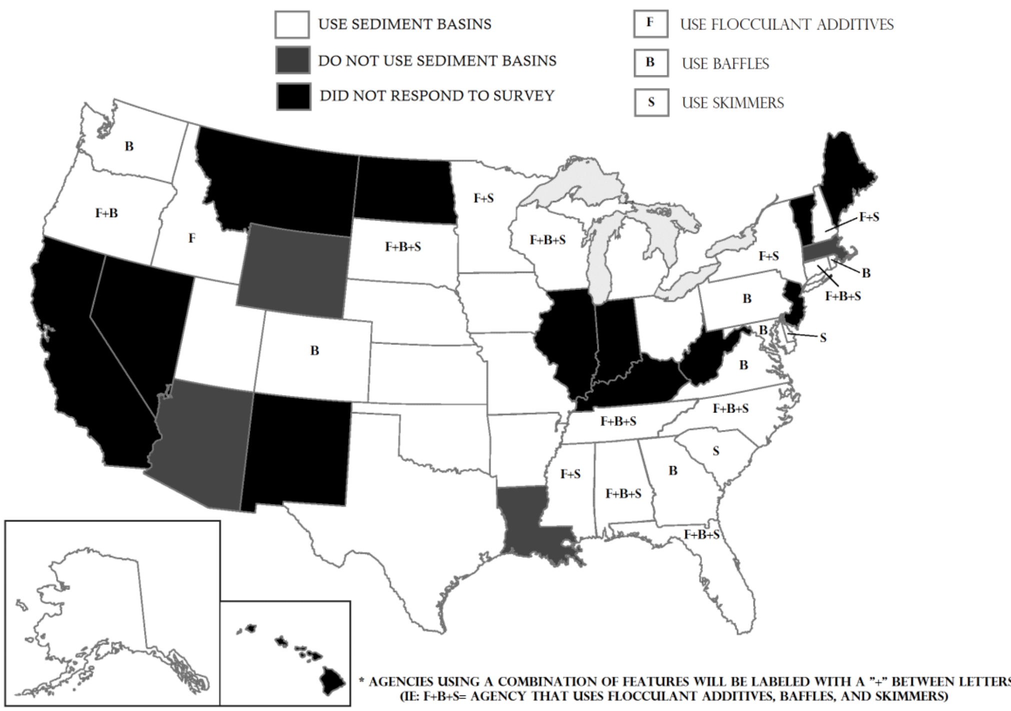


Figure 3.10: Use of sediment basin features among responding agencies.

3.3 Sediment Basin Construction

Constructing a sediment basin on a construction project is imperative to maximizing the sediment reduction in stormwater runoff. Fourteen agencies (42%) typically begin constructing sediment basins either during or immediately following clearing and grubbing activities.

Maintaining the usefulness of a sediment basin throughout the life of a construction project will allow for the least amount of sediment to be discharged in receiving bodies of water. As shown in Figure 3.11, the most common average service life of a sediment basin on a (1) large project (75+ acres) is more than 12 months (67%); (2) medium project (25–75 acres) is more than 12 months (52%); (3) small project (0–25 acres) is more than 12 months (40%).

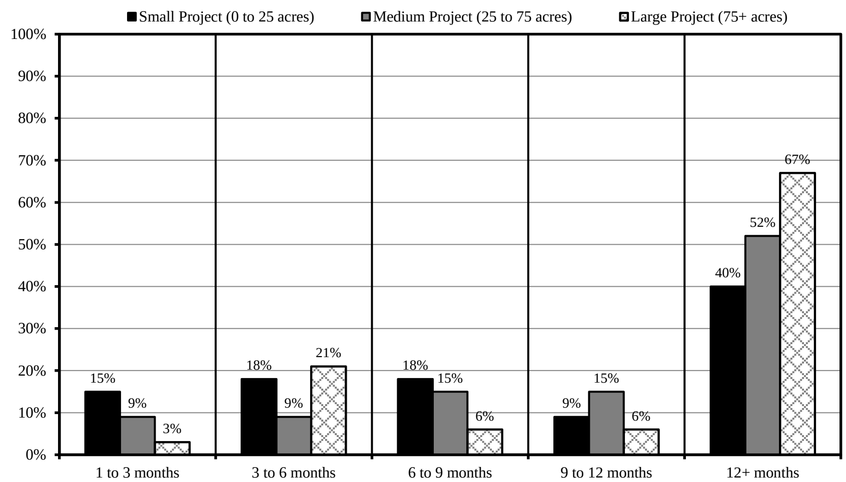


Figure 3.11: Average service life of sediment basins among responding agencies.

Pre-treating stormwater runoff prior to entering the inflow channel of sediment basins often improves the efficiency of sediment basins due to the lower amount of suspended sediment entering the basin. Practices used to promote the settling of larger sediment particles prior to reaching the basin include ditch checks, sumps, and sumps followed by ditch checks. Twenty-one agencies (64%) use ditch checks, followed by 10 agencies (30%) that use an excavated sump w/ditch check as inflow control devices for sediment basins. Of the agencies that use an excavated sump w/ditch check, the most common material for the ditch check is rock (100%). There are several different means that agencies may use to enable a level of protection for various aspects of a sediment basin so these areas do not become secondary sources of erosion.

Figure 3.12 illustrates the responding agencies' level of use of the various types of protection measures for various sediment basin components. The most commonly selected measure of protection used by responding agencies in the construction of a sediment basin include rip rap, rolled erosion control products, and seeded ground. One agency indicated that they use temporary plastic slope drain pipe across extreme elevation changes to prevent slopes from eroding prior to the establishment of vegetation.

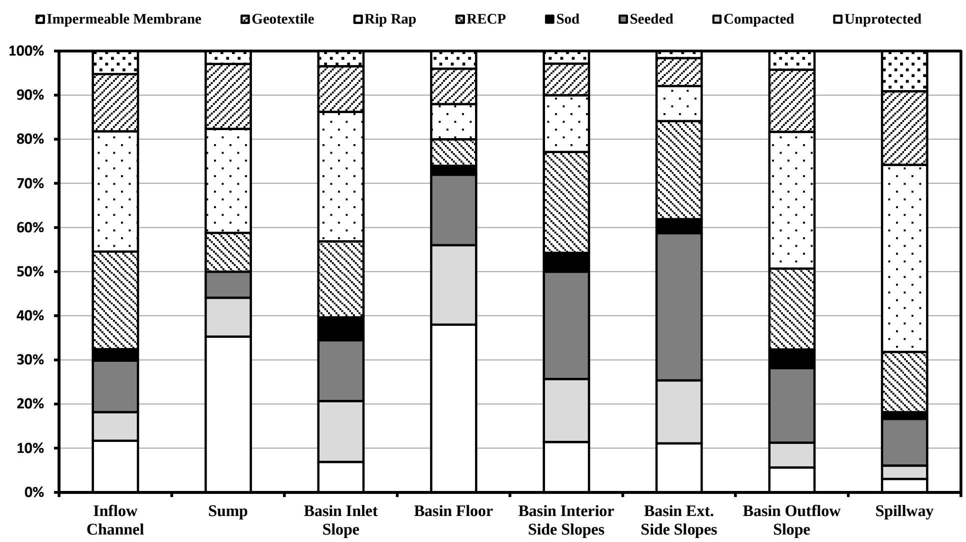


Figure 3.12: Protection measures used in the construction of sediment basins.

Allowing a sediment basin to be active throughout the entirety of a construction project, or until sediment loss is no longer an issue in stormwater runoff, maximizes the basin's effects on sediment removal. Twenty agencies (61%) remove basins during construction once final site stabilization has been achieved. Only 7 agencies (21%) have experienced any issues with sediment basin removal, mostly having to do with saturated subgrade materials, contaminated sediment, or disturbance to surrounding areas resulting in an erodible condition.

3.4 Sediment Basin Maintenance

In order for a sediment basin to function properly, it must be properly maintained throughout its effective life on the project. All 33 agencies (100%) having experience with sediment basins recommend that maintenance be performed on sediment basins during construction (i.e., when in active use). As depicted in Figure 3.13, the most influential factors in the determination of performing maintenance on sediment basins were captured sediment volume (88%), rainfall depth (80%), and rainfall intensity (73%); however, the least influential factors were life cycle costs (40%) and effluent turbidity (30%).

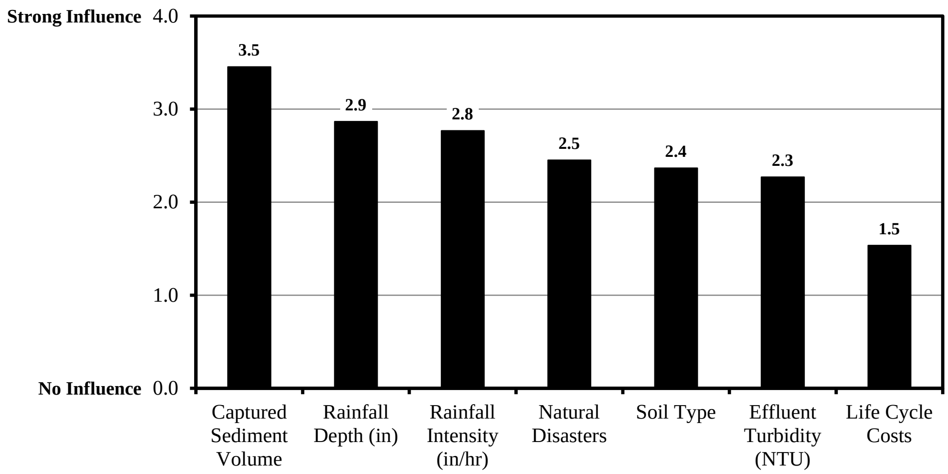


Figure 3.13: Most influential factors in performing sediment basin maintenance.

It is important to have a pre-established protocol in which maintenance activities are performed on a sediment basin in a timely fashion so that the sediment basin efficiency is not compromised. Twenty-four agencies (73%) determine that sediment cleanout should be performed at the point when the sediment basin loses 50% of its storage capacity. Almost all agencies indicated that sediment removed during the clean-out of basins is disposed of on-site in areas deemed suitable by the project engineering. If the sediment is considered a suitable material it would be placed and spread on-site and seeded as appropriate. If it was considered unsuitable soil, it would be placed in a designated waste area or disposed of off-site.

Maintaining baffles within a sediment basin is a very important factor in sustaining the effectiveness of the basin. However, almost two thirds (63%) of the agencies that use baffles do not require the contractor to replace baffles during the active lifespan of a sediment basin. Of the agencies that do require contractors to replace baffles, the most common circumstance requiring replacement is if damage occurs during a rain event (100%) and when baffles become “clogged” with sediment (83%), basically rendering the baffles ineffective. Twenty-eight agencies (85%) have not recognized a need to perform maintenance on the basin floor after sediment removal.

3.5 Sediment Basin Inspection and Monitoring

In order for agencies to determine the effectiveness of sediment basins, ensure effluent discharge meets EPA guidelines, and know when to check maintenance needs, it is important for sediment basins to be regularly inspected and monitored based on several factors. Common types of inspection and monitoring performed by agencies on sediment basins include sediment depth (36%), rainfall depth (24%), and sediment volume retained (21%); however, 16 agencies (48%) do not monitor sediment basin data (e.g., turbidity of effluent discharge). The only agency that monitors effluent discharge is the North Carolina Department of Transportation, observing the average discharge turbidity to be 1000+ NTU on basins without skimmers and 250 to 500 NTU on basins with skimmers.

3.6 Lessons Learned

The last section of this survey provided an area for each responding agency to provide a link to their specifications pertaining to sediment basins, problems encountered with the use of sediment basins, along with lessons learned and suggestions on how sediment basin use and efficiency can be improved. Twenty-three agencies (70%) having experience with sediment basins provided a link to their agency's specification for sediment basins. Based on past experiences, 26 agencies expressed specific problems encountered when using sediment basins which are summarized in Table 3.1. The most common problems that were expressed deal with limited right of way (ROW) availability and enforcing proper installation and maintenance by contractors.

Table 3.1: Problems experienced by agencies employing sediment basins on construction sites

- Lack of detailed design to install basins in most effective locations on the project
- Improper design or timing or installation
- Controlling effluent turbidity
- Problems containing clayey particles (sediment particles being too fine to settle)
- Problems occur when topography prevents proper size, L/W ratio, and placement of basins
- Difficulty and timing associated with ROW acquisition and utility relocation
- Slope stability issues
- Basins being constructed/installed smaller than shown on project plans
- Subgrade failure, breach of side berm and outlet control erosion
- Contractors put too much faith in the basins to work properly, and become less diligent in the use of erosion and sediment control elsewhere in the drainage area
- Smaller basins fill up quickly when contractor is not keeping up with maintenance during site stabilization
- Poor maintenance results in basin failure
- Contractors opening basins to let them drain faster
- Lack of maintenance and monitoring during construction

Also based on past experiences, 22 agencies provided suggestions on what, in their opinion, would improve the efficiency and use of sediment basins on construction projects, and 23 agencies provided positive practices or designs that they recommend for the use of sediment basins. Such suggestions and positive practices or designs have been summarized in Table 3.2. Suggestions for improvement provided by SHAs primarily focused on the need for properly designed sediment basins for each application, increasing the basin size versus contributing area ratio, and the increasing the usage of PAM with sediment basins. Recommendations on the use of sediment basins provided by SHAs focused on combining sediment basins with other BMPs in order to maximize basin efficiency, ensuring proper basin stabilization before any use of the basin ensuring that basins are properly sized in accordance with the largest possible contributing drainage area, and inspecting basins frequently and ensuring punctual and proper maintenance occurs.

Table 3.2: Lessons learned by agencies employing sediment basins on construction sites

Category:	Suggestions for Improving the Effectiveness of Sediment Basins
Design	▪ Ensure adequate right-of-way is acquired to allow for proper design, sizing, and locations of basins to improve efficiency ▪ Sediment basins should be specifically designed for each individual application ▪ Use sediment traps upstream of sediment basins to capture larger particles. Note that maintenance activities will be required ▪ Increase the use of PAM, ensuring proper type and dosage in each application ▪ Provide an increased emphasis on erosion control and other best management practices in addition to the use of sediment basins. Agencies cannot rely on sediment basins alone. The treatment train of practices will be needed to reach effluent discharge limitations established by regulatory agencies
Construction	▪ Ensure sediment basins are constructed according to plan, not allowing for contractor deviations to cut cost ▪ Install the basin as early in the project as clearing and grubbing allows ▪ Ensure basin features (e.g., inflow channels, side slops, and basin bottoms) are fully stabilized before use of a sediment basin ▪ Mandate the grading process be performed in stages and require the contractor to provide a plan to open and close-out areas, thereby reducing the total amount of the contributing drainage area
Maintenance	▪ Continued monitoring and performance evaluations could provide valuable information with respect to improvements ▪ Increase the amount and detail of sediment basin inspections and provide contractors with a strict and detailed maintenance program ▪ Poor installation and maintenance results in basin failures

3.7 Conclusion

The objective of this survey was to establish the state-of-the-practice nationwide in regards to how SHAs are using sediment basins on highway construction projects. Though a majority of the responding SHAs use sediment basins as a sediment control measure, there is a wide variety in practices being used for the construction, maintenance, and inspection of sediment basins, each showing different levels of experience with successes and limitations to overcome. Often considered to be a leader in the industry, NCDOT has been referred to as the agency for being on the cutting edge of erosion and sediment control practices. However, not all states can directly benefit from NCDOT research and technology by copying the NCDOT protocol, as soil types, topography, and geographic considerations play a large role in decision making for sediment basin designs and applications. Therefore many states use different systems of erosion and sediment control BMPs that best suit the conditions in that state. In addition to soil types, some of the different practices may be attributed to rainfall intensity and frequency, and ROW availability.

The results of this survey are intended to better facilitate for an open line of communication between responding agencies in an effort for the agencies to work collectively and improve each agency's use of sediment basins. Significant findings from this survey show that the typical design life of a sediment basin lifespan is between 6 months and 2 years. The generally accepted minimum storage volumes among most agencies is 3,600 cubic feet per acre of disturbed area draining to the basin, and most agencies do not have a limit on the maximum watershed area for sediment basin design. In addition, most states use a 2:1 length to width ratio in basin design but do not have a standard maximum length to width ratio. Seventy-five to eighty percent of all responding agencies did not specify a minimum or maximum value for inflow channel slope. Perforated risers are the most commonly used dewatering device, though it has been proven to be inefficient due to the fact that it dewaters the entire water column at once. No agencies use valves on their dewatering devices as a standard practice. Thirteen agencies (39%) out of the responding agencies having experience with sediment basins use flocculant additives to enhance the efficiency of sediment basins. The use of baffles within sediment basin is split among the responding agencies, however most agencies that do use baffles do not require contractors to maintain or replace them during the active use of the basin.

All responding agencies with sediment basin experience recommended that basin maintenance should be performed, and 85% of those recommend that basin cleanout should occur at when the sediment basin loses 50% or less of its storage capacity. Most importantly, it is notable that few agencies actually monitor or collect data from sediment basins. For agencies to improve upon current sediment basin designs and functionality, it will be important to monitor and collect basin data to gain an in-depth understanding of overall sediment basin performance and effectiveness.

CHAPTER FOUR

MEANS AND METHODS OF DATA COLLECTION

The following section describes the methodology and data collection effort established for monitoring the performance of sediment basins on ALDOT 502 project. In total, five ISCO 6712 sampler units were used to collect water samples at various locations before, within, and after the sediment basin. These five samplers were used in accordance with the following data collection plan.

4.1 Data Collection Plan:

Due to the large cut taking place in the upstream area of the construction site, this research project collected data from basin #4 on ALDOT 502 project in Franklin County, AL in two phases. In the first phase of the sediment basin, a single inflow channel (later to be deemed as the secondary inflow channel) was constructed to carry stormwater into the sediment basin (as shown in Figure 4.1).

Figure 4.1: ALDOT 502 project basin #4 phase 1 basin setup with one inflow channel.

Figure 4.2 shows that there were two inflow channels during the second phase of sediment basin #4, with the newly added inflow channel acting as the primary inflow channel. Figure 4.3 and Figure 4.4 illustrate a typical sediment basin with a single inflow along with all the necessary structural members and sampling equipment used in this research.

Figure 4.2: ALDOT 502 project basin #4 phase 2 with two inflow channels.

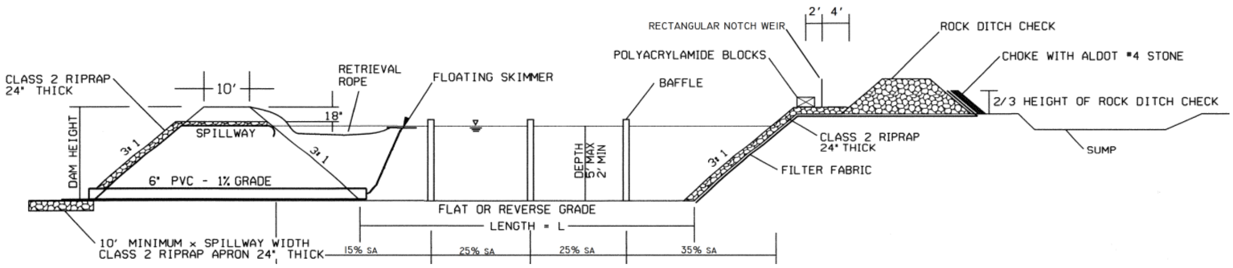


Figure 4.3: Profile view of typical sediment basin.

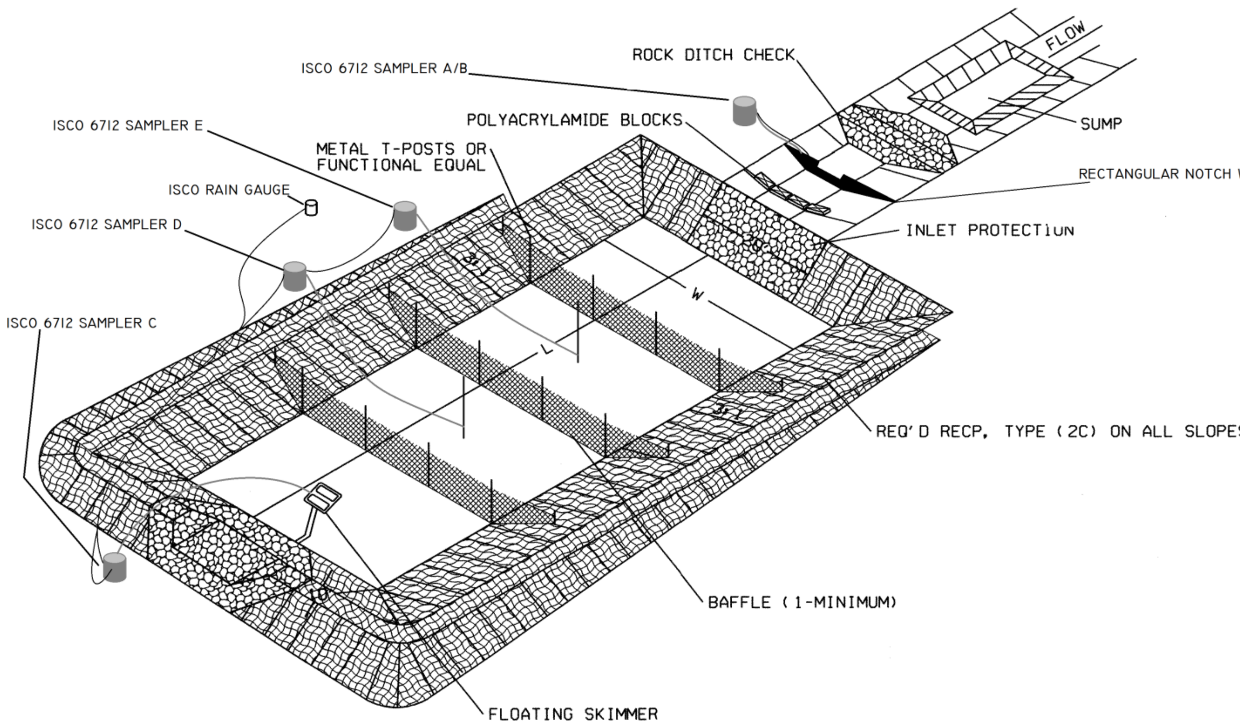


Figure 4.4: Typical sediment basin data collection equipment setup.

Upstream of the sediment basin and following the rock ditch check dam in each channel, a rectangular notched weir was installed in the channel to gauge inflow into the basin as shown in Figure 4.5.

(a) Weir at secondary inflow channel. (b) Weir at primary inflow channel.

Figure 4.5: Weir installed on secondary and primary inflow channels, respectively..

To properly accommodate flow in the both channels, the rectangular notch weirs were cut to 3 ft. and 4 ft. (for secondary and primary inflow channels, respectively) in width and 1.5 ft. in depth. The purpose of these weirs was to provide data collection points to take water quality samples of inflow as well as provide a means for determining the volume of stormwater inflow into the sediment basin. The water passing over each weir flowed over 4 anionic polyacrylamide (PAM) blocks (type 706B – Applied Polymer Systems, Inc.) that were secured on top of the riprap lined channels. The purpose of the PAM blocks was to aid in the flocculation of suspended sediment particles in the sediment-laden runoff and to promote quicker settling times of suspended sediment within the basin. These PAM blocks were specified by Applied Polymer Systems, Inc. to be the most efficient PAM blocks for the site based on a soil sample from the site. Immediately following the PAM blocks (in the direction of flow), the rip rap inflow channel continued for 35 and 37 feet (for the secondary and primary inflow channels, respectively) before emptying into the basin. This provided a means of further agitating the sediment-laden stormwater through the remainder of the channel to aid in the flocculation of sediment particles that had been introduced to PAM.

To monitor water quality in reference to sediment basin performance, five ISCO 6712 samplers (e.g. samplers A, B, C, D, and E) were used to take samples at the following locations: inflow (samplers A and B), within the sediment basin (samplers D and E), and outflow (sampler C). The inflow sampler units monitored the inflow of stormwater into the basin from the primary channel (sampler B) that runs alongside the road bed, and from the secondary inflow channel (sampler A) coming from the hillside, as shown in Figure 4.6.

Figure 4.6: Basin #4 inflow samplers.

Inflow sampler A took a 0.25L sample for every 50 cf of inflow passing over the weir in the secondary inflow channel, and inflow sampler B took a 0.25L sample for every 150 cf of inflow passing over the weir in primary inflow channel. For each inflow sampler (A and B), four 0.25L were collected in a single 1L container to create a composite stormwater sample to provide a measure of incoming water quality over the course of a rainfall event. In total, each of the inflow samplers had the capability of each collecting up to 96, 0.25L samples in a single program spanning a single rainfall event with a combined maximum inflow volume of 19,200 cf. The inflow amounts were monitored using an ISCO 730 Bubbler Flow Module that is mounted on the upstream side of the weir and directly connected to the inflow sampler, as shown in Figure 4.7.

Figure 4.7: Bubbler tube and suction head installed on primary/secondary inflow channels.

The bubbler module took flow readings via a plastic tube that was attached to the upstream side of the weir. The 730 Bubbler Module uses the plastic tube to emit a bubble in the upstream water and measures how much pressure it takes to emit that bubble. With this, the module could calculate the depth of the water over the plastic bubble tube. The module has the particular type of weir (i.e., size and shape) programmed into it and was pre-calibrated to a zero level (based on mounting depth below the weir opening) at the base of the weir opening so that when water passed through the weir it was registered as a positive water level.

The outflow of the sediment basin was monitored by an ISCO 6712 Sampler (sampler C), in conjunction with an ISCO 750 Flow Module, shown in Figure 4.8, mounted with a spring ring inside the specified 6 inch outflow pipe connected to a Faircloth Skimmer. The 750 Flow Module uses a radar producing instrument that senses the speed and depth of the water, that, in combination with the designed outflow of the skimmer determined using Manning's equation, shown in Equation 4.1, collects one flow rate value per minute.

Figure 4.8: ISCO 750 Flow Module.

$$V = \frac{k}{n} R_h^{2/3} S^{1/2} \qquad \textbf{(4.1)}$$

where,

V = cross sectional average velocity (ft/s)

k = conversion factor (1.4859 $ft^{1/3}/s$)

R_h = hydraulic radius (ft)

S = slope of the water surface

Sampler C activated once 0.002 cfs of outflow was detected by the flow module inserted in the outlet pipe of the skimmer and pulled a water quality sample from just below the intake orifice of the Faircloth skimmer. Sampler C acquired water quality samples from inside the filter grate of the Faircloth skimmer, attached using plastic zip ties, ensuring that it was submerged when a sample was taken. Sampler C drew a sample immediately after outflow is detected and will continue drawing samples at a one hour interval until the program was complete (23 hours). Sampler C collected 24, 1L samples total when the program was completely finished. Sampler C was also connected to an ISCO tipping bucket rain gauge to monitor the rain events on-site, giving accurate time stamped information regarding rainfall amounts and intensity.

Two other ISCO 6712 sampler units (Sampler D and Sampler E) were positioned within the sediment basin perimeter, as shown in Figure 4.9, to collect water quality samples from the minimum water depth of 1.5 ft (shown in Figure 4.10) from the bottom of the basin.

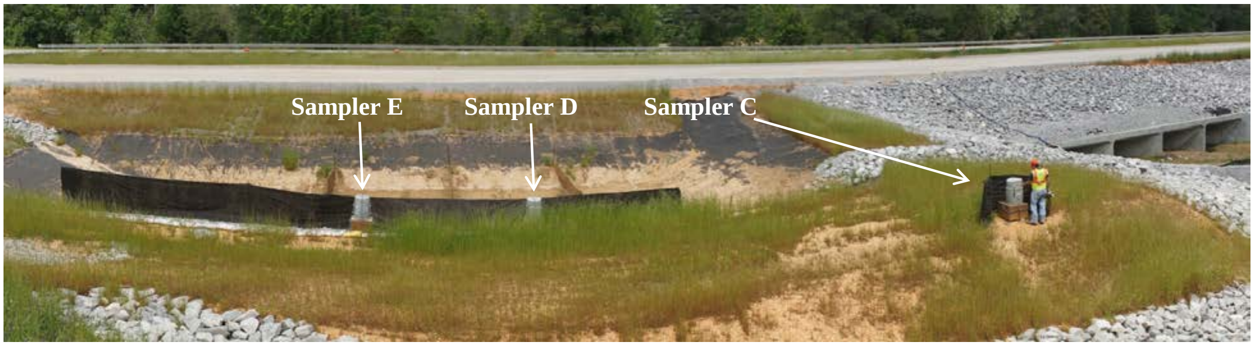


Figure 4.9: Basin #4 sampler locations.

Figure 4.10: Sampler D suction head mounted 1.5 ft above basin floor.

The suction heads for the samplers were positioned directly in the middle of the second bay (between the first and second baffle, with respect to flow) and in the middle of the third bay (between the second and third baffle, with respect to flow). Sampler D and Sampler E were connected directly to Sampler C via a special made "Y-cable", manufactured by Teledyne ISCO specifically for this project. This enabled the program for Sampler D and Sampler E to draw a sample in sequential order after Sampler C had completed each sampling cycle. Sampler C sent a "pulse" signal once it completed its pumping cycle to Sampler D, triggering Sampler D's pump cycle to draw a water quality sample. Likewise, Sampler D sent a "pulse" signal to Sampler E once its pump cycle was complete, triggering the pump cycle of Sampler E. Using this program and configuration, the samples within the basin were taken at relatively the same time as the outflow sample, providing a representative water quality sample in each bay of the sediment basin in relation to time.

All samples gathered by the ISCO 6712 sampling units have a recorded time stamp for each sample. Each individual sample container in each ISCO 6712 sampler was labeled in sequential order corresponding to the time samples will be taken (1 through 24, as there are 24, 1L bottles being used in each ISCO 6712 sampler for the sampling program being run).

Once a program in one of the samplers was complete, the bottles containing the samples were then removed and replaced with clean bottles within 24 hours. The bottles containing the samples were sealed and placed on ice to prevent algae growth. The samples were then transported back to the lab in Auburn for further analysis of turbidity and suspended solids. For each rainfall event, all data for each sampler was compiled into a spreadsheet containing time of sample, location of sample, flow rate, etc. This allowed for more distinguishable comparisons between collected data from various sample sets and established accurate results.

4.2 Quantifying Retained Sediment:

An initial, pre-evaluation survey of the sediment basin was performed by ALDOT surveyors prior to the deployment of ISCO sampling units to establish a baseline volume for the sediment basin. A post-evaluation survey was also conducted at the end of the monitoring period for the basin.

To determine the volume changes in the basin, a CADD program (MicroStation) was used to develop a three-dimensional digital model of the basin. Models were visually checked for accuracy for unusual shapes or depths of deposited sediment accumulation that do not match other numbers within the same survey. A retained sediment volume report was then generated by MicroStation, noting the net change in volume that was determined by subtracting the end-volume of the post-evaluation survey from the original volume of the pre-evaluation survey.

To obtain data on sediment deposited in the basin, samples were taken in the middle of each bay, with respect to length of the basin. The sediment basin had 4 bays, each being separated by a baffle. The sample locations include: (1) between the inflow channel and first baffle, (2) between the first and second baffle, (3) between the 2^{nd} and 3^{rd} baffle, and (4) between the last baffle and overflow structure. This process was done 3 times, with samples collected along each side of the basin as well as the middle of the basin, with respect to the width of the basin. Figure 4.11 provides a schematic of all sampling locations within the basin, while Figure 4.12 shows the sediment samples being taken from the sediment basin.

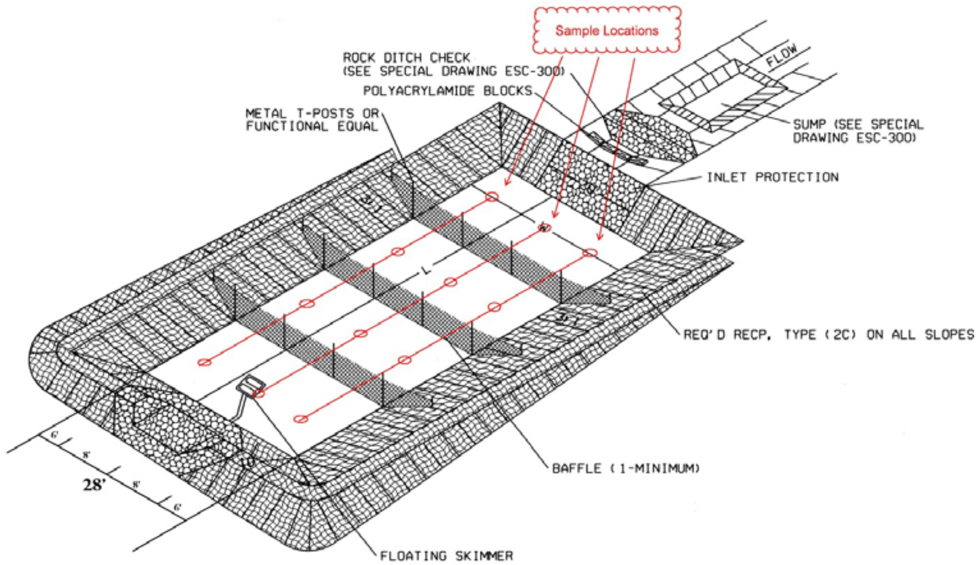


Figure 4.11: Deposited sediment sample location plan.

Figure 4.12: Sediment samples being taken from basin #4.

The sediment captured by the coir baffle material being used was visually observed by sampling three 4 ft^2 sections of each baffle prior to basin cleanout/maintenance, as shown in Figure 4.13. This allowed for a visual comparison to be made versus a clean sample of coir baffle material to determine approximate sediment retention amounts.

Figure 4.13: Three 4 ft^2 samples were taken from each baffle.

Soil samples collected of deposited sediment at the locations identified in Figure 4.11 allowed for the evaluation of the grain size distribution of deposited sediment and assessment of the performance of the baffles. This was done to determine whether or not the baffles are working correctly by dissipating energy and velocity of the incoming stormwater and allowing sediment to settle more quickly. Also, three different sets of sediment samples were taken so that outliers in the samples were easily identified, and then an average grain size distribution was generated for each bay within the basin.

4.2 Quantifying Sediment Basin Efficiency

Using the samples collected by the ISCO 6712 samplers, an evaluation of turbidity and total suspended solids (TSS) was performed in the laboratory, as show in Figure 4.14. This allowed for the measurement of the water quality of stormwater inflow, within the basin, and outflow. The water quality within the basin was evaluated to allow for determining the settling effect caused by the baffles being used within the basin.

Figure 4.14: Turbidity and TSS laboratory analysis station.

Turbidity was measured using the HACH 2100Q Portable Turbidimeter, shown in Figure 4.15.

Figure 4.15: HACH 2100Q Portable Turbiditimeter.

The maximum turbidity reading on this instrument is 1000 NTU. In the case that a sample had a higher turbidity than 1,000 NTU, the test sample was diluted using a 1:2 ratio of low-turbidity deionized water according to the *"SAMPLE DILUTION"* section of HACH Method 8366, shown in APPENDIX C. An example of sample dilution can be seen in Figure 4.16 below. The sample dilution shown represents a highly turbid inflow sample. In this procedure, the turbidity sample was diluted a total of 6 times, with a final turbidity reading of 458 NTU from the HACH turbiditimeter. The actual turbidity is calculated using Equation 4.2. Since this particular sample had a turbidity reading of 458, the actual turbidity, prior to dilution is calculated to be 29,312 NTU.

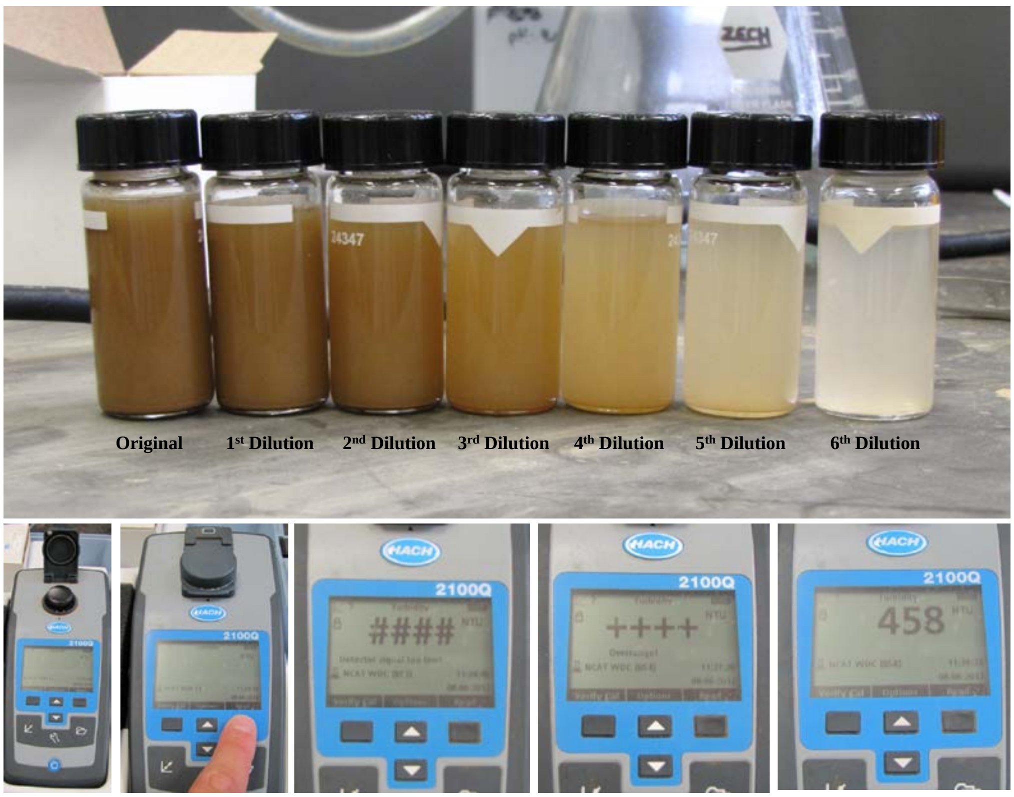


Figure 4.16: Sample dilution of inflow stormwater sample.

$$T = T_m * 2^c \qquad \textbf{(4.2)}$$

where,

T = Actual turbidity

T_m = Turbidity from HACH turbiditimeter

c = Number of dilutions performed

TSS of each sample was determined using vacuum filtration according to the *"DETERMINING TOTAL SUSPENDED SOLIDS"* section of HACH Method 8366. In this method, a crinkle dish with corresponding glass fiber filter was weighed using an analytical balance and recorded to attain each filters' clean weight. The filter was then placed on the filter holder of the vacuum filter apparatus with tweezers and with the wrinkled side facing upward. The funnel portion of the magnetic filter holder was then attached to the filter holder. Then, 20 mL of each sample was accurately measured out into a pipette. It is important that the sample be well mixed to ensure a homogeneous sample prior to taking the 20 mL sub-sample. This was achieved by first completely emptying the 1L sample into a beaker, placing the beaker onto a stir plate, and allowing the sample to stir for 1 minute to ensure the sample was well mixed. Using the filtering apparatus, next the 20 mL sub-sample was poured into the funnel portion of the vacuum filter apparatus, and the vacuum was turned on. If any residue remained on the outer walls of the funnel portion, low-turbidity deionized water was used to rinse all particulate onto the filter while the vacuum is still turned on. The filter was then rinsed 3 times with 10 mL of low-turbidity deionized water. Once all rinse water was vacuumed through the filter, the vacuum was shut off allowing the vacuum pressure to be slowly released. After all vacuum pressure had been released, the filter disc was gently removed from the apparatus using tweezers and placed back into the crinkle dish. The dish was then placed into an oven at 103° to 105°C for 1 hour, or longer, to completely dry the sample. After the dish and filter disc had been in the oven for the required amount of time to dry, it was removed, weighed again in an analytical balance, and the weight was recorded. This process allowed for TSS to be determined based on the difference in weight of the filter and crinkle dish. Figure 4.17 thru Figure 4.19, below, illustrate the vacuum filtration process performed on a single inflow sample.

Figure 4.17: Ensuring sample is well mixed for sampling turbidity and TSS.

Figure 4.18: Placing glass fiber filter on vacuum filtration apparatus.

Figure 4.19: Drawing 20 mL of stormwater sample and running through vacuum filtration.

4.3 Data Analysis Techniques

To determine the exact performance of the sediment basin, the raw data needed to be organized in such a way that a clear story could be shown. To do this, TSS, turbidity, and rainfall (when available) data collected from each sampling location was plotted versus time for each data collection rain event. Additionally, TSS and turbidity were plotted against each other in order to see what type, if any, correlation existed. Other data collected included inflow rates and times (when available), giving exact hydrographs for the inflow to the sediment basin.

To give a better overall performance report, data collected from several rain events or data collection periods were grouped together (when applicable) and plotted on one graph. This was done to show the total performance of the sediment basin for the entire dewatering period after a rain event. Rainfall data, TSS, and turbidity were all included in grouped data sets.

To further categorize and better determine the performance of the sediment basin, the data sets collected were grouped based upon 1 primary site condition: PAM. Grouping data in this manner allowed the overall performance of the sediment basin to be distinguishable depending on how the inflow was or was not being treated. This method resulted in 2 groups for phase 1 data and two groups for phase 2 data. Each group of data, based on PAM, was evaluated for TSS and turbidity reduction efficiency. The reduction efficiency at each sampling point within the basin was determined by fitting an exponential line equation to the data collected to calculate future reduction efficiencies beyond the end point of data collected. To visually distinguish differences in performance, two sets of graphs were developed, one for TSS and one for turbidity, plotting peak value reduction efficiency over the maximum design dewatering period.

The grouped data, based on PAM, for each phase of data collection was also evaluated for correlations between TSS and turbidity at each data collection point. This allowed for trends to be observed between sampling locations, also providing an excellent indicator of particle size at each sampling location.

Each of these techniques were carefully planned and executed to provide the maximum accuracy in results. The results gathered using these techniques ultimately show which features of the sediment basin performed well, as well as which features performed poorly. Moreover, the results from the data collection effort transition into providing an accurate recommendation to improve the overall sediment basin performance.

CHAPTER FIVE

DATA RESULTS AND DISCUSSION

The results of the data collection effort of this research were grouped based upon sediment basin configuration and conditions. This section will only review data sets that provide conclusive details to the sediment basin's performance. A comprehensive listing of ALL raw data collected during the research period, including data sets not analyzed in this chapter, is located in APPENDIX D. In addition to raw data, a data collection log was also maintained for each data collection trip providing details of the trip – including abnormal site conditions, errors, and otherwise notable comments relating to the sediment basin performance. This log has been included and is located in APPENDIX E. A fully detailed statistical account of the data collected for each rain event is located in APPENDIX F.

5.1 Phase 1

Phase 1 data collection took place in the early stages of the life of the sediment basin. During Phase 1, stormwater entered the sediment basin through a single inflow channel as the cut excavation progressed in the area upstream of the sediment basin. Two conditions were observed during Phase 1 data collection: 1) correct PAM placement in the inflow channel, and 2) incorrect (wrong) PAM placement in the inflow channel.

One data set was collected for each observed condition during Phase 1. Rain events for each data collection in both observed conditions were similar, producing 1.35 inches and 1.32 inches respectively. The intensity of the rain event during correct PAM placement for the sediment basin (11/16/2011) is unknown due to an error that occurred with the ISCO rain gauge; however, this issue was corrected and the observed average intensity for the rain event with the wrong PAM was 0.34 in/hr, with a peak observed intensity of 1.08 in/hr.

The inflow data collected was based upon inflow volume produced by each rain event as stormwater passed through the weir in the inflow channel. Figure 5.1 shows example inflow data distribution over time with respect to rainfall for the 12/5/2011 rain event (wrong PAM). All data distributions of each sampling location for each rain event discussed in this chapter are located in APPENDIX G. The inflow data collected for Phase 1 data collection was compiled and is shown in Table 5.1, below. Due to the phase of construction and little vegetative cover, turbidity and TSS values observed within the 11/16/2011 rain event are much higher in comparison to the 12/5/2011 rain event, after some vegetative growth had occurred.

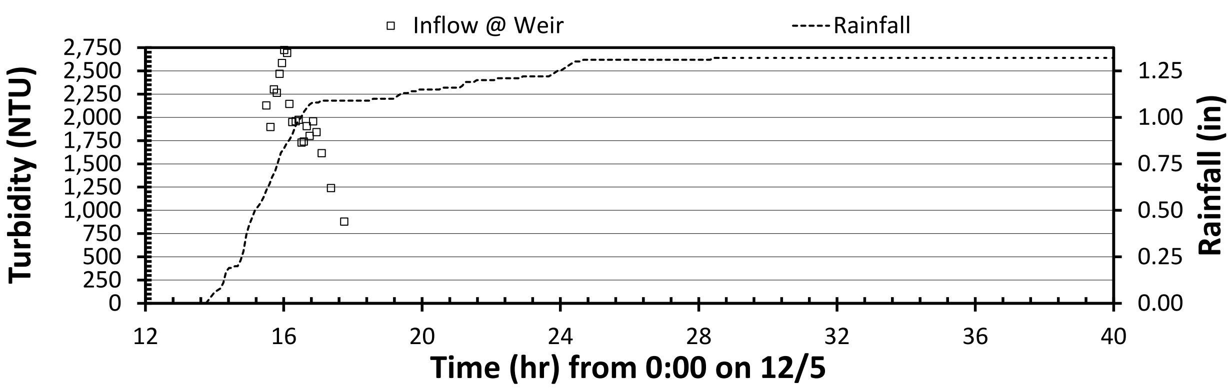


Figure 5.1: Phase 1 sample inflow turbidity distribution.

Table 5.1: Phase 1 inflow data for different PAM treatment types

Date	Turbidity (NTU)				TSS (mg/L)			
	Max	Min	Avg.	Std. Dev.	Max	Min	Avg.	Std. Dev.
11/16/2011	10,656	1,030	5,855	2,582	10,545	790	5,430	2,689
12/05/2011	2,724	878	1,989	446	1,950	465	1,305	380

The samples collected during these two rain events were analyzed for TSS and turbidity. Figure 5.2 shows how exponential reduction trends from peak observed values were applied to each data set to accurately predict the sediment basin performance for each rain event. This data was tabulated for all events and sampling locations and is given in APPENDIX F.

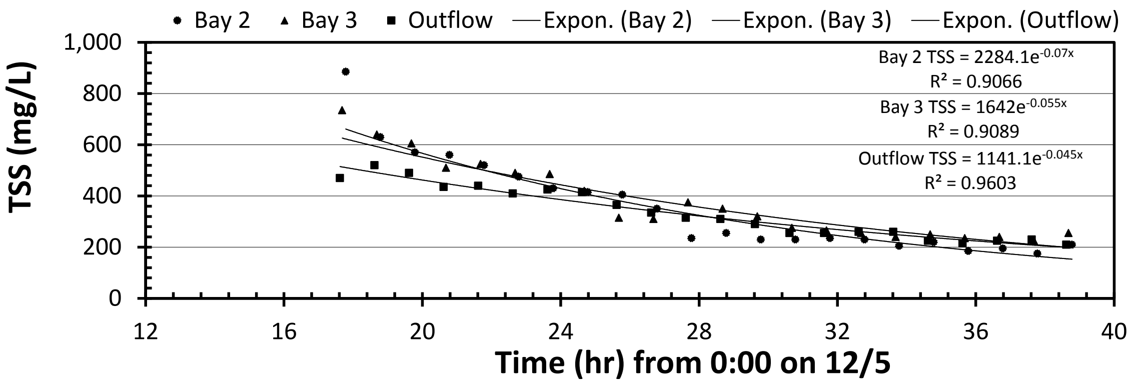
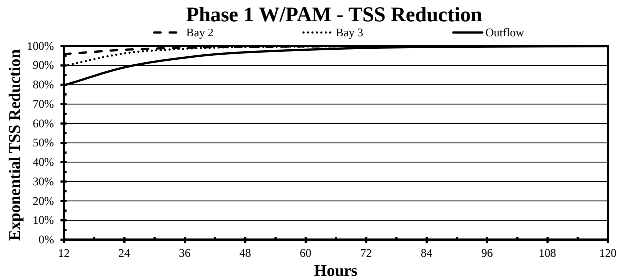


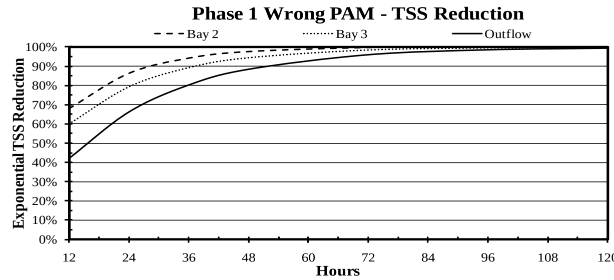
Figure 5.2: Exponential TSS reduction trends applied to 12/5/2011 data.

Figure 5.3, accompanied by Table 5.2, show the turbidity (NTU) and TSS reduction performance of each sampling location within the sediment basin under both PAM conditions. An initial performance advantage of nearly 50% is observed at all sampling locations with PAM versus with the wrong PAM.

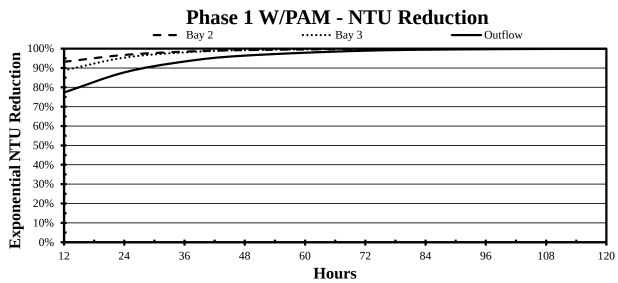
The outflow reached a 90% or greater reduction efficiency within 36 hours of the peak observed value for both TSS and NTU, whereas it took 72 hours for TSS and 96 hours for NTU to reach a 90% or greater reduction in the outflow for the rain event with the incorrect PAM. Bays 2 and 3 also showed similar trends to the outflow, reaching 90% or greater peak reduction within 24 hours, whereas it took as long as 72 hours to see 90% or greater reduction from peak values with the wrong PAM.



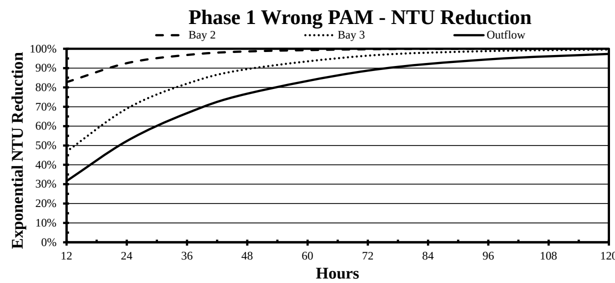
A.) With PAM TSS reduction.



B.) Incorrect PAM TSS reduction.



C.) With PAM NTU reduction.



D.) Incorrect PAM NTU reduction.

Figure 5.3: Phase 1 TSS and NTU observed reduction performance.

Table 5.2: Phase 1 TSS and NTU reduction performance

Phase 1 - W/PAM			**Exponential TSS Reduction (%)**						
Avg.(Peak) Inflow Rate (GPM)	**Sample Location**	**Max TSS**	**12hr**	**24hr**	**36hr**	**48hr**	**72hr**	**96hr**	**120hr**
456 (1,518)	Bay 2	4,940	96	98	99	100	100	100	100
	Bay 3	2,145	90	96	99	99	100	100	100
	Outflow	895	80	89	94	97	99	100	100
Phase 1 - Incorrect PAM			**Exponential TSS Reduction (%)**						
262 (554)	Bay 2	885	12	51	73	85	96	99	100
	Bay 3	800	60	79	89	94	99	100	100
	Outflow	520	42	66	80	89	96	99	100
Phase 1 - W/PAM			**Exponential NTU Reduction (%)**						
Avg.(Peak) Inflow Rate (GPM)	**Sample Location**	**Max NTU**	**12hr**	**24hr**	**36hr**	**48hr**	**72hr**	**96hr**	**120hr**
456 (1,518)	Bay 2	5,592	93	97	98	99	100	100	100
	Bay 3	3,856	89	95	98	99	100	100	100
	Outflow	1,646	77	88	93	96	99	100	100
Phase 1 - Incorrect/PAM			**Exponential NTU Reduction (%)**						
262 (554)	Bay 2	1,642	83	93	97	99	100	100	100
	Bay 3	1,552	47	69	82	89	96	99	100
	Outflow	1,112	32	52	67	77	89	94	97

It is important to note that the inflow for the 11/16/2011 rain event with PAM had much higher inflow TSS and NTU values than what was observed for the 12/5/2011 rain event that had the wrong PAM. In addition, the average inflow rate of the 11/16/2011 rain event was nearly twice as high, with a peak inflow rate of nearly three times what was observed in the 12/5/2011 rain event. Based on the inflow rates observed for both events, it can be concluded that the rainfall on 11/16/2011 had a higher average intensity, producing higher, more concentrated inflow rates. Despite these differences, the sediment basin's overall performance was much better for the 11/16/2011 rain event.

5.2 Phase 2

Phase 2 of the data collection took place in a more mature stage of site construction. Stormwater entered the basin through a new primary inflow channel, but the original inflow channel was also used as a secondary inflow channel for the basin due to the nature of the surrounding terrain. During Phase 2, road bed excavation had reached near completion, such that the entire design contributing watershed area of 9.21 acres emptied into the sediment basin. The data collected during this phase was divided into two categories based on site conditions: 1) "No PAM", and 2) "With PAM." Due to the new primary inflow channel and weir being improperly installed, stormwater coming into the basin through the primary inflow channel flowed around and under the weir – not coming into contact with the floc logs placed on top of the riprap downstream of the weir. Only in the case of a large concentrated inflow would the stormwater pass through the weir and come into contact with the floc logs, providing very limited amounts of PAM to be added to the inflow. After several rain events, this issue was corrected by reconstructing the primary inflow channel and properly installing the weir so that it maintained proper function.

During the “no PAM” category of Phase 2, inflow data that was collected was very limited based on the condition of the primary inflow channel and weir. That being said, accurate inflow rates were not able to be collected and inflow samples did not always accurately represent the total amount of stormwater that entered the basin. For this category, basin performances from 2 rain events were analyzed, as shown in Table 5.3. The first rain event occurred on 1/17/2012 producing a large concentrated inflow, allowing for a full set of inflow samples to be taken to allow for some representation of what type of stormwater was entering the basin. Due to the large concentrated inflow created by this rainfall, damage occurred to the primary inflow channel and weir, rendering them useless for future data collection until properly repaired. The second rainfall occurred on 1/21/2012 just upstream of the sediment basin. Due to the location of the rainfall, the ISCO rain gauge was unable to gather rainfall data; however, RainWave® software reported a total rainfall amount of 0.45 inches. RainWave® is unable to report rainfall intensity, therefore the average intensity of this storm is unknown. Due to the relatively small time span between rain events and condition of the sediment basin after the 1/17/2012 rain event, both data sets collected for no PAM were considered a product of the 1/17/2012 rain event – but allow for separate sediment basin performance rates to be determined for each rain event.

The second category of data collected during Phase 2, with PAM, spanned six rain events. Due to the nature of the rainfall events, continuous monitoring of the sediment basin, and overall performance of the sediment basin, samples collected with PAM were categorized by 4 rain events: A) 1/26/2012, B) 2/1/2012-a, C) 2/1/2012-b, and D) 2/4/2012.

Table 5.3: Phase 2 rainfall data

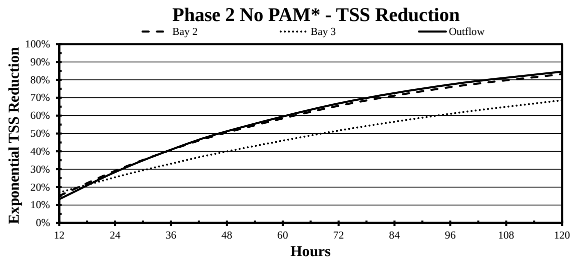
PAM	Start Date	Duration (HR:MIN)	Amount (in)	Average Intensity (in/hr)	Maximum Intensity (in/hr)
No PAM	1/17/2012	2:00	1.22	0.610	3.48
	1/21/2012	--	0.45	--	--
With PAM	1/26/2012	0:50	0.11	0.132	0.24
		5:30	0.47	0.085	0.24
		2:30	0.16	0.064	0.36
	2/1/2012-a	5:15	0.46	0.090	0.96
	2/1/2012-b	0:25	0.25	0.610	1.44
	2/4/2012	6:55	0.88	0.130	0.60

The inflow data collected for Phase 2 was tabulated and is located in Table 5.4, below. The 1/17/2012 rain event produced the highest NTU and TSS values observed over the entire data collection period. This was due to the nature of the rain event, creating an upset condition on site and generating a large concentrated inflow. The 1/26/2012 inflow had much lower observed values due to light rain and low inflow rates during the time which samples were being taken. The first rain event on 2/1/2012 produced enough inflow that the sampler collected all samples during for that rain event. Since the sampler had completed its sampling program during the inflow from the first rain event on 2/1/2012, no inflow samples were collected for the second rain event.

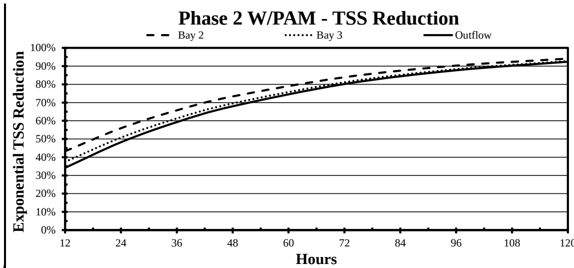
Table 5.4: Phase 2 inflow data for different PAM treatment types

PAM	Date	Turbidity (NTU)				TSS (mg/L)			
		Max	Min	Avg.	Std. Dev.	Max	Min	Avg.	Std. Dev.
No PAM	1/17/2012	28,352	3,488	9,902	6,234	26,325	2,720	7,433	5,632
	1/21/2012	--	--	--	--	--	--	--	--
With PAM	1/26/2012	785	191	506	149	435	95	275	75
	2/1/2012-a	3,688	508	1,905	1,067	2,645	250	1,105	745
	2/1/2012-b	--	--	--	--	--	--	--	--
	2/4/2012	3,892	616	1,944	914	2,315	255	1,068	561

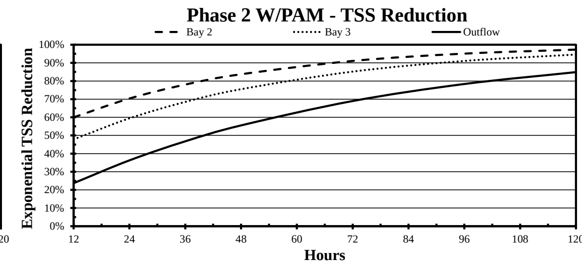
The observed TSS reduction performance by the sediment basin during Phase 2 was converted into exponential reduction rates and graphed in Figure 5.4, accompanied by Table 5.5. Likewise, the observed NTU exponential reduction rates were also graphed and are shown in Figure 5.5, accompanied by Table 5.6. The TSS and NTU reduction performance of the sediment basin with no PAM shows a much slower initial and overall reduction than any of the performance results with PAM. The TSS and NTU reduction performance observed for the 1/17/2012 rain event shows that it took 5 days to achieve 85% TSS reduction and 80% NTU reduction in the outflow. Based upon a designed dewatering time of 3-5 days and 80% (minimum) NTU removal, the sediment basin barely met the design requirements for the 1/17/2012 rain event. In addition to the overall performance with no PAM, the difference in performance from between sampling locations is much less, showing the outflow to have the maximum performance in TSS and turbidity reduction, rather than Bay 2 or Bay 3 as observed during Phase 1. In comparison, the data with PAM collectively shows a much higher initial performance at 12 hours at all sampling locations, with the order of efficiency being the highest at Bay 2 and lowest at the outflow. The reason for this order of reduction efficiency is due to sediment particle sizes, where the larger particles settle more quickly than smaller sediment particle sizes.



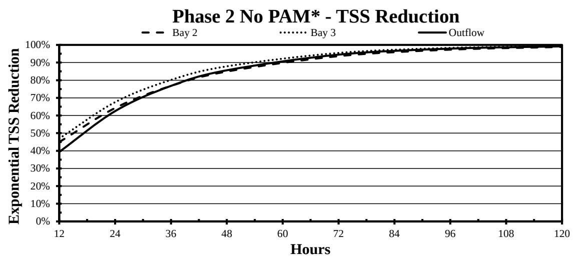
A.) 1/17/2012 TSS reduction.



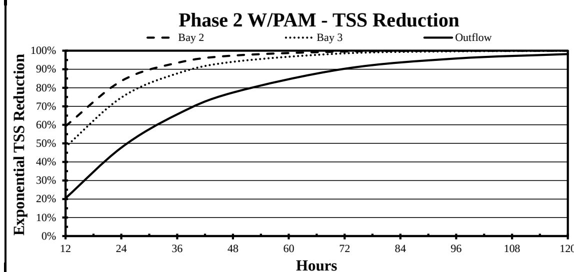
C.) 1/26/2012 TSS reduction.



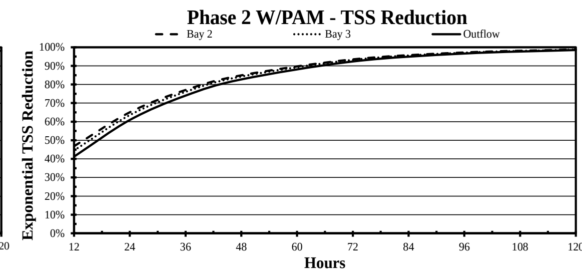
E.) 2/1/2012-b TSS reduction.



B.) 1/21/2012 TSS reduction.



D.) 2/1/2012-a TSS reduction.



F.) 2/4/2012 TSS reduction.

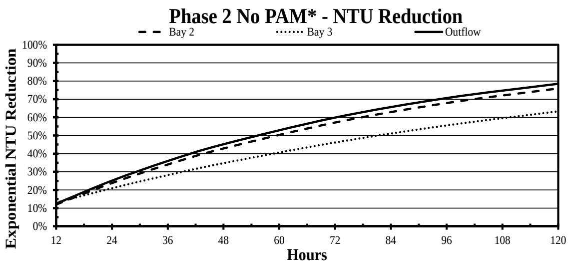
Figure 5.4: Phase 2 observed exponential TSS reduction performance.

Table 5.5: Phase 2 observed exponential TSS reduction performance

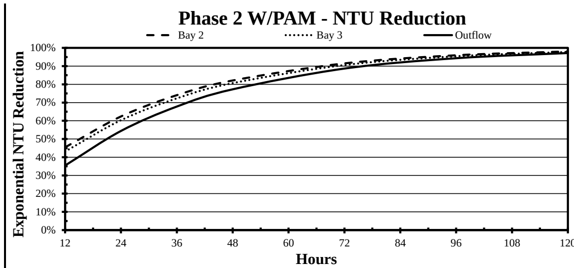
Phase 2 - No PAM*				Exponential TSS Reduction (%)						
Date	**Storm Intensity**	**Sample Location**	**Max TSS**	**12hr**	**24hr**	**36hr**	**48hr**	**72hr**	**96hr**	**120hr**
1/17/2012	High	Bay 2	805	15	29	41	51	65	76	83
		Bay 3	795	17	25	33	40	52	61	69
		Outflow	745	13	28	41	51	67	77	85
1/21/2012	High	Bay 2	810	45	64	77	85	94	97	99
		Bay 3	800	47	68	80	88	95	98	99
		Outflow	540	39	62	77	86	94	98	99
Phase 2 - With PAM				**Exponential TSS Reduction (%)**						
Date	**Avg.(Peak) Inflow Rate (GPM)**	**Sample Location**	**Max TSS**	**12hr**	**24hr**	**36hr**	**48hr**	**72hr**	**96hr**	**120hr**
1/26/2012	--	Bay 2	580	43	56	66	73	84	90	94
		Bay 3	510	37	51	61	70	81	88	93
		Outflow	385	34	48	59	68	80	88	92
2/1/2012-a	120 (643)	Bay 2	885	59	84	93	97	100	100	100
		Bay 3	660	48	75	88	94	99	100	100
		Outflow	340	20	48	66	77	90	96	98
2/1/2012-b	90 (898)	Bay 2	1,780	60	70	78	84	91	95	97
		Bay 3	1,255	48	59	68	75	85	91	95
		Outflow	585	24	36	47	56	69	78	85
2/4/2012	162 (959)	Bay 2	930	47	65	77	85	93	97	99
		Bay 3	940	45	64	76	84	93	97	99
		Outflow	595	41	61	74	83	92	97	99

*May contain very limited amounts of PAM.

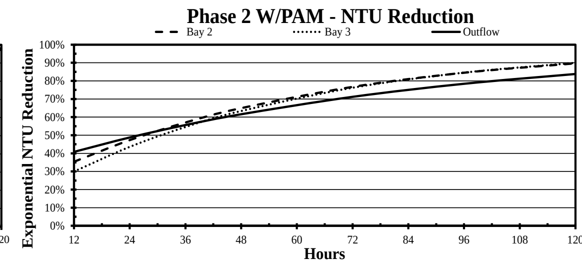
The two rain events on 2/1/2012 took place approximately 8 hours apart. The TSS reduction performances shown in D and E of Figure 5.4 and Figure 5.5 are theoretical based upon observed performance during that time period. Part D and E performance vary primarily due to the resuspension of sediment that occurred after the second rain event, thus causing the performance efficiency to decrease in part E as compared to part D.



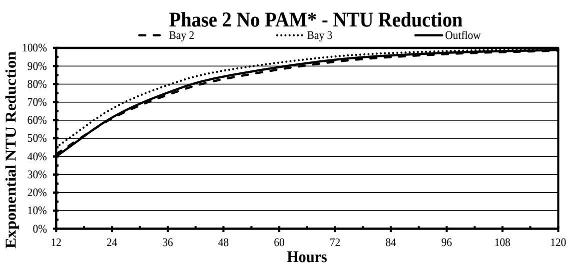
A.) 1/17/2012 NTU reduction.



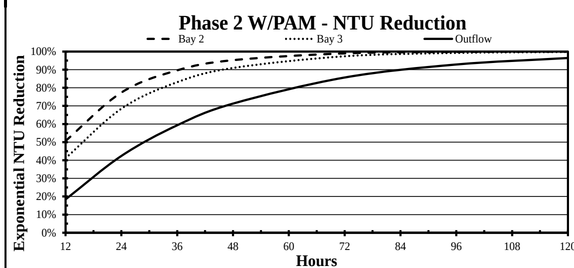
C.) 1/26/2012 NTU reduction.



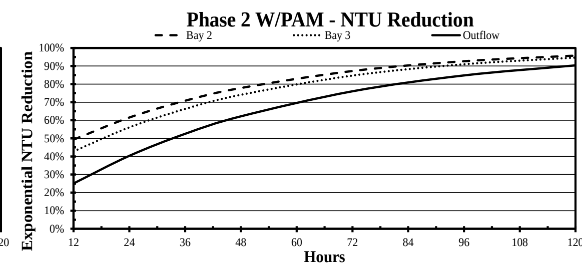
E.) 2/1/2012-b NTU reduction.



B.) 1/21/2012 NTU reduction.



D.) 2/1/2012-a NTU reduction.



F.) 2/4/2012 NTU reduction.

Figure 5.5: Phase 2 observed exponential NTU reduction performance.

Table 5.6: Phase 2 observed exponential turbidity reduction performance

Phase 2 - No PAM*				Exponential NTU Reduction (%)						
Date	Storm Intensity	Sample Location	Max TSS	12hr	24hr	36hr	48hr	72hr	96hr	120hr
1/17/2012	High	Bay 2	1,982	12	24	34	43	57	68	76
		Bay 3	1,926	13	21	28	35	46	56	63
		Outflow	1,858	12	25	36	45	60	71	79
1/21/2012	High	Bay 2	1,916	41	61	74	83	92	97	99
		Bay 3	1,956	45	66	79	87	95	98	99
		Outflow	1,170	40	61	75	84	93	97	99
Phase 2 - With PAM				**Exponential NTU Reduction (%)**						
Date	**Avg.(Peak) Inflow Rate (GPM)**	**Sample Location**	**Max TSS**	**12hr**	**24hr**	**36hr**	**48hr**	**72hr**	**96hr**	**120hr**
1/26/2012	--	Bay 2	1,008	35	47	57	65	77	85	90
		Bay 3	1,042	30	44	55	63	76	85	90
		Outflow	905	41	49	56	62	71	78	84
2/1/2012-a	120 (643)	Bay 2	1,552	51	77	90	95	99	100	100
		Bay 3	1,326	41	68	83	91	97	99	100
		Outflow	740	18	42	59	71	86	93	96
2/1/2012-b	90 (898)	Bay 2	2,996	49	62	71	78	87	93	96
		Bay 3	2,472	43	56	66	74	85	91	95
		Outflow	1,330	25	40	53	62	76	85	90
2/4/2012	162 (959)	Bay 2	1,988	45	62	74	82	92	96	98
		Bay 3	1,914	43	60	72	81	91	95	98
		Outflow	1,146	35	54	68	77	89	94	97

*May contain very limited amounts of PAM.

The overall performance of the sediment basin in Phase 2 with PAM versus what is seen without PAM is not as drastic as compared to what was observed in Phase 1 between correct PAM and incorrect PAM. Flow rates and volumes collected for each rain event provide a healthy explanation for this difference in performance. The average and peak flow rates observed in Phase 1 are much higher than the average flow rates observed in Phase 2. The total volume of stormwater entering the sediment basin in Phase 1 was around 7,500 cubic feet per rain event, whereas the total volume entering the basin during Phase 2 was around 30,000 cubic feet per rain event. Further insight into the inflow rates for each rain event show that the duration of inflow during Phase 1 rain events lasted an average of 2 hours – thus the higher average inflow rates. If the 2 hour peak inflow rate is taken from Phase 2 rain events, the average inflow rate ranges from 370 to 645 gal/min. This provides sufficient evidence to show that the sediment basin had much more volume being introduced per rain event for longer periods of time during Phase 2 than during Phase 1. The greater the volume of stormwater that is being introduced to the sediment basin, the more resuspension of sediment within the basin becomes an issue – driving the TSS and NTU reductions efficiency down and creating a fully mixed solution once the depth of the stormwater in the basin overtops the baffles. With this in mind, initial reduction efficiency within the first 36 hours after peak observed TSS and NTU values with PAM in Phase 2 were much lower than what was observed with correct PAM during Phase 1, despite having the correct PAM being introduced to the stormwater inflow properly.

5.3 Retained Sediment Analysis

Twelve samples of sediments retained by the sediment basin were collected as described in Chapter 4. Sediment samples were analyzed by performing an ASTM gradation test on each sample, and then the samples for each bay were averaged, excluding outliers, into a single gradation for that bay. The gradations for each bay were then plotted against each other in Figure 5.6.

As can be seen in Figure 5.6, the retained sediment from the sediment basin shows a general trend of reduction in sediment particle size from the one bay to the next as runoff progresses through the basin. The only exception to this trend is between Bays 1 and 2, where Bay 2 shows a slightly larger particle size until the #80 sieve (0.177 mm), where Bay 2 continues on more of a linear trend and drops below Bay 1 and slightly below Bay 3. There was a significant gap in particle sizes observed between Bays 1 and 2 and Bays 3 and 4 for sizes 0.177 mm and larger. This shows that the larger particles of sediment had a strong tendency to fall out of the stormwater earlier in the sediment basin, allowing smaller particles to fall out later and further into the basin. This was exceptionally true in Bay 4, where gradation sizes remained smaller than any of the other bays observed. Based upon this sediment gradation data, showing a strong trend of continuously smaller particle sizes from entry of the basin to exit – especially from the first 2 bays to the last 2 bays, this can happen due to gravity settling alone. In this study, because there is no direct comparison that can be made from an identical basin without using baffles, the overall function of the baffles performing as they were designed is still not clear and remains as a future research topic.

To gain an overall perspective of how the sediment gradation stacks up against virgin soil gradation, they were plotted together in Figure 5.6. In the figure, the virgin soil gradation is indicated by the blue gradation line. The virgin soil gradation shows a slight gap in the grading from 0.1 to 0.5 mm, which explains gap-like grading trends shown by the sediment gradations for Bay 1 and 3 as well.

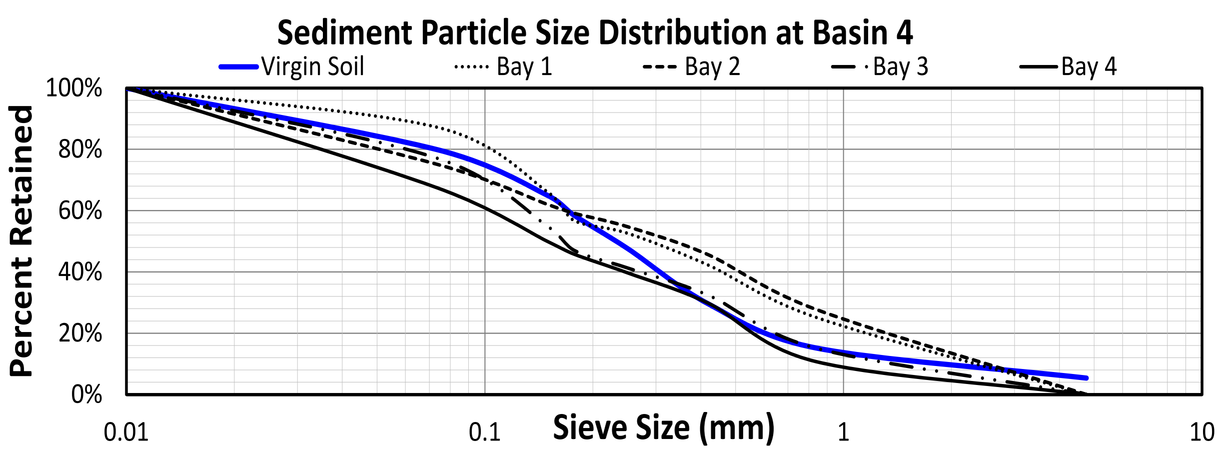


Figure 5.6: Retained sediment and virgin soil gradation.

A retained sediment volume report was generated by MicroStation, noting the net change in volume that was determined by subtracting the end-volume of the post-evaluation survey from the original volume of the pre-evaluation survey. Retained sediment volume for basin 4 was 62.89 yd^3 (1,698 ft^3) that was resulted from sediment-laden runoff generated from rainfall events from 9/13/2011 to 4/26/2012. The retained sediment volume occupied 65% of dead storage (2,622 ft^3) of basin 4. If assumed average sediment density is approximate 100 lb/ft^3, retained sediments were about 169,800 lb (77,020 kg).

CHAPTER SIX

CONCLUSIONS AND RECOMMENDATIONS

6.1 Basin Size

The size of sediment basin 4 in Franklin County, AL was originally designed to accommodate 670 yd^3 of stormwater, based on sediment basin dimensions given on sheet no. 86-1 in reference to project no. APD-0355(502). A minor field adjustment during construction added an extra 1.5 ft of depth (sediment/dead storage) – adding approximately 97 yd^3 volume of storage to the basin, for a total storage volume of 767 yd^3, or 20,709 ft^3. Considering the total contributing watershed area, 9.21 acres, of the sediment basin, the storage provided by the basin was calculated to be approximately 2,250 ft^3/acre. Discounting the 97 yd^3 addition added during construction, the sediment basin provided 1,964 ft^3/acre of storage. Based on this calculation, the sediment basin was designed using the outdated minimum sediment basin storage design standard of 1,800 ft^3/acre.

Actual inflow volumes observed during Phase 1 and Phase 2 data collection, shown in Table 6.1, show that observed inflow volumes during Phase 2 exceed the actual storage volume of the sediment basin. The problem with this is that the rain events observed in Phase 2 did not exceed the design storm volume of a 2-yr 24-hr storm of 3.91 inches.

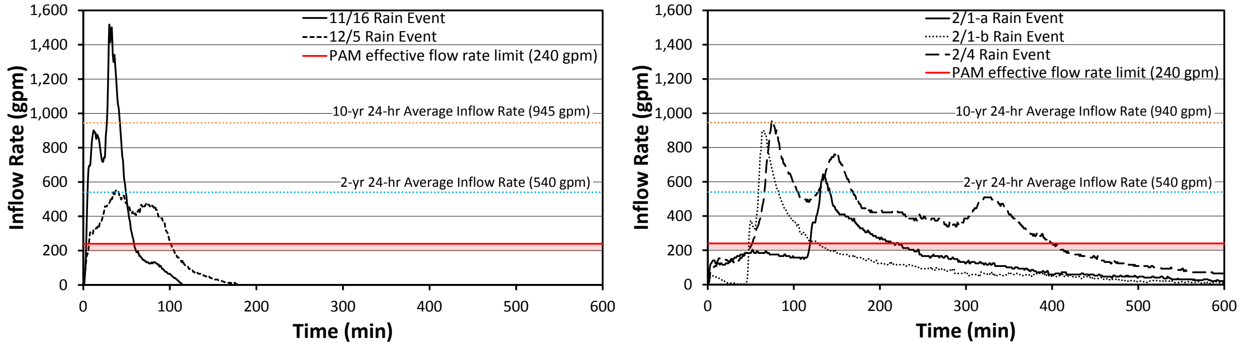
Table 6.1: Observed inflow volumes

Phase	Date	Inflow Volume (cf)
1	11/16/2011	6,941
	12/5/2011	6,218
2	2/1/2012	21,921
	2/4/2012	28,454

The current N.P.D.E.S. Construction General Permit (C.G.P.) provides sediment basin design requirements in section 2.1.3.2-a-i. to "Provide storage for either (1) the calculated volume of runoff from a 2-yr 24-hr storm, or (2) 3,600 cubic feet per acre drained," (ADEM 2011; USEPA 2012b). In this case, based upon current design standards and observed inflow volumes, 3,600 ft^3/acre would provide 33,156 ft^3 of storage, which would be sufficient to hold the observed volumes produced during the Phase 2 data collection. It is recommended that all sediment basin designs be up to date with all design standards at the time of construction to maximize sediment basin performance and efficiency.

6.2 Floc Logs

Results in Chapter 5 showed that flow rates observed over the entire data collection period exceeded the effective flow rate limit (240 gpm) of the 4 floc logs that were in place in both channels. The effective flow rate for the floc logs was determined by the manufacturer to be 50 to 60 gpm, as shown in APPENDIX H. Table 6.1 presents the observed flow rates of from Phase 1 and Phase 2, including average runoff flow rates of a 2-yr 24-hr and 10-yr 24-hr (calculated using PondPack software).



(a) Phase 1 flow rates

(b) Phase 2 flow rates

Figure 6.1: Phase 1 and Phase 2 observed inflow rates and durations.

There are two options of recommendations to improve the performance of the floc logs being used in the inflow channels for sediment basins: (1) increase the amount of floc logs to accommodate the average flow rate of a 2-yr 24-hr runoff flow rate; and (2) increase the amount of floc logs to accommodate the average flow rate of a 10-yr 24-hr runoff flow rate. For basin 4 in Franklin County, AL, the average runoff flow rate for a 2-yr 24-hr storm, the C.G.P. design storm for sediment basins, is 540 gpm. Nine to 11 floc logs would be required to be placed in each inflow channel to effectively treat this type of inflow rate. The 10-yr 24-hr runoff flow rate was also chosen as a worst case scenario, in the event that a significant rainfall were to occur when the basin is already at capacity from a previous rain storm – directly discharging stormwater through the emergency spillway with negligible detention time. To effectively treat the runoff flow rate of 940 gpm from a 10-yr 24-hr storm at basin 4, 16 to 19 floc logs would need to be strategically placed in inflow channel so that the maximum design flow rate through the spillway is also properly treated, significantly lowering the TSS load being discharged from the sediment basin.

6.3 Baffles

The baffles for basin 4 consisted of 2 layers of coir net attached to steel wire assembled perpendicular to the direction of flow within then basin. The problem observed during data collection, as shown in Figure 6.2, is that when runoff from a rain event filled the basin, the water level within the basin overtopped the baffles, creating a fully mixed condition within the basin, disabling the designed function of the baffles. The contractor stated that the height that the baffles were constructed was consistent with the width of the rolls steel support mesh and coir baffle material, creating a simple installation. In the case of basin 4, the height of the baffles was 4 ft, whereas the full depth of the sediment basin was approximately 6.5 feet.

Figure 6.2: Stormwater overtops the baffles when the basin fills to capacity.

It is recommended that the height of the baffles match the full depth of the sediment basin, preventing stormwater from overtopping them and creating a fully mixed condition. In order for the baffles to function properly, as designed, it is imperative that the height of the baffles be greater than the maximum potential water level in the sediment basin.

6.4 Cost Analysis

Additional costs associated with the above recommendations have been compiled with the additional associated costs of the new sediment basin design, given in Chapter 5, and are shown in Figure 6.3. For option 1, the number of floc logs has been increased to accommodate the average flow rate produced by a 2-yr 24-hr storm in each inflow channel and the coir netting baffle material has been increased to accommodate the extra height of the baffles. The total extra cost for option 1 beyond that which was expended on the basin as it was constructed in the field is $2,684.30. Option 2 contains the same items from option 1, with the expansion to 19 floc logs for in each inflow channel to accommodate a 10-yr 24-hr flow rate. This brings the total extra cost difference associated with option 2 to be $5,979.30 above what was originally expended on the basin as it was constructed.

Item	Units	Cost	Quantity	Total
Floc Log (for 2-yr 24-hr flow rate; 2 inflow channels)	each	$164.75	18	$2,965.50
Coir Netting (for total basin height)	LF	$5.40	582	$3,142.80
R.E.C.P.	SY	$5.00	1819	$9,095.00
Faircloth Skimmer	each	$1,665.00	1	$1,665.00
Filter Blanket Geotextile (Liner)	SY	$3.63	620	$2,250.60
			Total Additional Cost:	$19,118.90
			Total Additional Cost As Constructed:	$16,434.60
			Difference:	**$2,684.30**

(a) option 1

Item	Units	Cost	Quantity	Total
Floc Log (for 10-yr 24-hr flow rate; 2 infow channels)	each	$164.75	38	$6,260.50
Coir Netting (for total basin height)	LF	$5.40	582	$3,142.80
R.E.C.P.	SY	$5.00	1819	$9,095.00
Faircloth Skimmer	each	$1,665.00	1	$1,665.00
Filter Blanket Geotextile (Liner)	SY	$3.63	620	$2,250.60
			Total Additional Cost:	$22,413.90
			Total Additional Cost As Constructed:	$16,434.60
			Difference:	**$5,979.30**

(b) option 2

Figure 6.3: Additional costs associated with recommendations.

6.5 Future Research Opportunities

Amid the formulation of conclusions for this project, several opportunities for future research were recognized as being beneficial to the overall efficiency of the current sediment basin design. Primarily, these opportunities concern the placement of floc logs and the OSF of baffles.

Floc log placement is vital to the proper dosing of PAM. If the floc logs are not properly placed in the inflow channel, influent stormwater may be under-dosed, disallowing the PAM to perform at maximum efficiency. In the current sediment basin design, floc logs are placed across the top of the rip rap inflow channel. This configuration, however, does not introduce PAM to the stormwater in low flow situations, as the stormwater infiltrates through the rip rap and into the sediment basin. Additional research is also necessary to determine if stormwater can be over-dosed with floc logs. If so, the arrangement of floc logs in the inflow channel should consider the flow rate in relation to the shape and depth of water in the inflow channel, so that the proper dosage of PAM is being applied at all inflow rates.

Baffles are often used within sediment basins to dissipate energy and evenly distribute flow coming into the sediment basin. It has also been proposed that, with the ideal dosage of PAM, the fibrous material of the coir mesh baffle may retain and trap suspended sediment, increasing the overall efficiency of the sediment basin. It is proposed that research be done to determine the ideal OSF of the coir mesh to maximize the overall performance the baffles, while also considering the usable life of the baffles without requiring replacement.

6.6 Summary

In an effort to improve current sediment basin design, construction, and performance, ALDOT has chosen to adopt a basin design from the North Carolina Erosion and Sediment Control Planning and Design Manual. To ensure that this new sediment basin design is performing at maximum TSS/turbidity reduction and cost efficiency, the Auburn University Highway Research Center performed research, collecting overall sediment basin performance data, and determined the inefficiencies of this design on this site. Based upon the results of the data collected and observed site conditions during the research period, the above mentioned recommendations will provide ALDOT with a sediment basin design that will perform at maximum performance and cost efficiency.

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APPENDIX A: SEDIMENT BASIN STATE-OF-THE-PRACTICE SURVEY

I. BACKGROUND | EXPERIENCE

QUESTION 2: *Does your agency use sediment basins on construction projects to capture sediment-laden runoff and promote sedimentation prior to effluent discharge?*

Total Responses	YES	NO
37	33	4
100%	89%	11%

II. DESIGN

QUESTION 3: *Does your agency have a standard design/drawing for sediment basins?*

Total Responses	YES	NO
33	24	9
100%	73%	27%

***QUESTION** 4: Please provide a link to the standard design/drawing.*

http://www.iowadot.gov/erl/current/RS/content_eng/rl9.pdf
http://www.michigan.gov/documents/2006_SESC_Manual_165226_7.pdf
http://www.ncdot.org/doh/operations/dp_chief_eng/roadside/soil_water/erosion_control/
http://www.ct.gov/dot/cwp/view.asp?a=3200&q=260108
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http://www.dnrec.state.de.us/DNREC2000/Divisions/Soil/Stormwater/New/Delaware%20ESC%20Handbook_06-05.pdf
http://www.okladot.state.ok.us/roadway/roadway2009/r04.pdf
http://standarddetails.dot.ga.gov/stds_dtls/files/gcded22.tif
http://www.dot.state.oh.us/Divisions/Engineering/Hydraulic/Standard%20Drawings/DM/PDF/dm43_apr09_V8.pdf
http://www.itd.idaho.gov/design/StandardDrawings.htm#P
https://www.dot.ny.gov/main/business-center/engineering/cadd-info/drawings/standard-sheets-us-repository/209-07_090210.pdf
http://www.coloradodot.info/business/designsupport/standard-plans/m-s-standards-plans-list-sheet
www.arkansashighways.com/roadway_design_division/usunits/57--tec-2.pdf
http://www.modot.mo.gov/business/standards_and_specs/documents/80610.pdf
http://roadwaystandards.dot.wi.gov/standards/fdm/10-15-005att.pdf or for contractors
http://dnr.wi.gov/runoff/pdf/stormwater/techstds/erosion/SedimentBasin_1064.pdf
http://www.scdot.org/doing/pdfs/stddrawings/new_2011/sd11-01_800_Incidental_Construction.pdf
http://www.udot.utah.gov/main/uconowner.gf?n=567860925574793041
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http://www.tdot.state.tn.us/Chief_Engineer/engr_library/design/Std_Drwg_Eng.htm#EROSIONCONTROLANDLANDSCAPING
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ftp://ftp.odot.state.or.us/techserv/Geo-Environmental/Environmental/Procedural%20Manuals/Erosion%20Control%20Manual/Chapter%203.pdf
http://kart.ksdot.org/StandardDrawings/_us_published_pdfs/la852a.pdf
http://dotapp7.dot.state.mn.us/edms/download?docId=914121

QUESTION 5: *The average design life of a sediment basin on an active construction site used by your agency is approximately:*

Total Responses	< 6 Months	6 - 12 Months	1 - 2 years	2 - 3 years	> 3 Years
33	2	15	10	2	4
100%	6%	45%	30%	6%	12%

QUESTION 6: *Your agency uses sediment basins in: (select all that apply)*

Total Responses	Cut Sections	Fill Sections	Transition Sections
33	28	25	24
100%	85%	76%	73%

QUESTION 7: *Does your agency use basins in serieswhere terrain limits storage capacity of a single sediment basin?*

Total Responses	YES	NO	Sometimes
33	10	12	11
100%	30%	36%	33%

QUESTION 8: *You selected that your agency uses or sometimes uses sediment basins in series. How are these basins connected to each other?*

Total Responses	Pipes	Skimmers	Spillways	Other
21	11	2	17	4
100%	52%	10%	81%	19%

Other (Please Specify):

(IA) Ditch
(NY) Swales
(OH) Open Channel
(WA) Swales

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QUESTION 9: *The minimum storage volume that your agency uses in the design of sediment basins is:*

Total Responses	1,800 cubic ft per acre	3,600 cubic ft per acre	Other
33	6	17	10
100%	18%	52%	30%

Other (Please Specify):

(FL) Depends on design parameters

(IA) 1,500 cubic feet/acre

(ID) 2 year 24 hour storm event. Sediment accumulation is not calculated. Many local municipalities do require a foot of "free board" in the design of sediment basins. This "free board" is to account for the accumulation of sediment and reduced future infiltration due to sediment accumulation. Common methods used to determine the volume for the 2 year 24 hour storm are the Rational Method and TR-55, which do account for vegetated cover and infiltration. Typically only the portion of the watershed contributing to the basin would be included, but Idaho does not have a formal watershed approach to stormwater design….yet.

(MI) Not determined by runoff

(MO) 3,600 cubic feet per installation

(RI) Specific design criteria determines volume of storage over time

(TX) 2,500 CF/acre (based on 25-yr flood event for region)

(UT) No Minimum

(WA) Surface area of 2080 square feet per cfs of inflow with a minimum 3.5 depth

(WI) No Minimum

QUESTION 10: *The minimum watershed area used by your agency for a sediment basin design is:*

Total Responses	No Minimum	1 acre	2 acres	3 acres	4 acres	Other
33	20	3	1	1	1	7
100%	61%	9%	3%	3%	3%	21%

Other (Please Specify):

(KS) 10 acres. We don't really have a minimum, but we require sediment basins where we have ten or more disturbed acres draining to a single point, and since the contractor is the one putting together the erosion control plan, we don't typically see sediment basins if they are not required.

(MI) not determined by acres

(MO) 10 acres

(OH) 10 acres

(OK) unknown

(PA) 5 acres

(SC) 10 acres

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QUESTION 11: *The maximum watershed area used by your agency for a sediment basin design is:*

Total Responses	No Maximum	Up to 10 acres	Up to 20 acres	Up to 30 acres	> 30 acres
33	17	7	1	1	7
100%	52%	21%	3%	3%	21%

> 30 (Please Specify):

(CT) Dependant on project site location
(DE) 100 acres
(MI) Not determined by acres
(NY) 100 acres
(PA) 100 acres
(TN) 50 acres
(VA) 100 acres (allowed by regulations)

QUESTION 12: *Your agency most often sizes sediment basins for a _-year 24-hour rainfall event.*

Total Responses	2	10	20	Other
33	16	6	0	11
100%	48%	18%	0%	33%

Other (Please Specify):

(IA) Not used.
(KS) We don't really size the sedimentation basins. That is up to the contractor, putting together the erosion control plan with the requirement of 3,600 cu ft/ acre.
(MI) Not used.
(MO) Varies by installation and available right of way
(NC) 10 Yr & 20 Yr Depending on Water Quality Designation
(NY) Not used. (volume per acre only)
(OH) Not used.
(PA) Not used.
(RI) 100 year 24 hour event not including free board
(UT) Not used.
(VA) 25 year peak discharge

QUESTION 13: *The minimum length/width ratio used by your agency in the design of sediment basins is:*

Total Responses	None	1:1	2:1	3:1	4:1	Other
33	5	0	19	4	1	4
100%	15%	0%	58%	12%	3%	12%

Other (Please Specify):

(FL) No minimum required; length maximized for efficiency.
(MD) Formula calculations per state standards.
(RI) Depends on site constraints.
(SD) Depends on site-constraints.

QUESTION 14: *The maximum length/width ratio used by your agency in the design of sediment basins is:*

Total Responses	None	3:1	4:1	5:1	6:1	Other
33	20	2	2	1	2	6
100%	61%	6%	6%	3%	6%	18%

Other (Please Specify):

(FL) No maximum; length maximized for efficiency
(CO) Depends on site-constraints.
(ID) 2:1 is a general guideline
(MD) Formula calculations per state standards
(RI) Depends on site-constraints.
(SD) Depends on site-constraints.

QUESTION 15: *The minimum depth your agency uses for sediment basin design is:*

Total Responses	No Minimum	4 ft	3 ft	2 ft	Other
27	20	2	2	1	2
100%	74%	7%	7%	4%	7%

Other (Please Specify):

(AR) 3.5 ft
(FL) No minimum required. (depth targeted for expected load)
(MD) 2.5 ft
(MI) Site specific criteria determines sizing.
(RI) Site specific criteria determines sizing.
(UT) 1 ft
(WA) 3.5 ft

QUESTION 16: *The maximum depth your agency uses for sediment basin design is:*

Total Responses	No Maximum	5 ft	10 ft	15 ft	Other
33	15	4	1	4	9
100%	45%	12%	3%	12%	27%

Other (Please Specify):

(AR) 6' for basin w/spillway only or perforated riser pipe; 5' for sump basin
(CO) 3.5 ft
(FL) No maximum required. (depth targeted for expected load)
(MI) Site specific criteria determines sizing.
(MO) 1 foot plus design flow depth.
(RI) Site specific criteria determines sizing.
(SD) Design for 2' - 3' depths wherever possible.
(TN) No maximum. Dams that are more than 20 ft in height must meet the Tennessee Safe Dam Act.
(VA) No maximum specified but typically try to limit depth to 5' or less.

QUESTION 17: *The minimum allowable slope that your agency uses for the inflow channel of a sediment basin is:*

Total Responses	1%	2%	3%	4%	Other
33	4	2	0	1	26
100%	12%	6%	0%	3%	79%

Other (Please Specify):

(AR) None
(CO) Level – No Slope
(DE) 0.5%
(FL) None; Designed for efficient site conditions.
(IA) None
(ID) None
(KS) None
(MD) 2:1
(MI) None
(MN) None; Depends on soil
(MO) None; Varies by installation
(MS) None
(NC) None
(NH) 0.5%
(NY) None
(OH) None - Site Specific
(OK) None
(PA) None
(SC) 0.5%
(TN) None
(TX) None
(UT) None
(VA) None
(WA) None; minimum velocity is 3 feet per second
(WI) None

QUESTION 18: *The maximum allowable slope that your agency uses for the inflow channel of a sediment basin is:*

Total Responses	1%	5%	10%	15%	Other
33	0	5	2	0	26
100%	0%	15%	6%	0%	79%

Other (Please Specify):

(AL) None
(CO) 50%
(DE) No maximum; Basically using anything that would eliminate gullying and sediment generation.(i.e. use of riprap chutes/swales)
(FL) None; Designed for efficient site conditions
(IA) None
(ID) None
(KS) None
(MD) 2:1
(MI) None
(MN) None; Depends on soil
(MO) None; Varies by installation
(MS) 2:1 slope
(NC) None
(NH) None
(NY) None
(OH) None – Site Specific
(OK) None
(PA) None
(TN) None
(TX) None
(UT) None
(VA) None
(WA) None; Maximum velocity of 10 feet per second
(WI) None

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QUESTION 19: *What types of dewatering devices does your agency use in sediment basins to discharge effluent? (select all that apply)*

Total Responses	Solid Riser Pipe	Perforated Riser Pipe	Flashboard Riser Pipe	Floating Skimmer	Spillway Only	Other
67	10	23	4	11	19	5
100%	15%	34%	6%	16%	28%	7%

Other (Please Specify):

(DE) Usually use a floating skimmer, but minimum requirement is: "Dewatering shall be done in such a manner as to remove relatively clean water without removing any of the sediment that has settled out and without removing any appreciable quantities of floating debris."

(IA) Note: Perforated riser pipe is not in standard yet.

(MD) Horizontal and Vertical Draw Down Devices

(OH) Note: Solid Riser/Perforated Riser and Spillway

(RI) Weir style outlet structures

QUESTION 20: *The minimum dewatering time that your agency uses in the design of a sediment basin is:*

Total Responses	< 1 day	1 day	2 days	3 days	> 3 days
33	10	10	4	1	8
100%	30%	30%	12%	3%	24%

> 3 days (Please Specify):

(FL) None – designed for efficiency

(IA) None

(MI) None

(MS) None

(OK) None

(SD) As construction allows…dependant on soil.

(TN) Dependent on size of basin.

(WA) None

QUESTION 21: *The maximum dewatering time that your agency uses in the design of a sediment basin is:*

Total Responses	No Maximum	3 days	4 days	5 days	> 5 days
33	24	5	0	0	4
100%	73%	15%	0%	0%	12%

> 5 days (Please Specify):

(DE) Some sediment basins will be designed with a permanent pool elevation.
(PA) 7 days
(SD) As construction allows…dependant on soil.
(TN) Dependent on size of basin.

QUESTION 22: *Your agency typically sizes the spillway of a sediment basin for a _-year 24-hour rainfall event.*

Total Responses	2	10	20	25	Other
33	11	10	0	4	8
100%	33%	30%	0%	12%	24%

Other (Please Specify):

(IA) Not based on rainfall event.
(KS) No requirement other than a min 10 foot width.
(MI) Undefined.
(MO) Varies by installation.
(OH) Undefined.
(PA) 2 cfs/acre.
(RI) 100 year 24 hour event.
(UT) Undefined.

QUESTION 23: *Does your agency use valves on the outlet pipes of sediment basins for controlling effluent discharge?*

Total Responses	YES	NO	Sometimes
33	0	30	3
100%	0%	91%	9%

QUESTION 24: *In the previous question, you selected that your agency uses or sometimes uses valves on the outlet pipes of sediment basins. Please explain how your agency uses valves.*

(AL) As a backup measure at the end of the outlet pipe.

(NH) To control the release of construction stormwater runoff.

(NY) NYSDOT may sometimes use a valve in its outlet structure when there is a need to contain the entire contents of the basin, meaning no chance of discharge unless valve is open, or if there is a concern for a material from a fuel spill draining into the basin.

QUESTION 25: *Does your agency use flocculant additives with sediment basins to promote deposition?*

Total Responses	YES	NO
33	13	20
100%	39%	61%

QUESTION 26: *What kind of additive does your agency use? (select all that apply)*

Total Responses	Polyacrylamide (PAM) floc blocks	Liquid PAM	Granular PAM	Other
13	11	6	8	3
100%	85%	46%	62%	23%

Other (Please Specify):

(ID) Chitosan

(MN) Chitosan

(NC) Bi-Polymers and Other products on the market that are approved by NC Water Quality

QUESTION 27: *Does your agency use baffles in sediment basins?*

Total Responses	YES	NO
33	16	17
100%	48%	52%

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QUESTION 28: *Primarily what type of material does your agency use for baffles? (select all that apply)*

Total Responses	Coir fiber net	Silt fence	Filter fabric	Other
23	5	7	4	7
100%	22%	30%	17%	30%

Other (Please Specify):

(CO) Concrete jersey barrier
(CT) Rip rap berm
(GA) Wood
(MD) 1/2" Exterior Grade Plywood
(PA) Plywood and sheet piling
(RI) Earthen or rip rap berm
(VA) Plywood

QUESTION 29: *How many baffles does your agency recommend for use in a sediment basin?*

Total Responses	1	2	3	4	Other
16	4	0	3	0	9
100%	25%	0%	19%	0%	56%

Other (Please Specify):

(CT) As needed according to residence storage time and volume determined by performing flood routing using approximate methods in detention basin measurement (TR-55).
(FL) Site dependent.
(GA) Potentially more (than 4) to lengthen the flow path.
(MD) Formula in Md. Dept. of Enviroment, Water Management Admin. Spec. Detail 18, page C-10-28.
(PA) As needed to achieve min. 2L:1W flow ratio.
(TN) Dependent on size.
(TX) Varies among installations.
(VA) Typically one continuous to achieve desired length to width ratio.
(WI) No recommendation.

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QUESTION 30: *In what way does your agency determine the spacing between baffles in sediment basins?*

Total Responses	Divide total length of basin equally	Divide basin into 4 "chambers", with an inlet zone which makes up 35% of basin surface area (BSA), first and second chamber which makes up 25% each of BSA, and an outlet zone which makes up 15% of BSA.	Baffle spacing is dependant on the length of the sediment basin	Our agency has no set standard for baffle spacing	Other
16	5	0	3	6	2
100%	31%	0%	19%	38%	13%

Other (Please Specify):

(CT) The forebay must hold 10% of total for sediment load clean out.

(MD) Formula in Md. Dept. of Enviroment, Water Management Admin. Spec. Detail 18, page C-10-28.

QUESTION 31: *In the previous question, you selected, "Baffle spacing is dependent on the length of the sediment basin." Please explain.*

(FL) Contractor is responsible for the design of the basin.

(NC) Of coir fiber mat attached to steel T-posts to be 5 ft. in height (3 ft. above ground) in the basin or storage area. Install 3 baffles in the erosion control device at a spacing of ¼ the basin length, but if basin length is less than 20 ft., only 2 baffles need to be installed at a spacing of 1/3 the basin length.

(RI) Site specific design criteria determine the basin size and shape, therefore any baffle spacing as well

QUESTION 32: *In what arrangement does your agency recommend that the baffles be placed in the sediment basin?*

Total Responses	Perpendicular to flow	Perpendicular to flow with staggered openings	Other
16	9	4	3
100%	56%	25%	19%

Other (Please Specify):

(MD) Formula in Md. Dept. of Enviroment, Water Management Admin. Spec. Detail 18, page C-10-28.

(PA) We do not have any guidance on how they are placed.

(VA) Parallel to inflow to increase flow length.

QUESTION 33: *In question 27, you selected that your agency "does not use baffles" in sediment basins. Why?*

(AK)Not needed.

(DE) Baffles are not typically used at present as all of our sediment basins will be converted into permanent stormwater management facilities. When the new DNREC regulations go into effect in January, temporary sediment basins will be required on projects that disturb more than 10 acres in any phase. Under the temporary sediment basin spec in the DNREC E&S Handbook (pg. 3.1.4-1), baffles would be required to achieve the minimum flow path length of a basin shape of length to width ration of 2 to 1.

(IA) Have not tried yet. Likely will take up more space.

(ID) No design guidelines from regulatory agencies.

(KS) Our designs are very minimal. In fact, generally they are done by the contractor thus it is not something that we see used.

(MI) Department policy.

(MN) Usually they are smaller basins. We have used them on site specific and the baffles would be coir or burlap.

(MO) We have not found them to be necessary.

(MS) Our standards haven't been updated to include them at this time.

(NE) No requirements to decrease turbidity.

(NH) Our agency often times uses locations for permanent water quality basins/ detention basins as temporary sediment basins during construction. The basin volumes are designed for the 10-year design storm and are cleaned, as necessary, to maintain adequate storage volume. I do not believe that we have constructed any baffles in our sediment basins.

(NY) Not required by state standards. NYSDOT is not aware of research findings that quantify the benefits of baffles, nor appropriate design criteria.

(OH) It's site specific design developed by the Contractor's registered Engineer.

(OK) Haven't evolved to that requirement yet.

(SC) Have not found the need to use them.

(UT) The use of baffles is not specifically required and is not mentioned in the standard specification. However, they can be used if desired.

III. CONSTRUCTION

QUESTION 34: *In the project sequence of construction, when does your agency typically begin constructing sediment basins on projects?*

Total Responses	Prior to clearing and grubbing	Following clearing and grubbing	During road bed construction	Following road bed construction	Other
33	11	14	5	0	3
100%	33%	42%	15%	0%	9%

Other (Please Specify):

(AK) Project dependant

(RI) Project dependant

(TN) Project dependant

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***QUESTION 35:** Typically what is the average service life of a sediment basin on a ___?*

Question	< 1 month	1 - 3 months	3 - 6 months	6 - 9 months	9 - 12 months	> 12 months	Total Responses
Large Project (75+ acres)	0%	3%	21%	6%	6%	67%	33
Medium Project (25 - 75 acres)	0%	9%	9%	15%	15%	52%	33
Small Project (0 - 25 acres)	0%	15%	18%	18%	9%	40%	33

***QUESTION 36:** What type of inflow control devices does your agency allow for a sediment basin? (select all that apply)*

Total Responses	Excavated Sump	Ditch Check	Excavated Sump w/ditch	Other
50	9	21	10	10
100%	18%	42%	20%	20%

Other (Please Specify):

(AK) None
(CO) None
(DE) Pretty much anything that would eliminate gullying and sediment generation.
(IA) None
(KS) Whatever the contractor chooses, which is generally nothing.
(MD) None
(MI) None
(NC) Slope Drain Pipe
(PA) None
(RI) Site constraints determine inflow device. Permanent vs. temporary sediment basin also determines inflow device and sizing.

***QUESTION 37:** What type of ditch check device does your agency use in combination with an excavated sump? (select all that apply)*

Total Responses	Rock	Wattle	Silt fence	Other
15	10	2	1	2
100%	67%	13%	7%	13%

Other (Please Specify):

(MS) sand bags
(NY) triangular silt dikes, fiber (coir) rolls

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QUESTION 38: *What types of ditch check devices does your agency use? (select all that apply)*

Total Responses	Rock	Wattle	Silt fence	Other
45	21	11	7	6
100%	47%	24%	16%	13%

Other (Please Specify):

(AR) Sand Bags
(MN) Wood fiber
(MO) Proprietary devices
(MS) Sand bags, hay bales, triangle silt dikes
(NY) Triangular silt dikes, fiber (coir) rolls
(WI) Bales, triangular silt dike

QUESTION 39: *What type of protection measures does your agency recommend be used for the following areas of a sediment basin? (select all that apply)*

Question	Natural Ground / Unprotected	Compacted Embankment	Seeded Ground	Sod	Rolled Erosion Control Product	Riprap Stone	Geotextiles	Impermeable Membrane	Other	Total Responses
Inflow Channel	27%	15%	27%	6%	52%	64%	30%	12%	3%	33
Sump	36%	9%	6%	0%	9%	24%	15%	3%	0%	33
Basin Inlet Slope	12%	24%	24%	9%	30%	52%	18%	6%	0%	33
Basin Floor	64%	27%	24%	3%	9%	12%	12%	6%	0%	33
Basin Interior Side Slopes	24%	30%	52%	9%	48%	27%	15%	6%	0%	33
Basin Exterior Side Slopes	21%	27%	64%	6%	42%	15%	12%	3%	3%	33
Basin Outflow Slope	12%	12%	36%	9%	39%	67%	30%	9%	0%	33
Spillway	6%	6%	21%	3%	27%	85%	33%	18%	0%	33

QUESTION 40: *You selected "other" for protection measures used on the inflow channel. Please list the other measures your agency uses here:*

(NC) We may use plastic slope drain pipe for extreme elevation changes.

QUESTION 41: *You selected "other" for protection measures used on the basin interior side slopes. Please list the other measures your agency uses here:*

(VA) Stabilization mulch for exterior slopes

QUESTION 42: *At what stage of construction are sediment basins removed?*

Total Responses	Temporary site stabilization	Final site stabilization	Other	Sediment basins are not removed (converted to permanent basins)
33	2	20	4	7
100%	6%	61%	12%	21%

Other (Please Specify):

(KS) It varies from project to project, when they are no longer required.
(NH) Project-dependent.
(SD) Site-specific.
(WI) Could be at any time, when done using.

QUESTION 43: *Has your agency ever experienced any issues with sediment basin removal?*

Total Responses	YES	NO
33	7	26
100%	21%	79%

Please list all notable issues experienced by your agency in the removal of sediment basins:

(AL) Accessibility over finished slopes.
(CO) Saturated subgrade
(ID) History of basin failure reaching waters of the US
(MD) Basin was designed in the foot print of the new roadway. When contractor was ready to remove the basin and continue with roadway cut and fill operations, the drainage area was not directed to an appropriate sediment control. Issues had to be resolved with proper approvals from MDE and SHA.
(NC) - Disturbance to surrounding areas when basin is removed results in erodible condition.
- Stabilizing the disturbed area after removal during times of the year when vegetation establishment is difficult to achieve.
- Inability to reach the location of the basin to have it removed due to topography.
(OH) Slope stability, contaminated sediment, erodible embankments
(OR) Disposal of material. Establishment of vegetation after removal.

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III. MAINTENANCE OF SEDIMENT BASINS DURING CONSTRUCTION

QUESTION 44: *Does your agency recommend that maintenance be performed on sediment basins during construction?*

Total Responses	YES	NO
33	33	0
100%	100%	0%

QUESTION 45: *How much do the following factors influence the decision for your agency to perform maintenance on sediment basins?*

Question	Strong Influence	Influential	Neutral	Low Influence	No Influence	Total Responses
Soil Type	27%	27%	23%	3%	20%	30
Rainfall Depth (in)	27%	53%	10%	0%	10%	30
Rainfall Intensity (in/hr)	30%	43%	13%	0%	13%	30
Effluent Turbidity (NTU)	19%	27%	31%	8%	15%	26
Captured Sediment Volume	67%	21%	6%	3%	3%	33
Natural Disasters	29%	26%	26%	0%	19%	31
Life Cycle Costs	0%	21%	39%	11%	29%	28
Other	40%	40%	20%	0%	0%	5

Other (Please Specify):

(CO) Location to proposed roadway. (Neutral)

(DE) As with our normal E&S inspection practices, the basin would be inspected weekly as well as after any rain event that is 1/2" depth or greater. (Strong Influence)

(KS) The contractor is required to maintain the sedimentation basin and clean it when the sediment level reaches a certain height. (Strong Influence)

(MI) Must be maintained to contain sediment. (Influential)

(NY) Significance of receiving waterbody. Maintenance may be done more frequently (or at least greater attention paid to proper maintenance) if the discharge is to a 303d list waterbody or in a TMDL watershed, or if the waterbody has other special local sensitivity. (Influential)

QUESTION 46: *At what point does your agency determine that sediment cleanout should be performed? (select all that apply)*

Total Responses	When basin loses 20% storage capacity	When basin loses 30% storage capacity	When basin loses 40% storage capacity	When basin loses 50% storage capacity	Other
36	3	4	0	24	5
100%	8%	11%	0%	67%	14%

Other (Please Specify):

(AR) As directed by the engineer.
(NH) When basin fills to original design capacity of 3600 CF/acre.
(RI) Basin size and sediment load determine maintenance schedule.
(VA) When basin loses 25% of its capacity
(WI) When not functioning properly

QUESTION 47: *Does your agency require the contractor to replace baffles during the active lifespan of a sediment basin?*

Total Responses	YES	NO
7	3	4
100%	43%	57%

QUESTION 48: *Under what circumstances does your agency require replacement of baffles in a sediment basin? (select all that apply)*

Total Responses	If damage occurs during a rain event	When baffles become 'clogged' with sediment	During basin cleanout	Other	My agency does not recommend that maintenance be performed on sediment basins.
14	6	5	3	0	0
100%	43%	36%	21%	0%	0%

QUESTION 49: *Has your agency recognized a need to perform maintenance on the basin floor after sediment removal?*

Total Responses	YES	NO
33	5	28
100%	15%	85%

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QUESTION 50: *What does your agency recommend be done with the sediment removed from the sediment basin?*

(AL) Dry out and use in back-slopes.
(AR) Normally incorporated into embankment construction.
(CO) Replace saturated embankment if basin was located under future embankment or roadway template.
(CT) Use as clean fill in gore areas seed and mulch.
(DE) Depends more on what is happening with the job at the time. Could be stockpiled, dried out, and used somewhere else on the job as fill If the job does not need any fill material, than the contractor would have to haul away.
(FL) Depends on composition of sediment; used elsewhere if suitable.
(GA) Either haul off the site or incorporate it into embankment construction (after suitable drying has occurred) and stabilize the area.
(IA) Specs require contractor to dispose of silt material off the project unless Engineer approves a suitable site within project limits.
(ID) Put at approved waste sites.
(KS) Contractor is just required to remove and properly dispose of it.
(MD) It shall be placed in such a manner that it will not erode from the site. It shall not be deposited down stream, adjacent to a stream or floodplain. Disposal areas must be stabilized.
(MI) Disposed of at an upland site.
(MN) Place it on the slopes and provide temporary mulch.
(MO) Incorporate it into the fill.
(MS) Either remove from project site or spread out on slopes.
(NC) Material is removed to a location where it will be used in the project or wasted in waste area.
(NE) Incorporate it into the adjacent slopes.
(NH) Placed within the project limits as embankment, if possible.
(NY) Use as fill in upland area (as long as its suitable material).
(OH) Upland land disposal.
(OK) Typically, dried and spread on the project's slopes.
(OR) Dispose on-site. Contractor responsibility.
(PA) Distribute on site and seed.
(RI) Sediment removed is typically sent to a landfill as an alternate cover or disposed as solid waste.
(SC) Place on project slopes.
(SD) Placed back on-site, away from water bodies.
(TN) Taken to an approved waste site.
(TX) Depends on sediment. If contains hazardous waste then it will have to be taken to an approved landfill. If non-hazardous then it can be stockpiled for future fill or embankment needs.
(UT) Disposed of at approved location.
(VA) Dispose of in an agency approved upland site.
(WA) Contractor has to dispose of the sediment on a contractor owned or operated, permitted site. Clean sediments can be stabilized on site using approved BMP's.
(WI) Often wasted on the project outside of the slope intercept or taken offsite to a waste site.

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IV. INSPECTION AND MONITORING

QUESTION 51: *What type of monitoring (i.e., data collection), if any, does your agency perform on sediment basins? (select all that apply)*

Total Responses	Sediment volume	Sediment depth	Inflow stormwater volume	Inflow stormwater turbidity (NTU)	Effluent Volume	Effluent Turbidity	Rainfall Amount (in)	Rainfall Intensity (in/hr)	My agency does not monitor sediment basin data
33	7	12	0	2	0	2	8	0	16
100%	21%	36%	0%	6%	0%	6%	24%	0%	48%

QUESTION 52: *What has your agency observed as the average effluent discharge turbidity in sediment basins without skimmers?*

Total Responses	0 - 100 NTU	100 - 250 NTU	250 - 500 NTU	500 - 1000 NTU	Other
1	0	0	0	0	1
100%	0%	0%	0%	0%	100%

Other (Please Specify):

(NC) 1000+

QUESTION 53: *What has your agency observed as the average effluent discharge turbidity in sediment basins with skimmers?*

Total Responses	0 - 100 NTU	100 - 250 NTU	250 - 500 NTU	500 - 1000 NTU	Other
1	0	1	0	0	0
100%	0%	100%	0%	0%	0%

QUESTION 54: *What has your agency observed the average turbidity reduction of sediment basins with skimmers to be?*

Total Responses	No reduction	1 - 100 NTU	100 - 200 NTU	200 - 300 NTU	300 - 400 NTU	400 - 500 NTU	> 500 NTU
2	0	1	0	0	0	1	0
100%	0%	50%	0%	0%	0%	50%	0%

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QUESTION 55: *Please provide a link to your agency's specification for sediment basins (if available):*

http://www.iowadot.gov/erl/current/GS/content/2602.pdf
ftp://ftp.dot.state.pa.us/public/bureaus/design/pub408/Pub%20408%202011%20IE/872.pdf
http://www.ncdot.org/doh/operations/dp_chief_eng/roadside/soil_water/details/
http://www.ct.gov/dot/cwp/view.asp?a=3200&q=260108 http://www.dot.state.fl.us/rddesign/dr/Manualsandhandbooks.shtm (& click E & SC Manual)
http://www.dnrec.state.de.us/DNREC2000/Divisions/Soil/Stormwater/New/Delaware%20ESC%20Handbook_06-05.pdf
http://www.okladot.state.ok.us/c_manuals/specbook/oe_ss_2009.pdf
http://www.dot.ga.gov/doingbusiness/theSource/special_provisions/shelf/sp163.pdf
http://www.dot.state.oh.us/Divisions/ConstructionMgt/Specification%20Files/832_05052009_for_2010.PDF
http://www.itd.idaho.gov/manuals/Downloads/spec%2704%27.htm
https://www.dot.ny.gov/main/business-center/engineering/specifications/english-spec-repository/espec1-12-12english.pdf (refer to Section 209)
http://www.coloradodot.info/business/designsupport/standard-plans/m-s-standards-plans-list-sheet
http://www.arkansashighways.com/standard_spec/2003/03-600.pdf (Section 621)
http://www.dot.state.mn.us/environment/erosion/specs.html (Specification 2573)
http://www.modot.mo.gov/business/standards_and_specs/Sec0806.pdf
At this link please refer to Std Spec 01571: http://www.udot.utah.gov/main/f?p=100:pg:0:::1:T,V:1925,
Guidelines are available at: http://www.sddot.com/pe/roaddesign/docs/WQEP_DesignManual/section6.pdf
Highway Runoff Manual –http://www.wsdot.wa.gov/publications/manuals/fulltext/M31-16/HighwayRunoff.pdf
and Standard Specifications –http://www.wsdot.wa.gov/Publications/Manuals/M41-10.htm
http://www.sha.maryland.gov/ , www.mde.state.md.us
http://www.tdot.state.tn.us/construction/specbook/2006_Spec200.pdf
http://www.dot.state.al.us/conweb/doc/Specifications/2008_GASP.pdf#page=232
http://des.nh.gov/organization/divisions/water/stormwater/manual.htm
http://www.ksdot.org/burConsMain/specprov/2007/pdf/07-09002-r05.pdf

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V. LESSONS LEARNED

QUESTION 56: *Based upon your agency's experiences, what specific problems has your agency encountered with using sediment basins on construction projects?*

Responding Agency	Comments
ALDOT	Effluent turbidity.
CDOT	Subgrade failure, breach of side berm and outlet control erosion.
ConnDOT	Time to build, cost to clean out long term maintenance.
DelDOT	Making sure the contractor keeps up with the maintenance aspects.
GADOT	The regulator believes they should produce drinking water... Fitting them to a site can be challenging and creativity to preserve a 2:1 flow path length is sometimes needed.
IDOT(IA)	Not enough design is done so that basins are installed at most effective locations. Sediment basins are sometimes installed much smaller than shown on Standard Road Plan Basins filling up very quickly when contractor is not keeping up with site stabilization. On a side note, we are planning to revise our Design Manual and Standard Road Plans to
IDOT (ID)	Poor design and slope failure.
KDOT	Getting the contractor to properly build and maintain them. Having state agencies provide the design of sediment basins to the contractor and having state required maintenance program for sediment basins would improve the quality and effectiveness of sediment basins. I just want to clarify that we are talking about temporary sediment basins. If we are talking permanent basins there really is no problem. They build them as we put in the plans and we maintain them after the project is done. The problem I see is when we don' design specifically to put the into our plans but rather just provide the r/w room for them and leave the design and implementation time up to the contractor. I think they just don' want to take the time and effort to construct them. As far as the maintenance of them the contractor is already required to maintain them, and if we are talking about maintenance with state forces I think that would actually cause greater issues. Part of our issue is enforcement on the part of our inspectors and engineers in the field.
MDOT (MD)	Right of way agreements and property purchases to have adequate space for the Basins.
MDOT (MI)	Problems with containing clay particles.
MnDOT	Not always used at the proper time and constraints with right of way also not always maintained.
MODOT	Limited right of way and fat clay soils that take a long time to clear.
MDOT (MS)	Right-of-way limitations may not allow the proper sizing of the required silt basin.
NCDOT	Basins along with coir fiber baffles, Skimmers, proper stabilization, and flocculants can provide a very affective device at reducing the sediment and turbidity of project effluent Problems occur when topography prevents proper size and placement of the basins. Poor installation and maintenance results in basin failures.
NDOT	Contractors opening them to drain faster.
NHDOT	Controlling effluent turbidity.
NYSDOT	1- Sediment particles too fine to settle out (i.e. sediment basin was probably an inappropriate practice for the situation). 2- Contractors put too much faith in the basins to work
ODOT (OH)	Limited R/W, MOT Hazards, Slope Stability.
ODOT (OK)	Oklahoma has not evolved in the efficient design and use of sediment basins. The challenges involved in the timely design of these features that would enable the necessary R/W
ODOT (OR)	Only used on a few large projects. Have not experienced any significant problems.
PennDOT	Performance in areas with clayey soils.
RIDOT	Maintenance during construction and monitoring during construction are typical issues.
SCDOT	Some were not sized properly and some were not maintained according to plans.
SDDOT	Finding adequate land area to construct & maintain.
TDOT	Lack of right-of -way.
WisDOT	Most of the time they are not designed into projects as not to limit a contractor's means and methods. We have many difficulties with improper design and timing of installation. We are looking to develop a new spec closely modeled after the one used by the other state agencies: (http://dnr.wi.gov/runoff/pdf/stormwater/techstds/erosion/SedimentBasin_1064.pdf) The difficult part is determining when they are DOT designed vs contractor

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QUESTION 57: *Based upon your agency's experiences, what changes would you suggest to improve the efficiency and use of sediment basins on construction projects?*

Responding Agency	Comments
CDOT	Require max inflow design slope and increase capacity where possible.
ConnDOT	Design up front with PE Plans.
DelDOT	I would try and limit the use of temporary sediment basins if at all possible. This could be done by more attention to detail of project phasing aspects as well as a lot more temporary stabilization. If having to construct a permanent pond, which we do a lot, than a sediment basin is not that big of deal, but if doing a sediment basin that will be removed, I believe that is possibly more additional construction than is necessary as well as trying to find space on a road project. Again, if the phasing aspects are worked out with the contractor and use of temporary stabilization is increased, there should not be any reason to just use sediment traps versus basins. But, if the effluent limit guidelines ever get enacted, I believe sediment basins will be a necessity along with using PAM's.
FDOT	More usage of PAM's.
GADOT	We are moving slowly toward using flocculants and considering skimmers as well. (Having the colloidal clays that we do, as does Alabama, makes the passive control
IDOT (ID)	Better engineering review process and more frequent maintenance.
KDOT	Require them more often.
MDOT (MI)	Timely stabilization of ditch slopes and bottoms.
MnDOT	Timely incorporation and effective locations, possibly more time to obtain temporary easements for basins.
MODOT	Increase the size where possible and keep the basin well maintained.
NCDOT	Mandate how the project will be graded and require contractor to provide a plan to open and close out areas so that basins can be utilized in the best way.
NDOT	Strengthen permit requirements to ensure they are designed and built.
NHDOT	Continued monitoring and performance evaluation could provide valuable information with respect to improvements.
NYSDOT	Increase the size of the basins per drainage area. Allow increased settlement times.
ODOT (OH)	Good Question!
ODOT (OK)	Emphasis during the early design stages.
PennDOT	Non-proprietary "floating" or "skimming" device that can be easily fabricated by contractors. PennDOT cannot use the Faircloth Skimmer because it is proprietary and FHWA rules do not allow specification of items when alternate methods (such as a riser pipe) are available.
RIDOT	Ensure sufficient right of way is obtained for installation of the basin.
SDDOT	Developing standard details & notes. Instill as a cultural norm.
TDOT	Phasing of project to reduce basin size.
WaDOT	Possibly using skimmers for outlets. We are looking into that, but since our outfall sizing is based on predevelopment flows and we have to use a continuous storm simulation model (in Western Washington), we have not determined a way to size them yet.
WisDOT	Clearer understanding of appropriate design and functioning.

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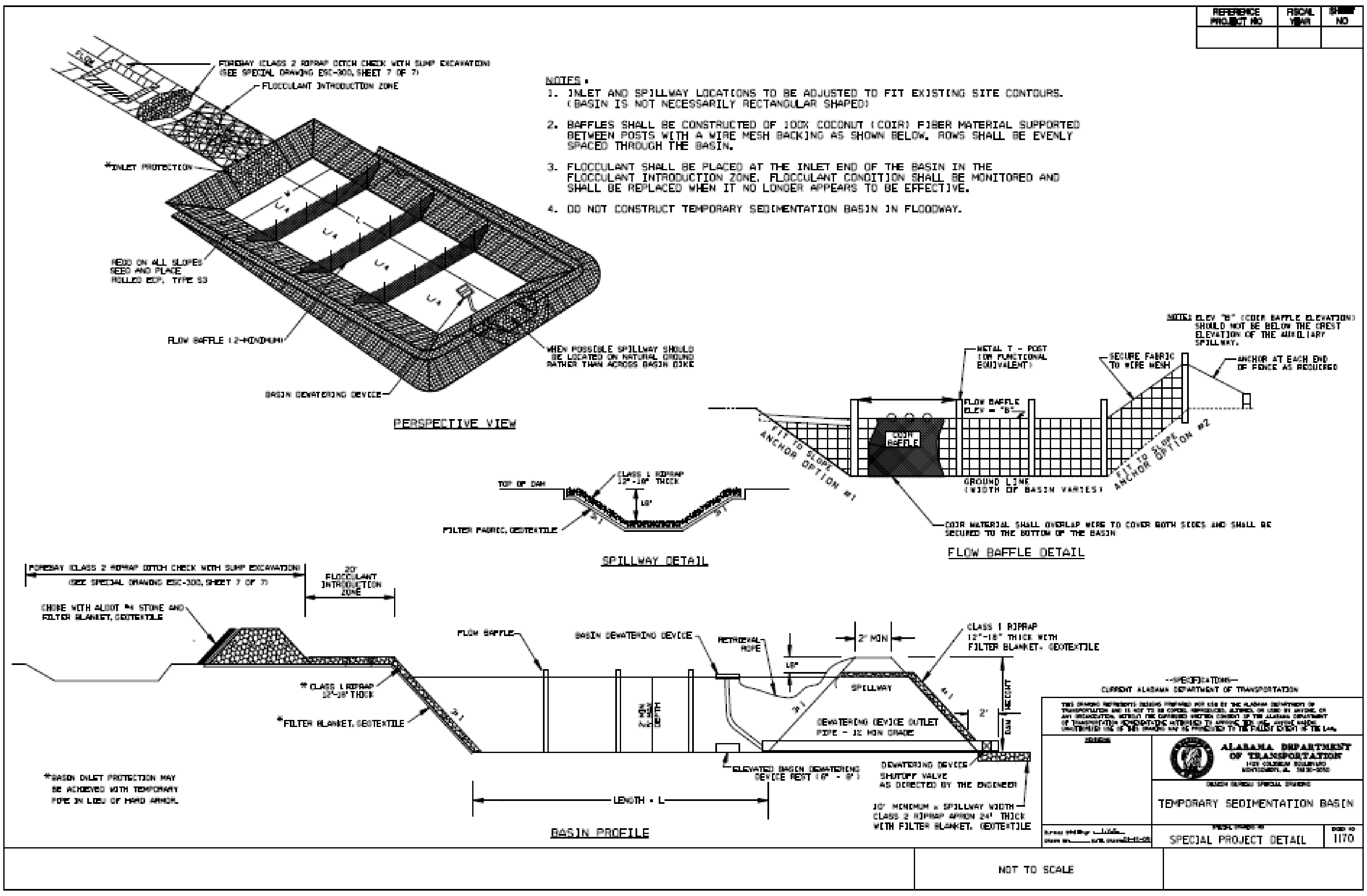
QUESTION 58: *Based upon your agency's experiences, what positive practices or designs would you recommend on the use of sediment basins?*

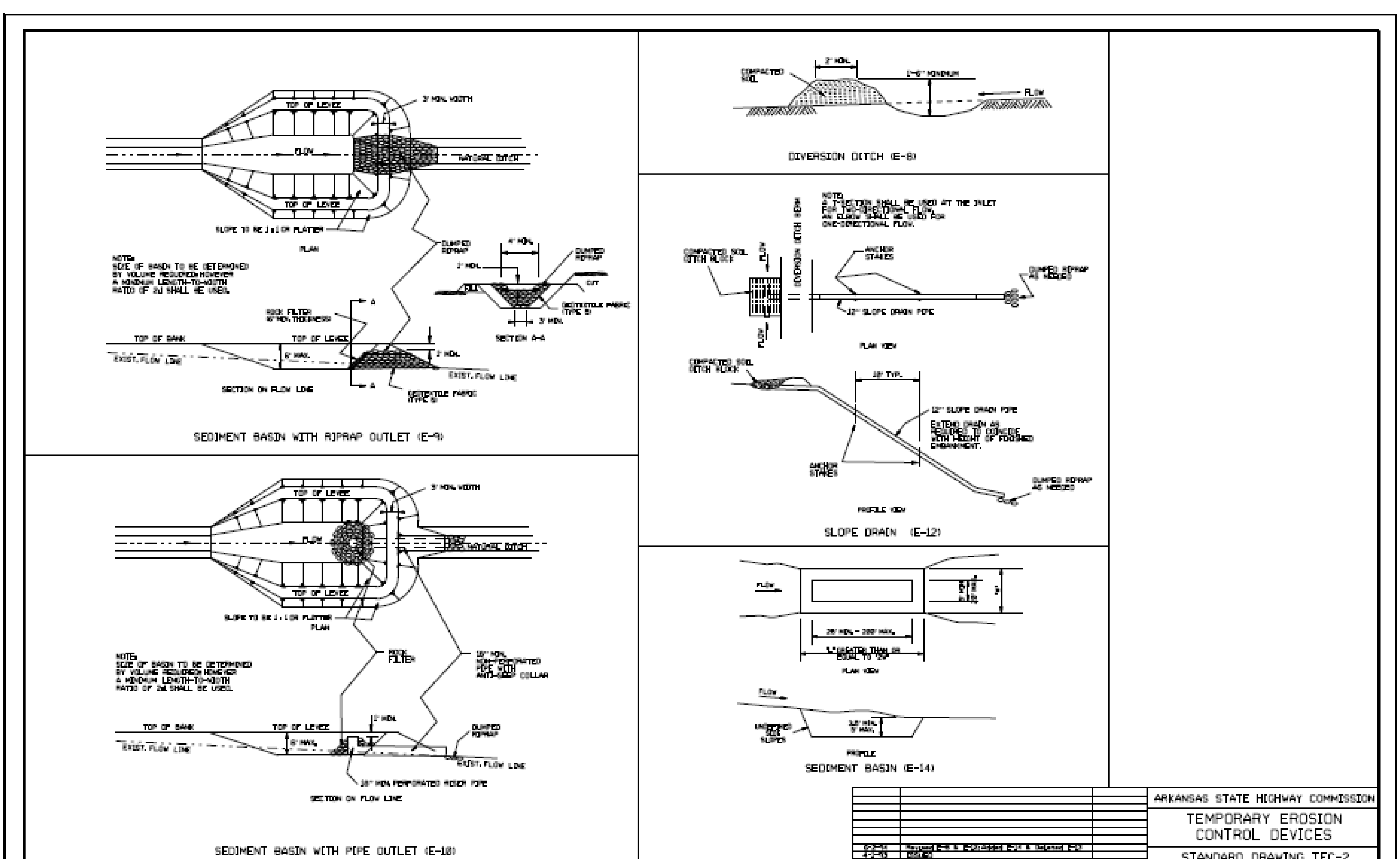
Responding Agency	Comments
ConnDOT	Ensure that the basin is stable before you allow drainage to enter.
CDOT	Require geotextile under riprap weir and maintain min length to width ratio of 4:1.
FDOT	More usage of PAM's.
GADOT	Have a maintenance requirement, try to avoid constructing one from embankment; instead excavate them from existing topography when you can. Stabilize the interior.
IDOT (IA)	Riser pipes, possibly flocculants.
IDOT (ID)	Useful in meeting effluent requirements.
MDOT (MD)	Rip-Rap Outfall structures, Wier Walls with Draw down devices, daily inspections by project staff, Bi-weekly QA Inspections by Environmental Compliance representatives, Proper maintenance and clean out.
MDOT (MI)	Keep them maintained and install correctly.
MnDOT	Work in progress.
MODOT	Get the basin installed as early in the project as clearing and grubbing will allow.
NYSDOT	There is more to erosion control then the use of sediment basins. Reliance can not be on basins alone if you want to be successful. It will require every tool in a BMP tool box to reach the goal of the effluent limitation guidelines set by the EPA.
NCDOT	With the linear nature of our projects, the treatment train approach seems affective.
ODOT (OR)	Combine sediment basin use with other erosion control methods (e.g. flocculants) in highly erodible soils.
RIDOT	Require that side slopes be stable before allowing the basin to be used.
ODOT (OH)	If appropriate sediment basin footprint areas are identified in the plans, the Contractor designed sediment basins become practical.
ODOT (OK)	Would like to know what other states are doing in this area.
PennDOT	Consider disturbed soils within the contributing drainage area carefully.
RIDOT	Site specific design criteria should be carefully considered.
SCDOT	Design with the intent to convert to permanent detention/water quality after completion of project.
SDDOT	Use sediment traps where ever feasible. Maintenance is essential. Use a maximum of 3:1 side slopes. Consider safety of traveling public. Proper placement. Fit the practice to the actual site be flexible. Use other BMPs where basins are not practical.
TDOT (TN)	The use of skimmers. Adequately sized basins.
WaDOT	Use a sediment trap upstream of the basin. Use multiple sediment control BMPs while conveying the water to the facility such as grass lined ditches with check dams.
WisDOT	Longer retention times. Acknowledgement of different soil types, this will affect the size and performance of the basin. Require baffles when using polymers.

APPENDIX B: STANDARD DESIGN DRAWINGS BY STATE

Alabama:



Arkansas:



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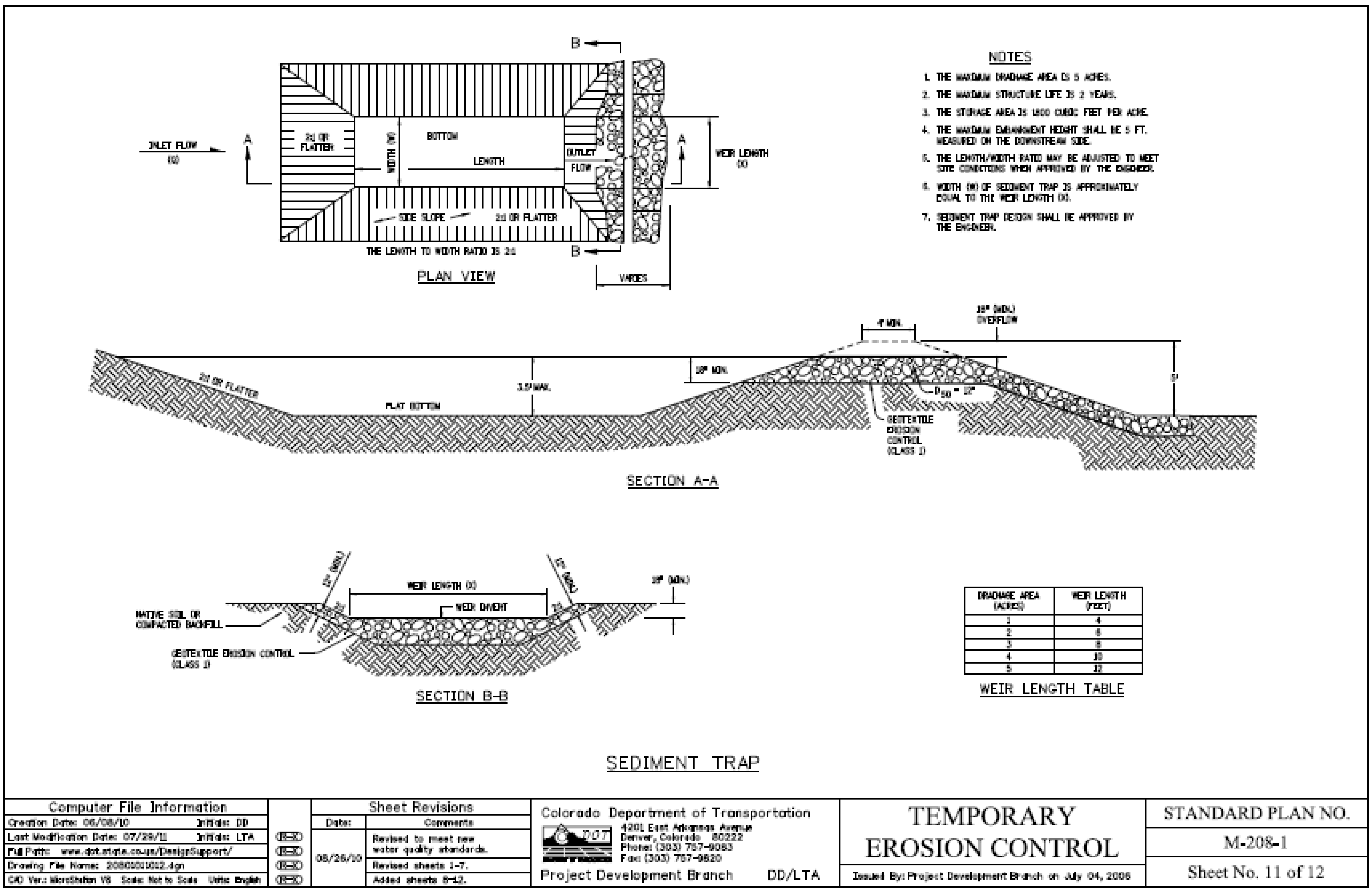
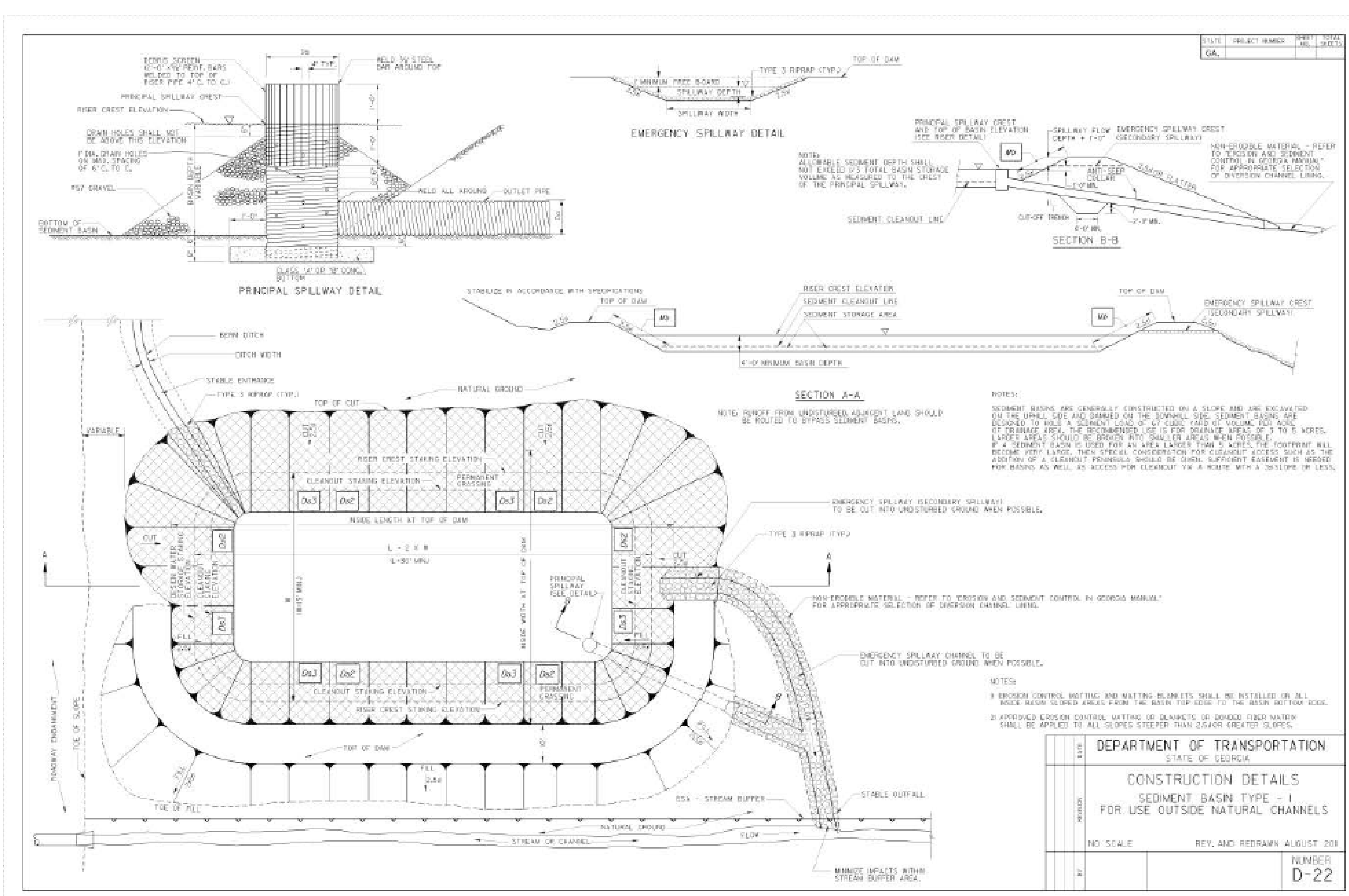
Colorado:



Georgia:



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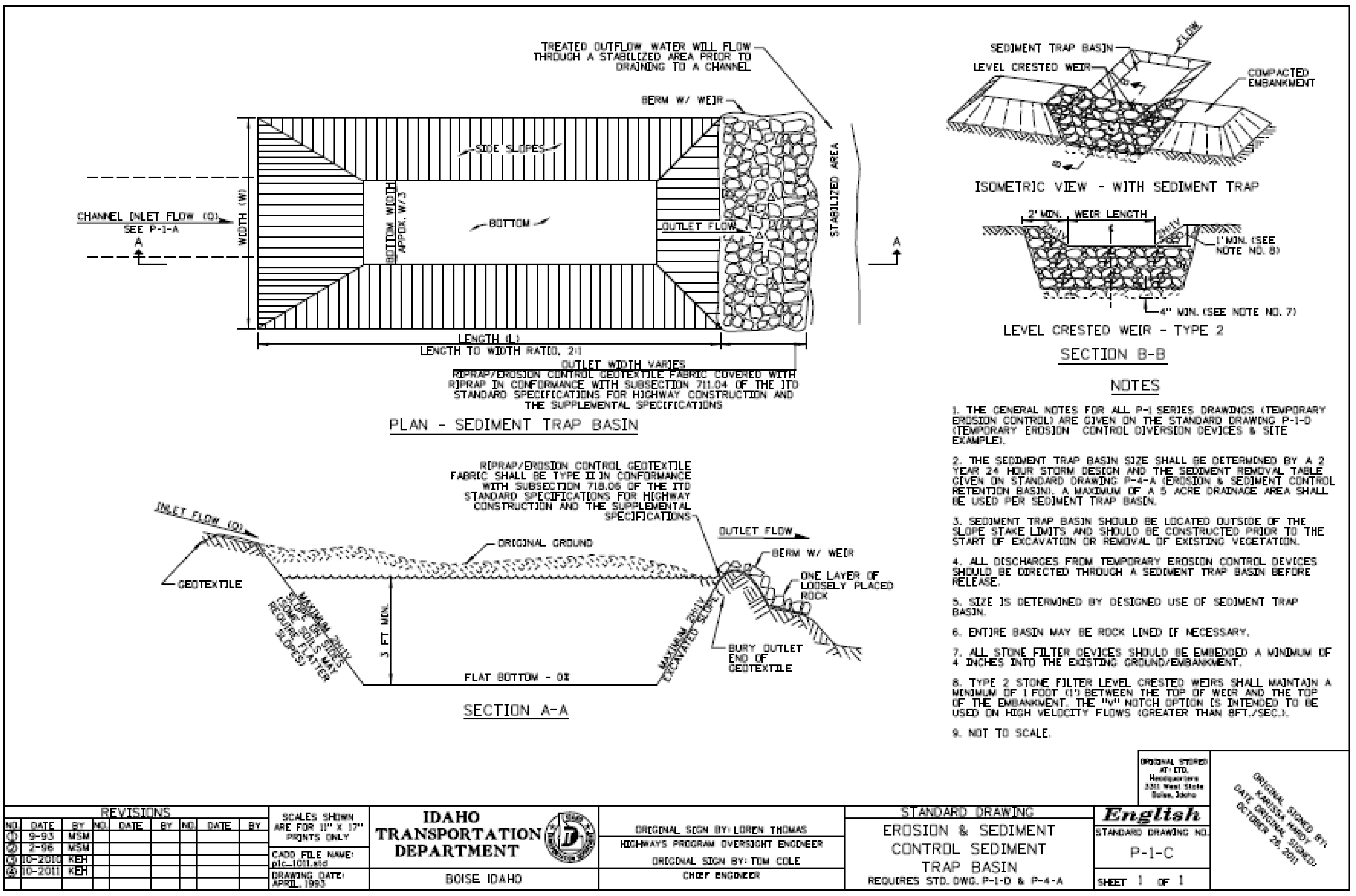
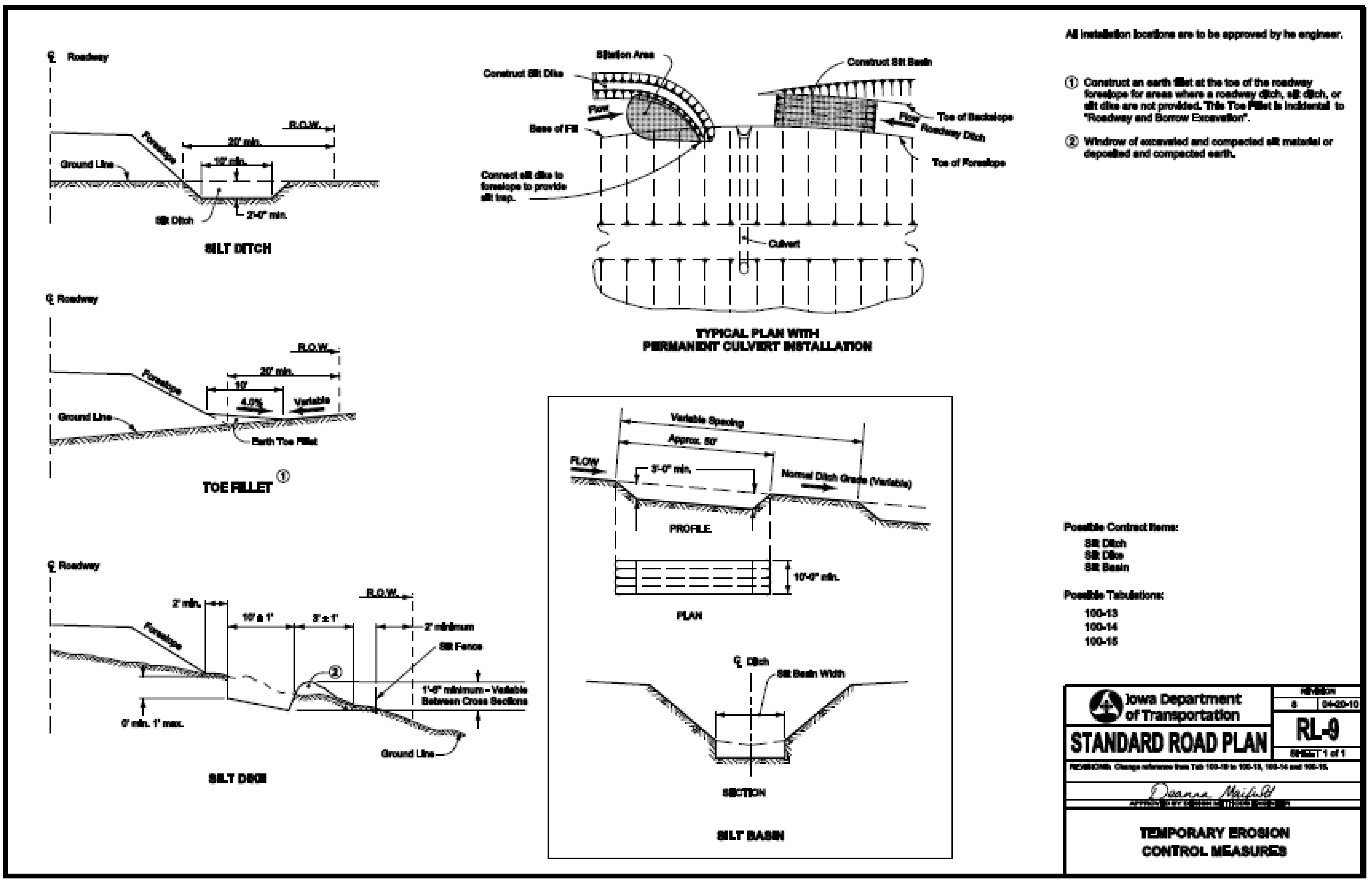
Idaho:

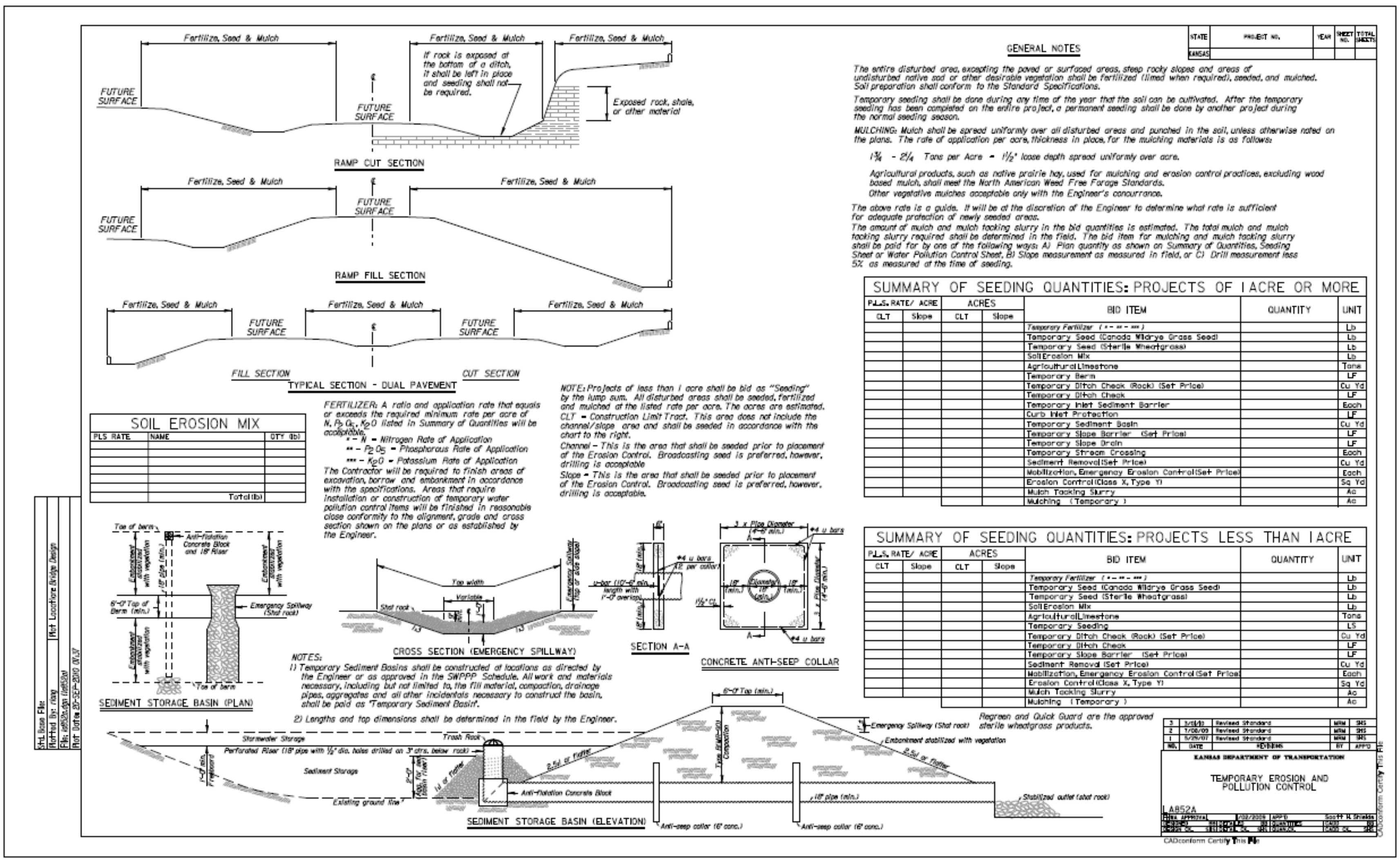


Iowa:



APPENDIX B

Kansas:



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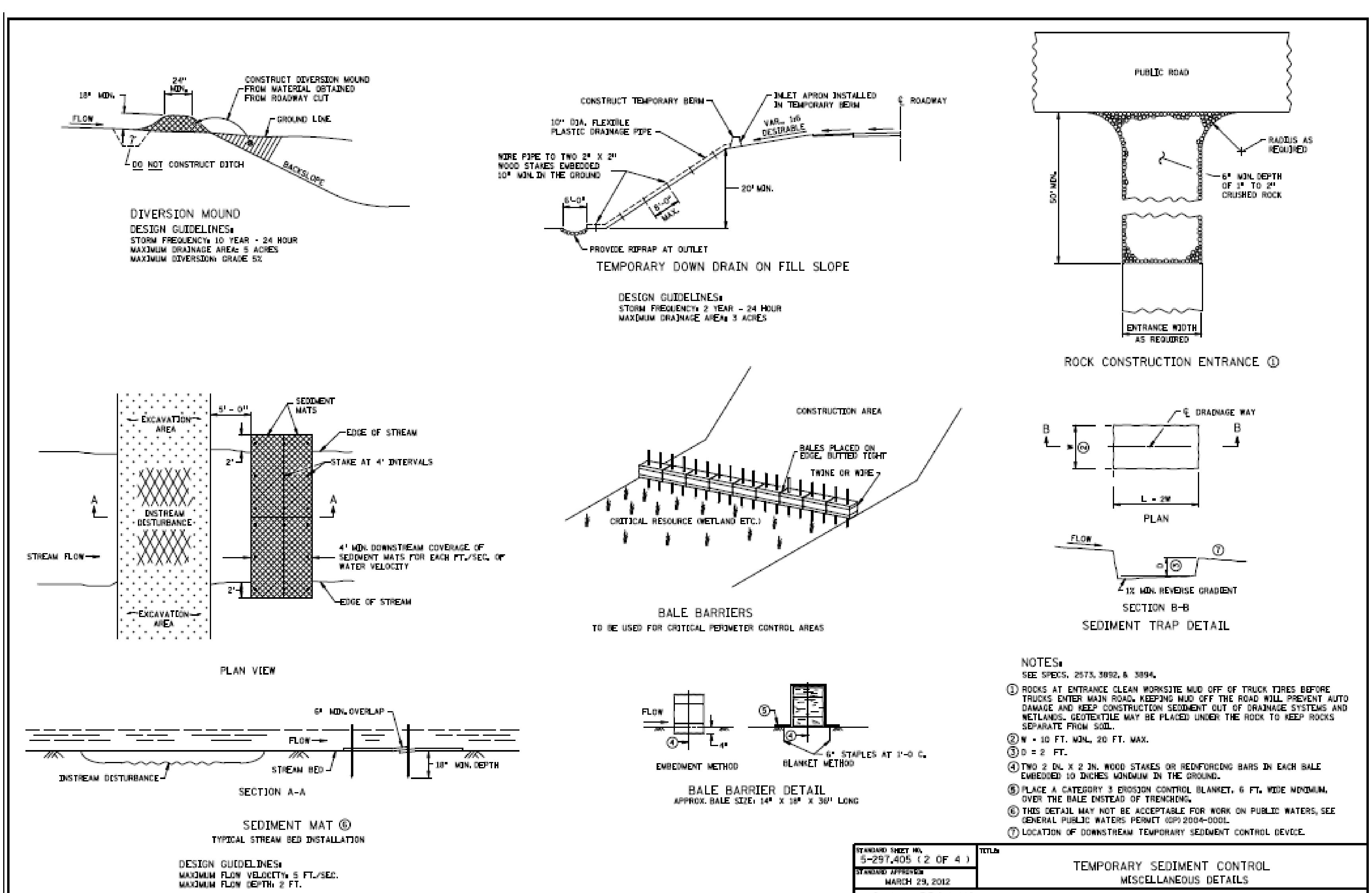
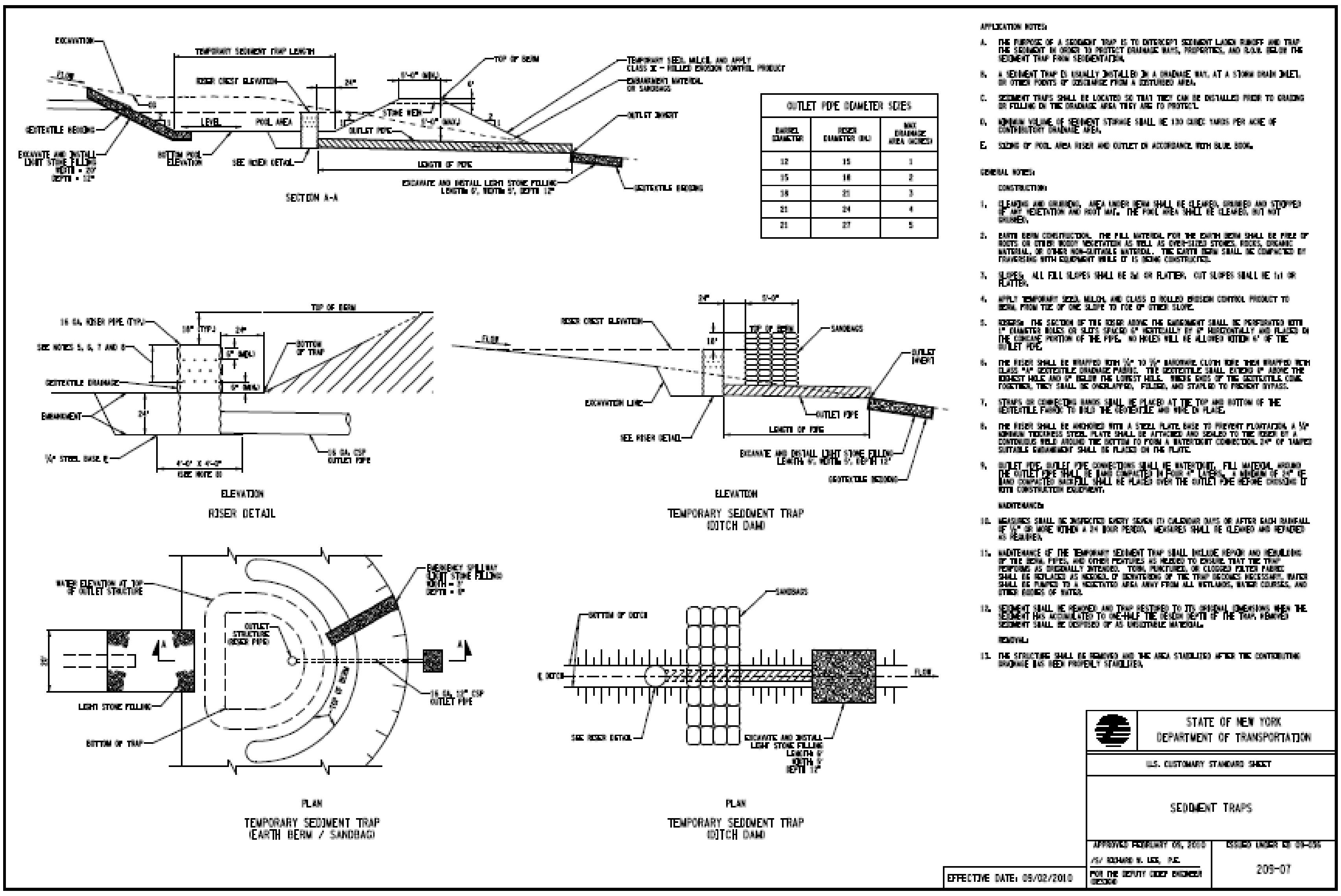


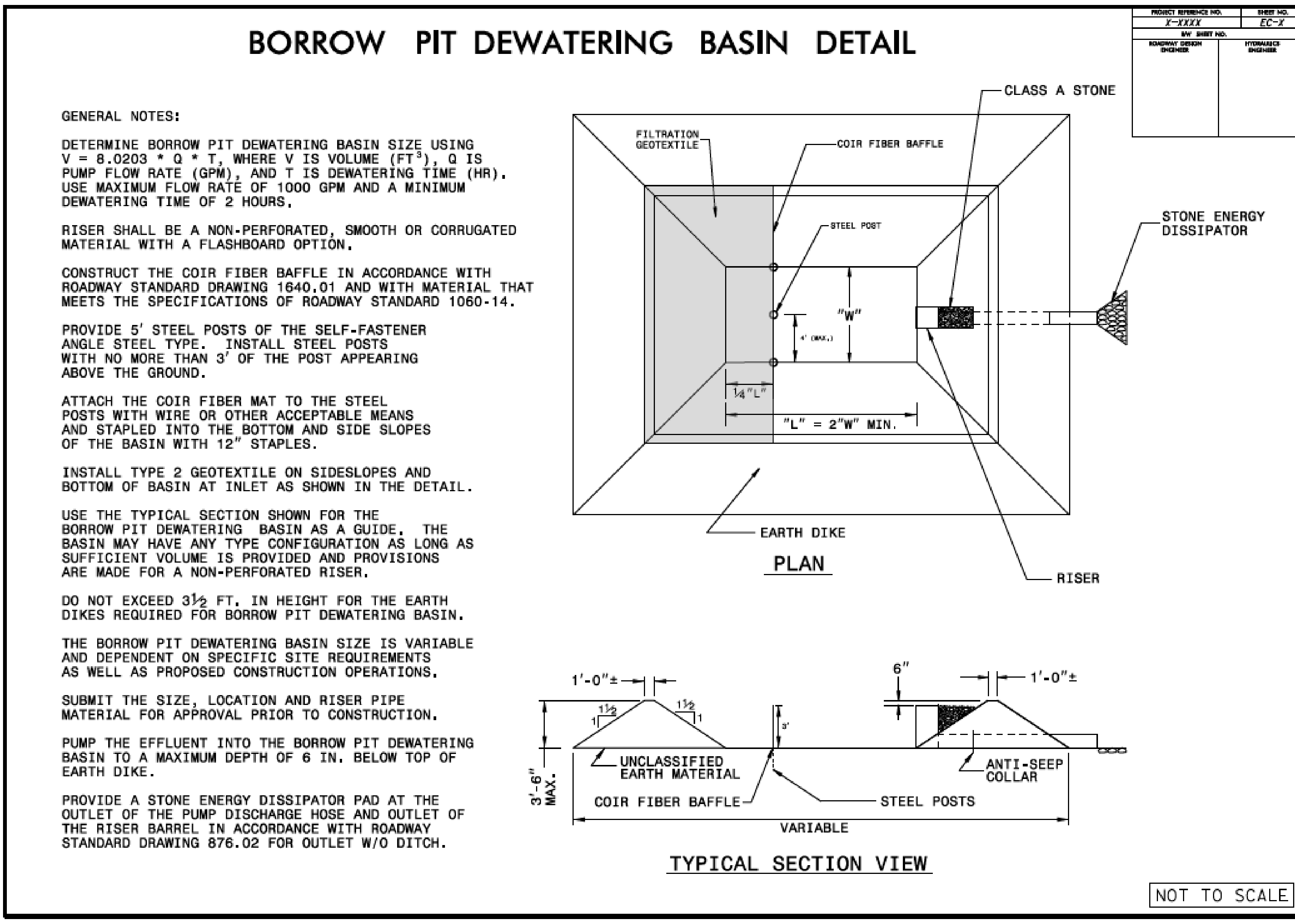
APPENDIX B

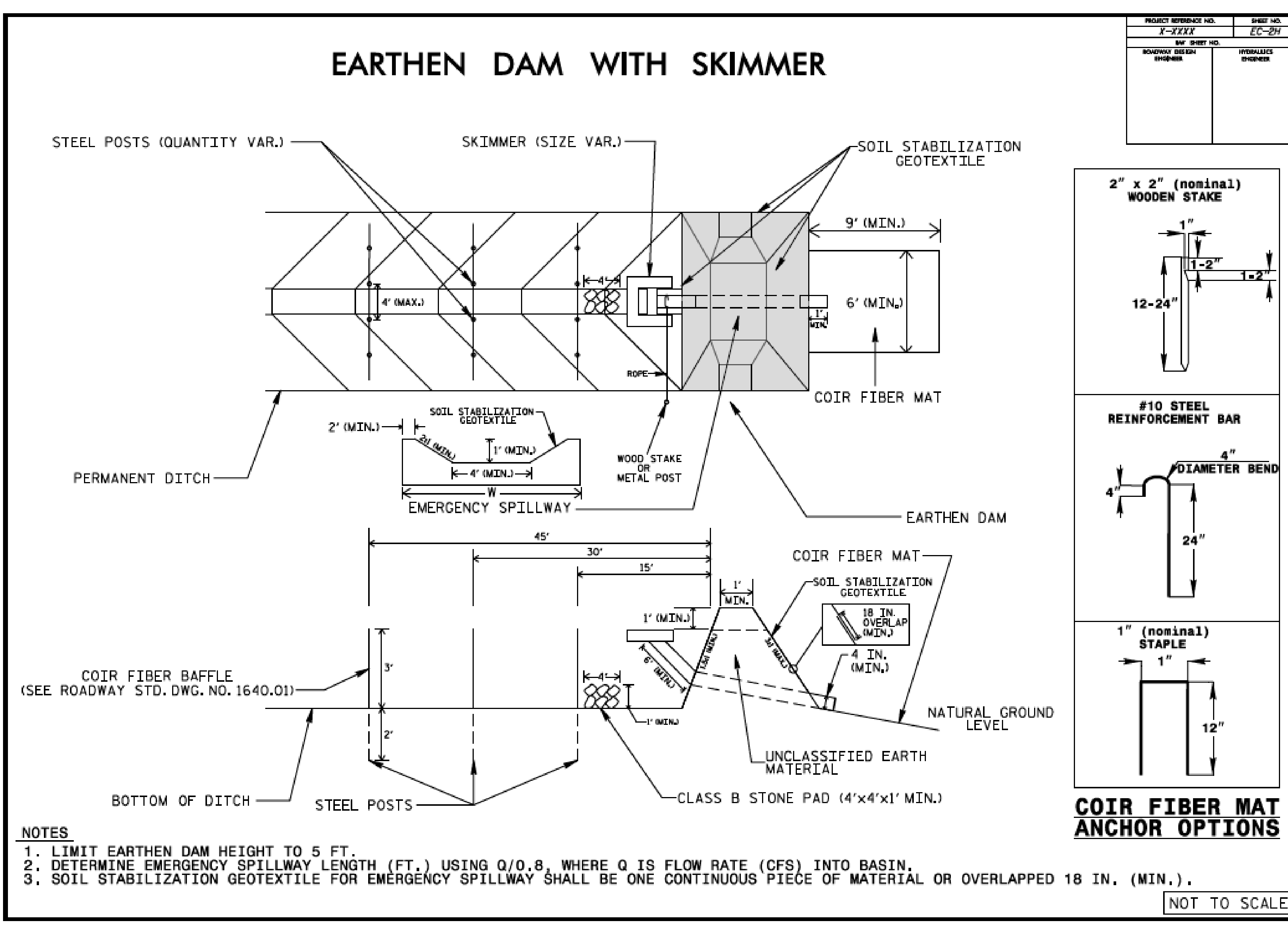
New York:



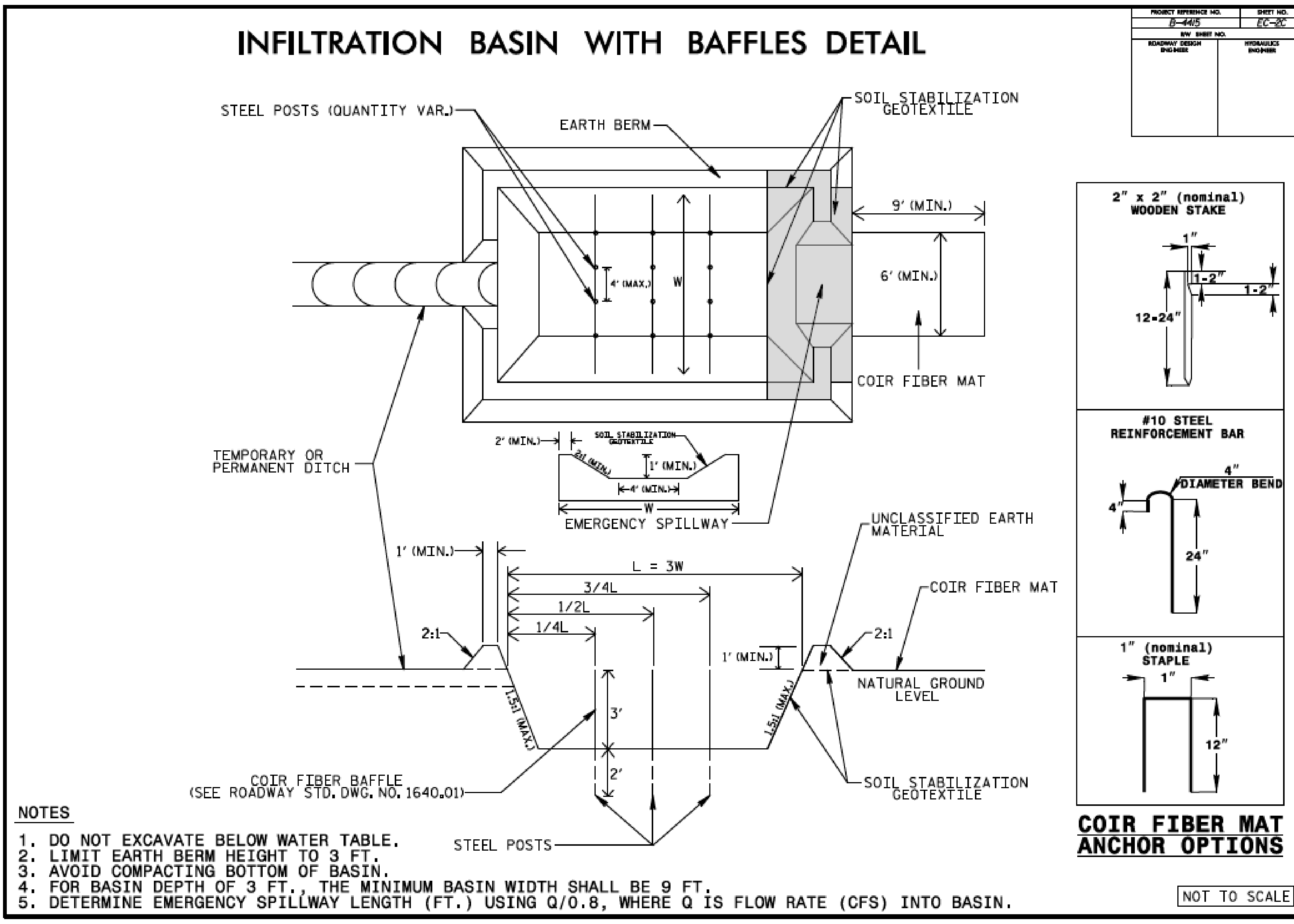
APPENDIX B

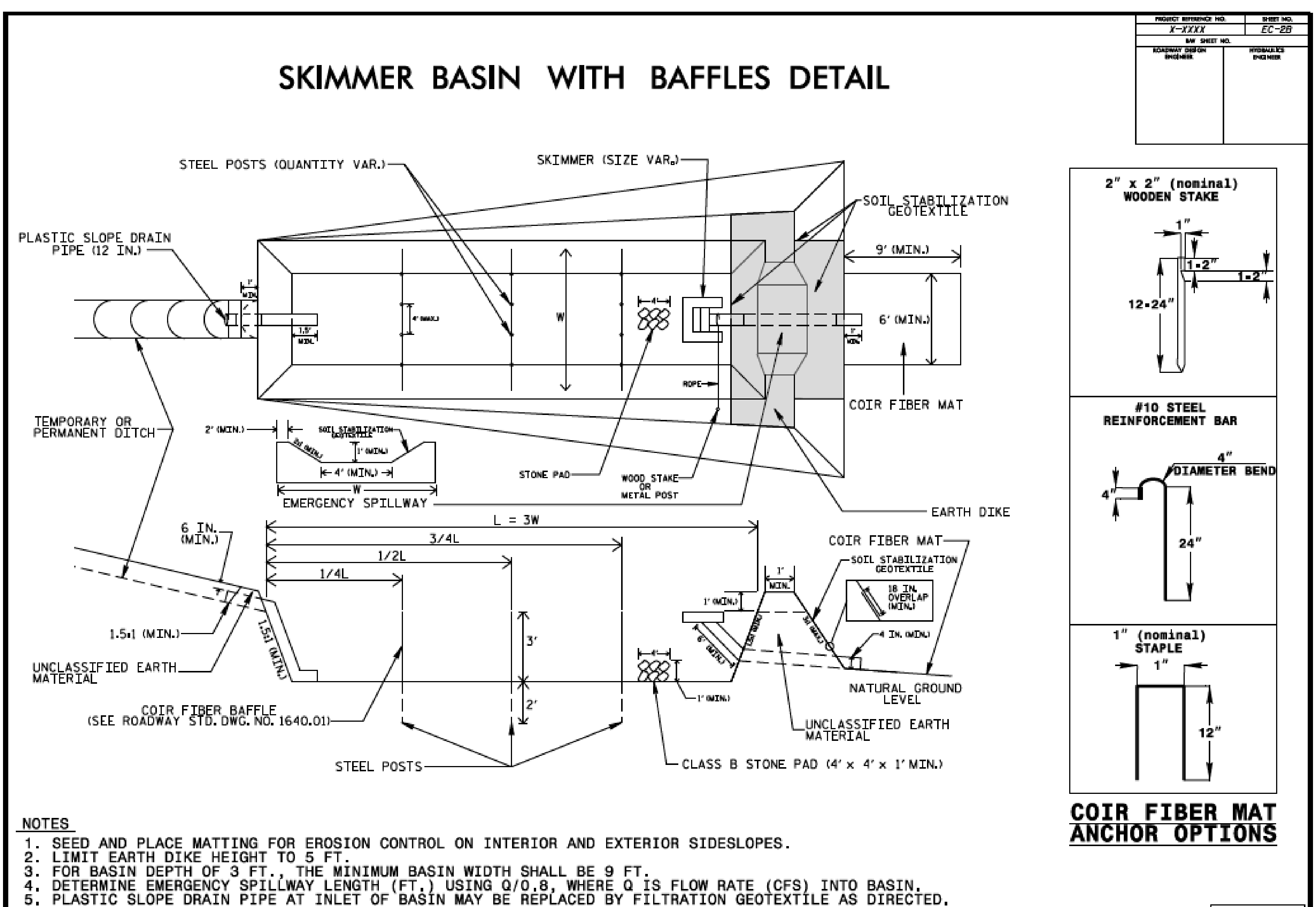
North Carolina:

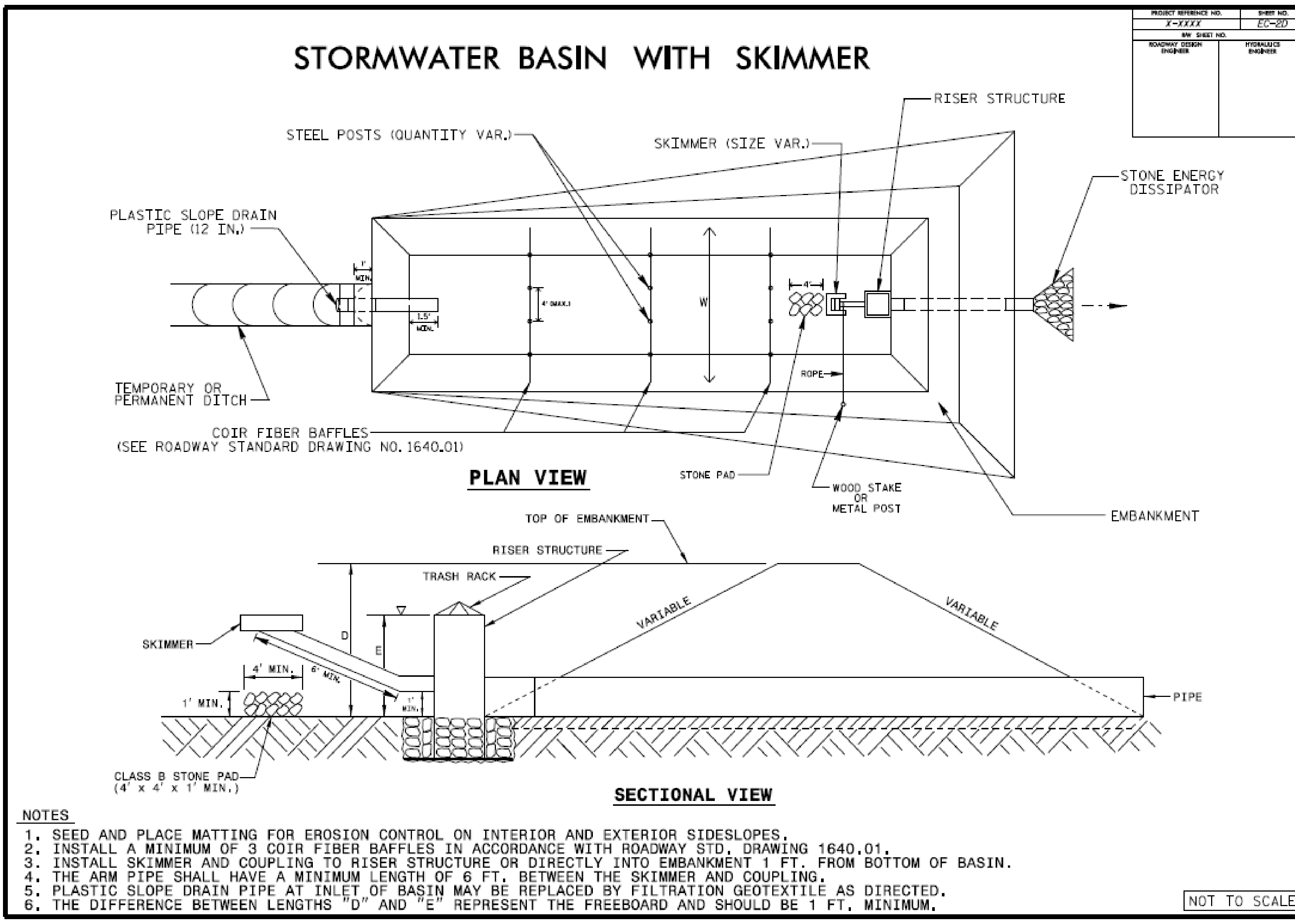


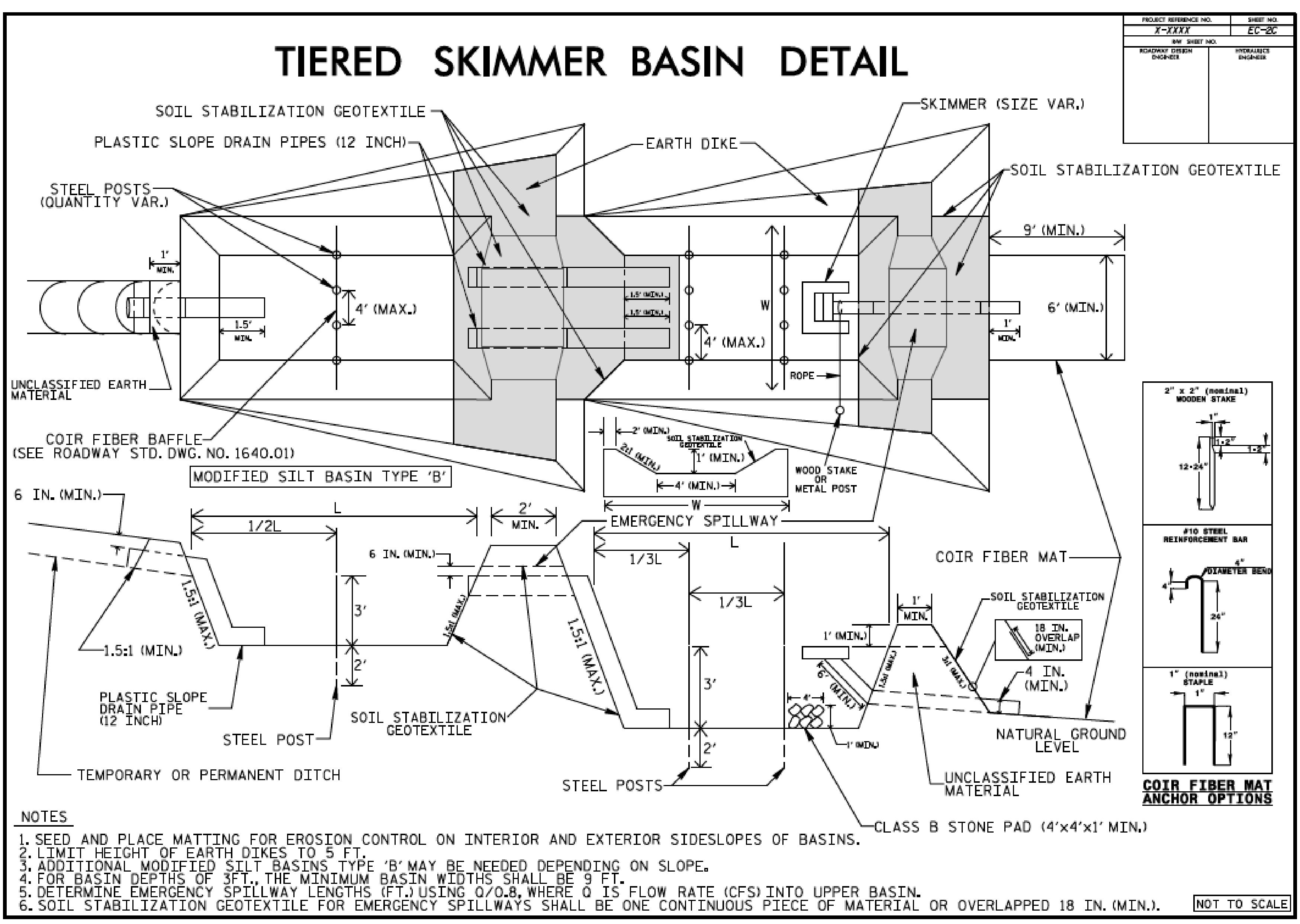


APPENDIX B


INFILTRATION BASIN WITH BAFFLES DETAIL
B-4415
EC-2C
STEEL POSTS (QUANTITY VAR.)
EARTH BERM
SOIL STABILIZATION GEOTEXTILE
9' (MIN.)
6' (MIN.)
4' (MAX.)
W
COIR FIBER MAT
2' (MIN.)
1' (MIN.)
4' (MIN.)
EMERGENCY SPILLWAY
TEMPORARY OR PERMANENT DITCH
UNCLASSIFIED EARTH MATERIAL
L = 3W
3/4L
1/2L
1/4L
2:1
1.5:1 (MAX.)
3'
2'
NATURAL GROUND LEVEL
COIR FIBER BAFFLE (SEE ROADWAY STD. DWG. NO. 1640.01)
STEEL POSTS
2" x 2" (nominal) WOODEN STAKE
1"
1-2"
12-24"
#10 STEEL REINFORCEMENT BAR
4" DIAMETER BEND
4"
24"
1" (nominal) STAPLE
12"
COIR FIBER MAT ANCHOR OPTIONS
NOTES
1. DO NOT EXCAVATE BELOW WATER TABLE.
2. LIMIT EARTH BERM HEIGHT TO 3 FT.
3. AVOID COMPACTING BOTTOM OF BASIN.
4. FOR BASIN DEPTH OF 3 FT., THE MINIMUM BASIN WIDTH SHALL BE 9 FT.
5. DETERMINE EMERGENCY SPILLWAY LENGTH (FT.) USING Q/0.8, WHERE Q IS FLOW RATE (CFS) INTO BASIN.
NOT TO SCALE

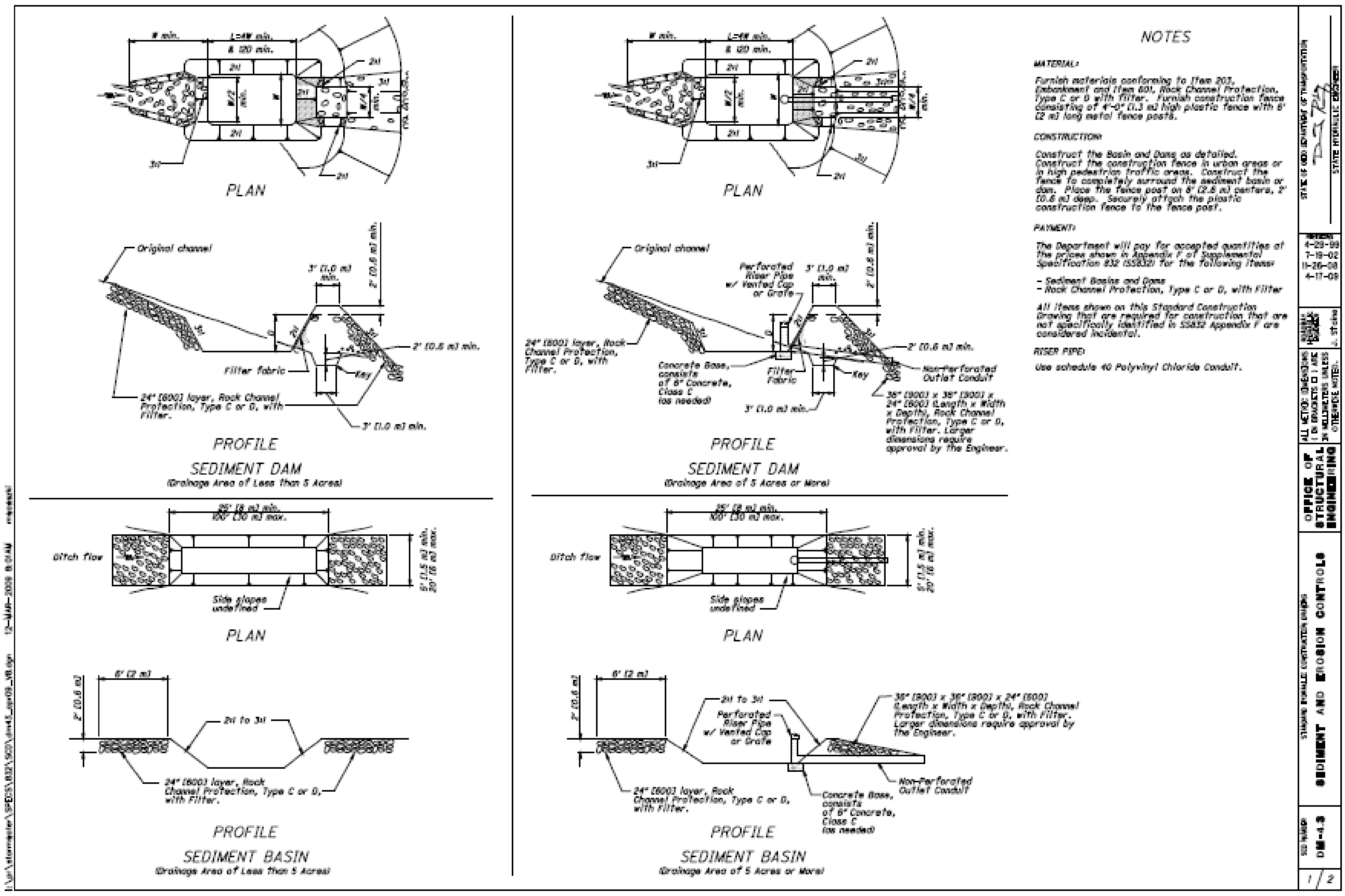

SKIMMER BASIN WITH BAFFLES DETAIL
X-XXXX
EC-2B
STEEL POSTS (QUANTITY VAR.)
SKIMMER (SIZE VAR.)
SOIL STABILIZATION GEOTEXTILE
PLASTIC SLOPE DRAIN PIPE (12 IN.)
9' (MIN.)
6' (MIN.)
W
ROPE
COIR FIBER MAT
TEMPORARY OR PERMANENT DITCH
2' (MIN.)
4' (MIN.)
EMERGENCY SPILLWAY
STONE PAD
WOOD STAKE OR METAL POST
EARTH DIKE
L = 3W
3/4L
1/2L
1/4L
6 IN. (MIN.)
1.5:1 (MIN.)
UNCLASSIFIED EARTH MATERIAL
COIR FIBER BAFFLE (SEE ROADWAY STD. DWG. NO. 1640.01)
STEEL POSTS
3'
2'
18 IN. OVERLAP (MIN.)
4 IN. (MIN.)
NATURAL GROUND LEVEL
CLASS B STONE PAD (4' x 4' x 1' MIN.)
2" x 2" (nominal) WOODEN STAKE
1"
1-2"
12-24"
#10 STEEL REINFORCEMENT BAR
4" DIAMETER BEND
4"
24"
1" (nominal) STAPLE
12"
COIR FIBER MAT ANCHOR OPTIONS
NOTES
1. SEED AND PLACE MATTING FOR EROSION CONTROL ON INTERIOR AND EXTERIOR SIDESLOPES.
2. LIMIT EARTH DIKE HEIGHT TO 5 FT.
3. FOR BASIN DEPTH OF 3 FT., THE MINIMUM BASIN WIDTH SHALL BE 9 FT.
4. DETERMINE EMERGENCY SPILLWAY LENGTH (FT.) USING Q/0.8, WHERE Q IS FLOW RATE (CFS) INTO BASIN.
5. PLASTIC SLOPE DRAIN PIPE AT INLET OF BASIN MAY BE REPLACED BY FILTRATION GEOTEXTILE AS DIRECTED.
6. SOIL STABILIZATION GEOTEXTILE FOR EMERGENCY SPILLWAY SHALL BE ONE CONTINUOUS PIECE OF MATERIAL OR OVERLAPPED 18 IN. (MIN.).
NOT TO SCALE

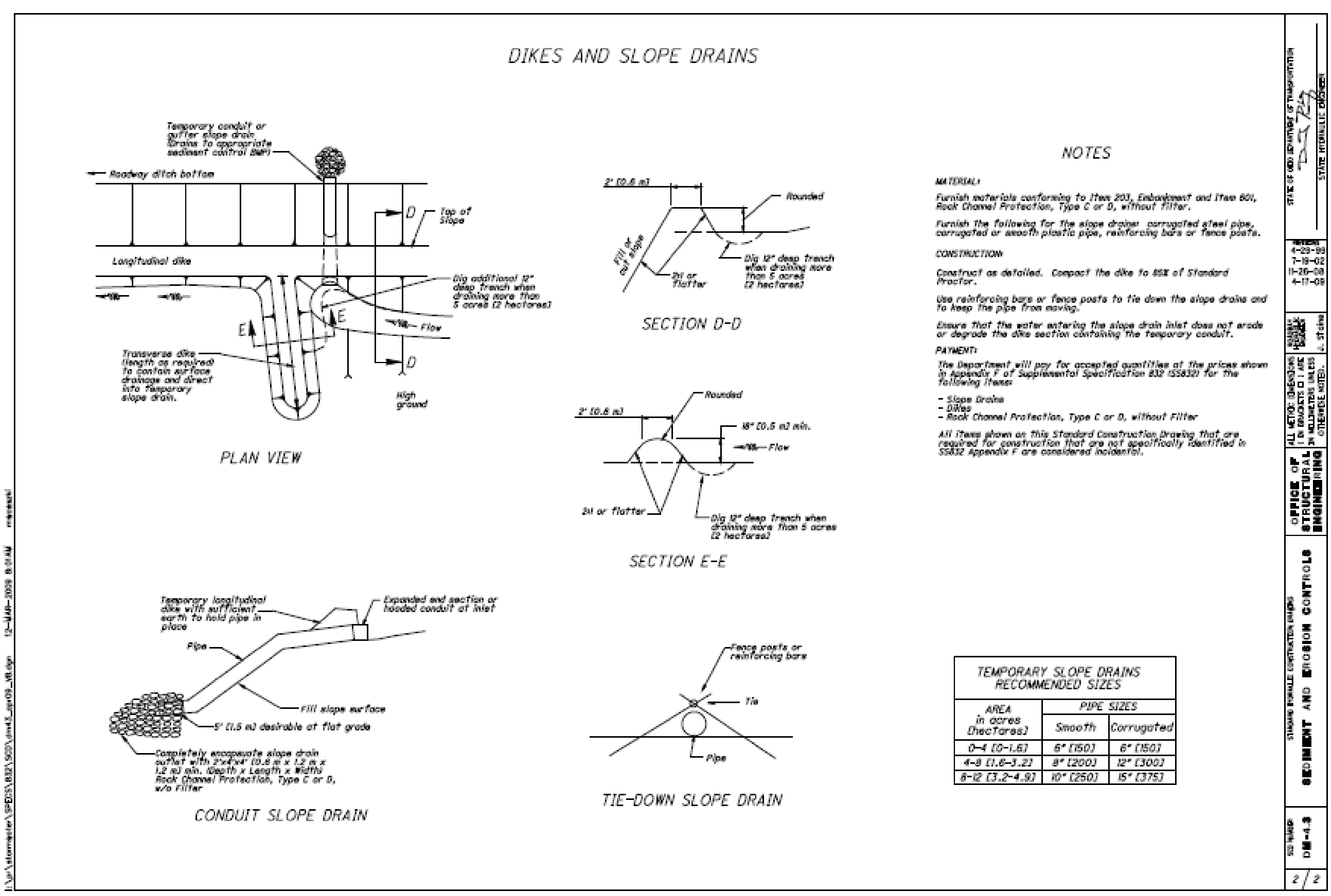

STORMWATER BASIN WITH SKIMMER
X-XXXX
EC-2D
RISER STRUCTURE
STEEL POSTS (QUANTITY VAR.)
SKIMMER (SIZE VAR.)
STONE ENERGY DISSIPATOR
PLASTIC SLOPE DRAIN PIPE (12 IN.)
TEMPORARY OR PERMANENT DITCH
COIR FIBER BAFFLES (SEE ROADWAY STANDARD DRAWING NO. 1640.01)
W
ROPE
PLAN VIEW
STONE PAD
WOOD STAKE OR METAL POST
EMBANKMENT
TOP OF EMBANKMENT
RISER STRUCTURE
TRASH RACK
SKIMMER
VARIABLE
VARIABLE
D
E
4' MIN.
6' MIN.
1' MIN.
PIPE
CLASS B STONE PAD (4' x 4' x 1' MIN.)
SECTIONAL VIEW
NOTES
1. SEED AND PLACE MATTING FOR EROSION CONTROL ON INTERIOR AND EXTERIOR SIDESLOPES.
2. INSTALL A MINIMUM OF 3 COIR FIBER BAFFLES IN ACCORDANCE WITH ROADWAY STD. DRAWING 1640.01.
3. INSTALL SKIMMER AND COUPLING TO RISER STRUCTURE OR DIRECTLY INTO EMBANKMENT 1 FT. FROM BOTTOM OF BASIN.
4. THE ARM PIPE SHALL HAVE A MINIMUM LENGTH OF 6 FT. BETWEEN THE SKIMMER AND COUPLING.
5. PLASTIC SLOPE DRAIN PIPE AT INLET OF BASIN MAY BE REPLACED BY FILTRATION GEOTEXTILE AS DIRECTED.
6. THE DIFFERENCE BETWEEN LENGTHS "D" AND "E" REPRESENT THE FREEBOARD AND SHOULD BE 1 FT. MINIMUM.
NOT TO SCALE


TIERED SKIMMER BASIN DETAIL
X-XXXX
EC-2C
SOIL STABILIZATION GEOTEXTILE
PLASTIC SLOPE DRAIN PIPES (12 INCH)
EARTH DIKE
SKIMMER (SIZE VAR.)
SOIL STABILIZATION GEOTEXTILE
STEEL POSTS (QUANTITY VAR.)
9' (MIN.)
4' (MAX.)
6' (MIN.)
4' (MAX.)
W
ROPE
UNCLASSIFIED EARTH MATERIAL
COIR FIBER BAFFLE (SEE ROADWAY STD. DWG. NO. 1640.01)
MODIFIED SILT BASIN TYPE 'B'
WOOD STAKE OR METAL POST
EMERGENCY SPILLWAY
6 IN. (MIN.)
L
1/2L
2' MIN.
1/3L
1/3L
1.5:1 (MAX.)
1.5:1 (MIN.)
3'
2'
PLASTIC SLOPE DRAIN PIPE (12 INCH)
STEEL POST
SOIL STABILIZATION GEOTEXTILE
COIR FIBER MAT
18 IN. OVERLAP (MIN.)
4 IN. (MIN.)
NATURAL GROUND LEVEL
UNCLASSIFIED EARTH MATERIAL
TEMPORARY OR PERMANENT DITCH
STEEL POSTS
CLASS B STONE PAD (4'x4'x1' MIN.)
2" x 2" (nominal) WOODEN STAKE
#10 STEEL REINFORCEMENT BAR
1" (nominal) STAPLE
COIR FIBER MAT ANCHOR OPTIONS
NOTES
1. SEED AND PLACE MATTING FOR EROSION CONTROL ON INTERIOR AND EXTERIOR SIDESLOPES OF BASINS.
2. LIMIT HEIGHT OF EARTH DIKES TO 5 FT.
3. ADDITIONAL MODIFIED SILT BASINS TYPE 'B' MAY BE NEEDED DEPENDING ON SLOPE.
4. FOR BASIN DEPTHS OF 3FT., THE MINIMUM BASIN WIDTHS SHALL BE 9 FT.
5. DETERMINE EMERGENCY SPILLWAY LENGTHS (FT.) USING Q/0.8, WHERE Q IS FLOW RATE (CFS) INTO UPPER BASIN.
6. SOIL STABILIZATION GEOTEXTILE FOR EMERGENCY SPILLWAYS SHALL BE ONE CONTINUOUS PIECE OF MATERIAL OR OVERLAPPED 18 IN. (MIN.).
NOT TO SCALE

APPENDIX B

Ohio:

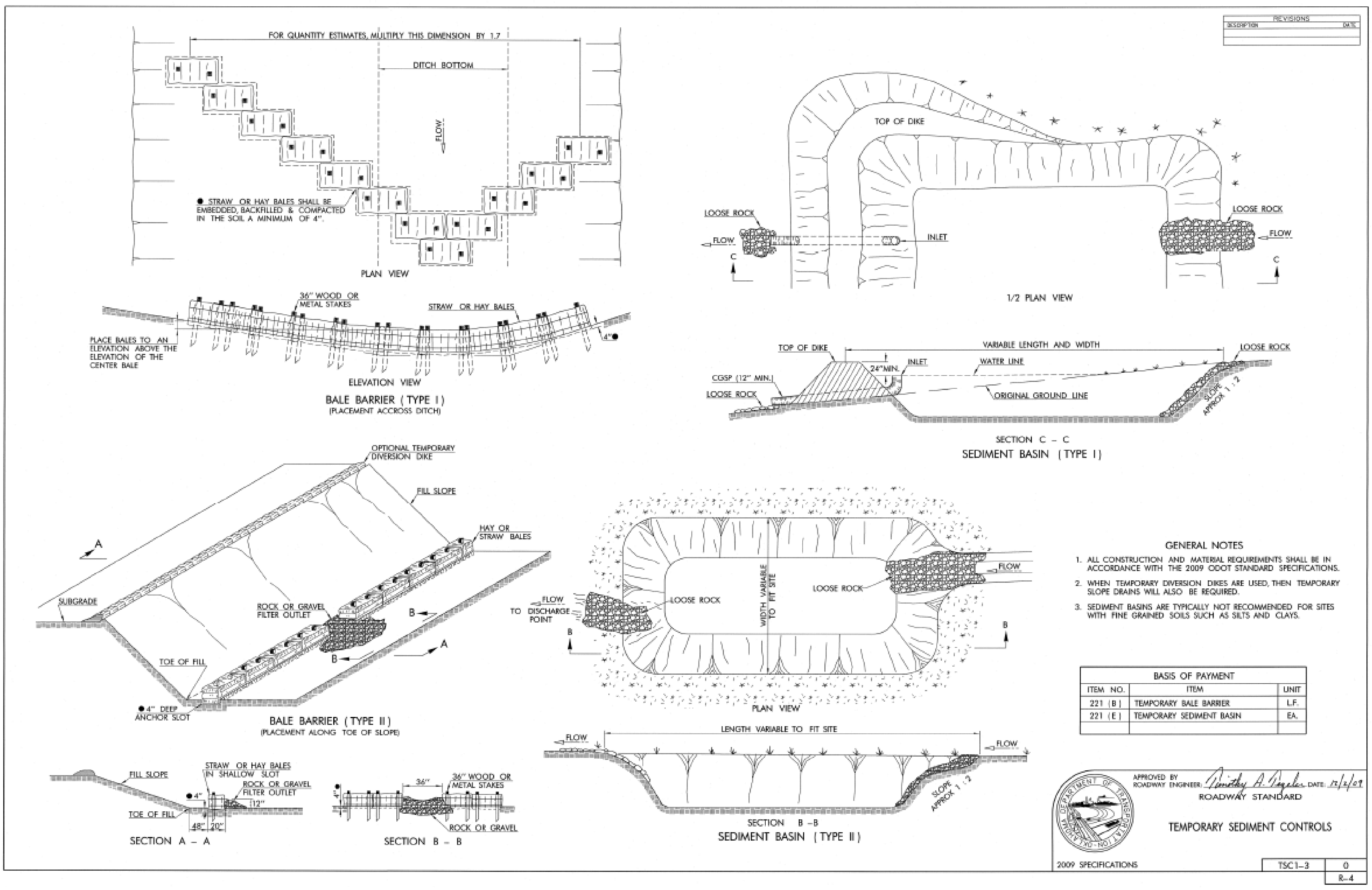




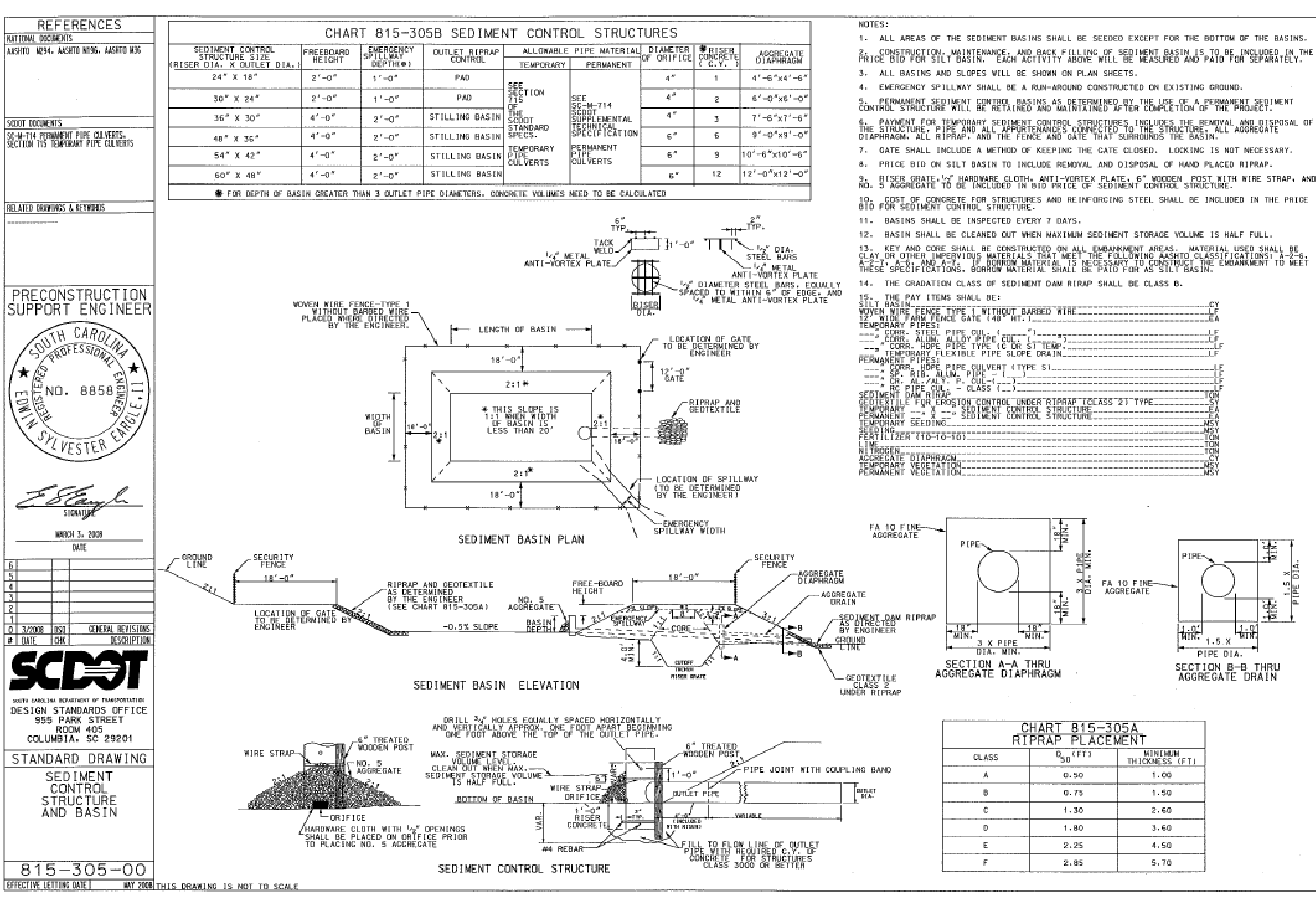
TEMPORARY SLOPE DRAINS RECOMMENDED SIZES		
AREA in acres [hectares]	PIPE SIZES	
	Smooth	Corrugated
0-4 [0-1.6]	6" [150]	6" [150]
4-8 [1.6-3.2]	8" [200]	12" [300]
8-12 [3.2-4.9]	10" [250]	15" [375]

APPENDIX B

Oklahoma:

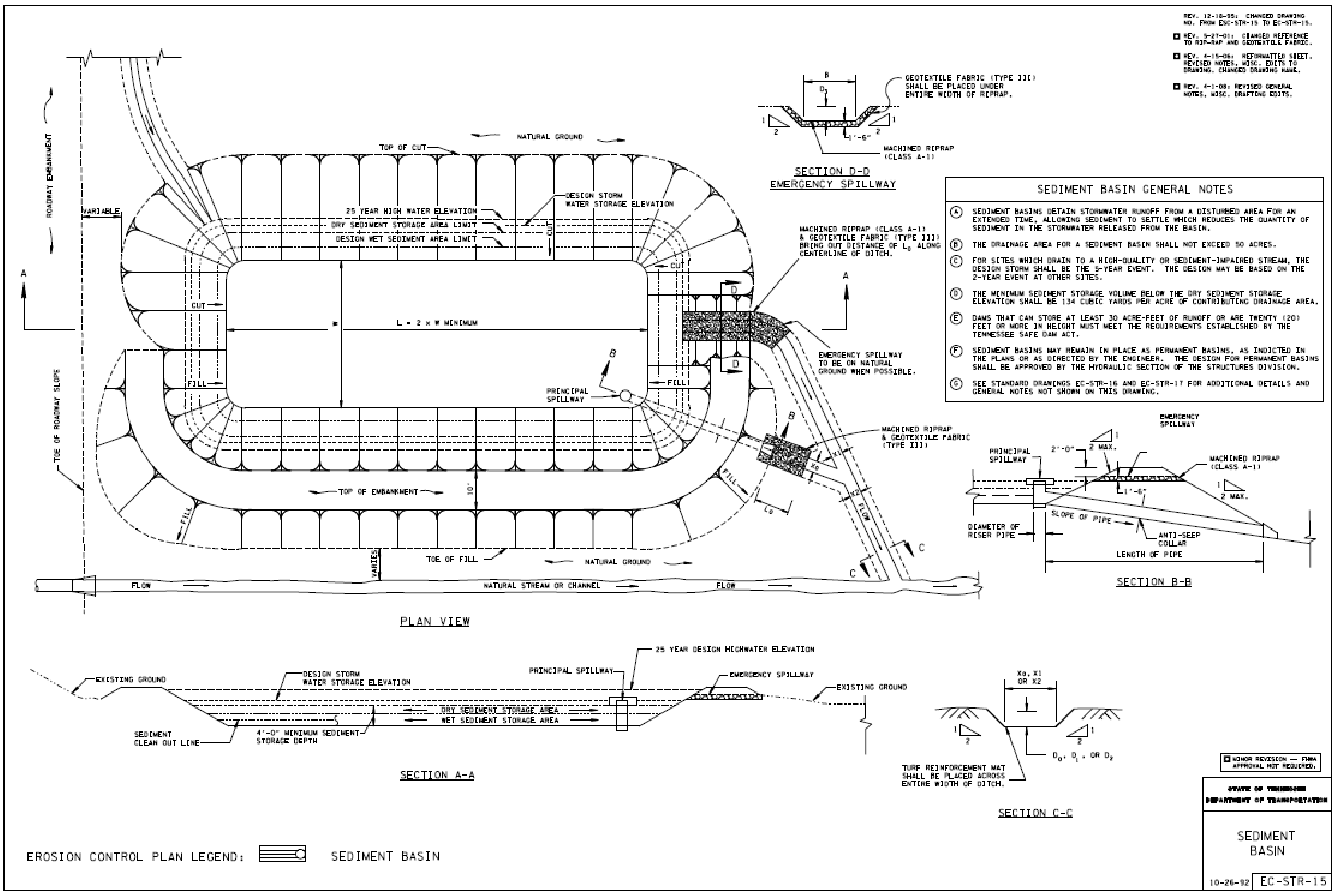


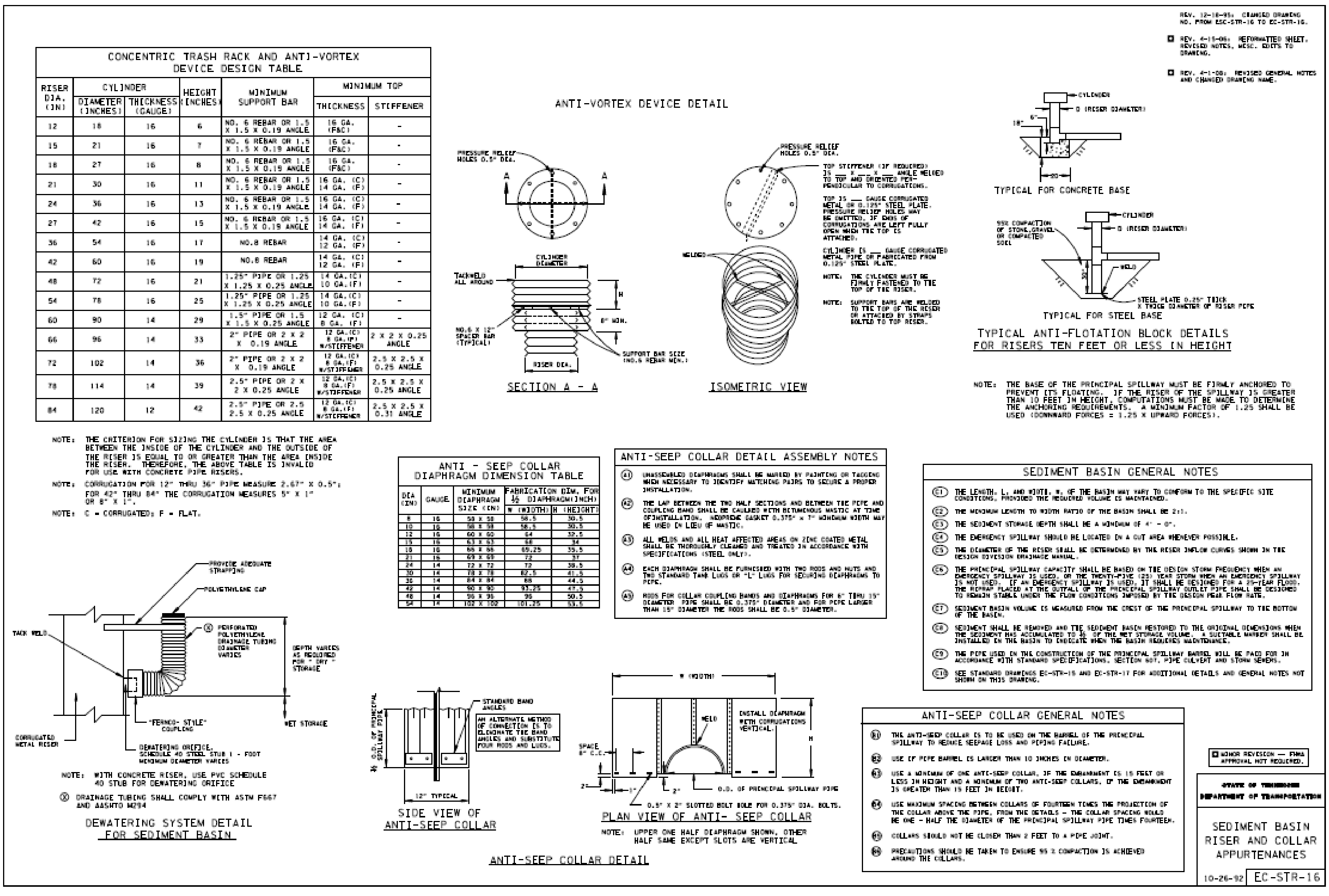
South Carolina:

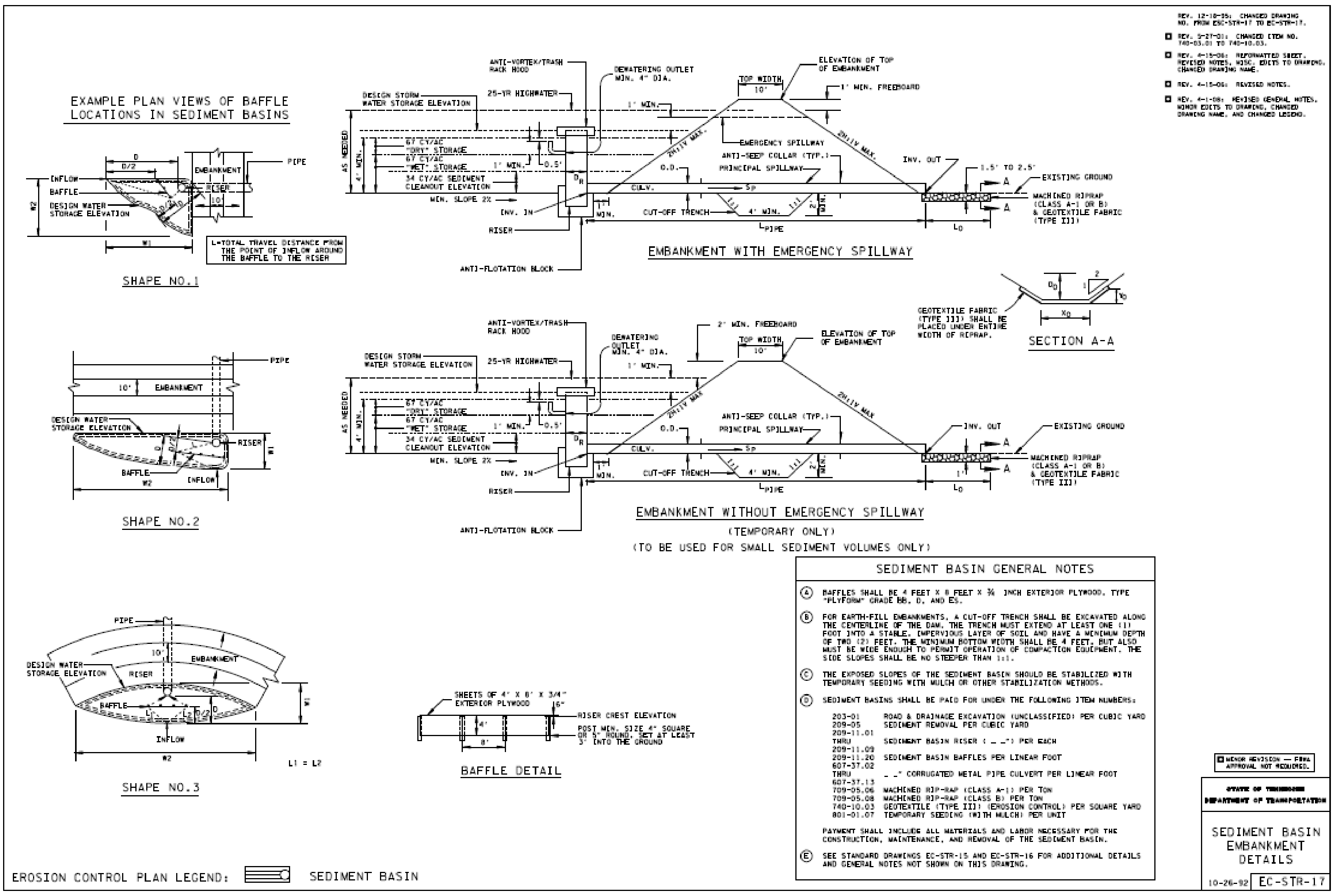


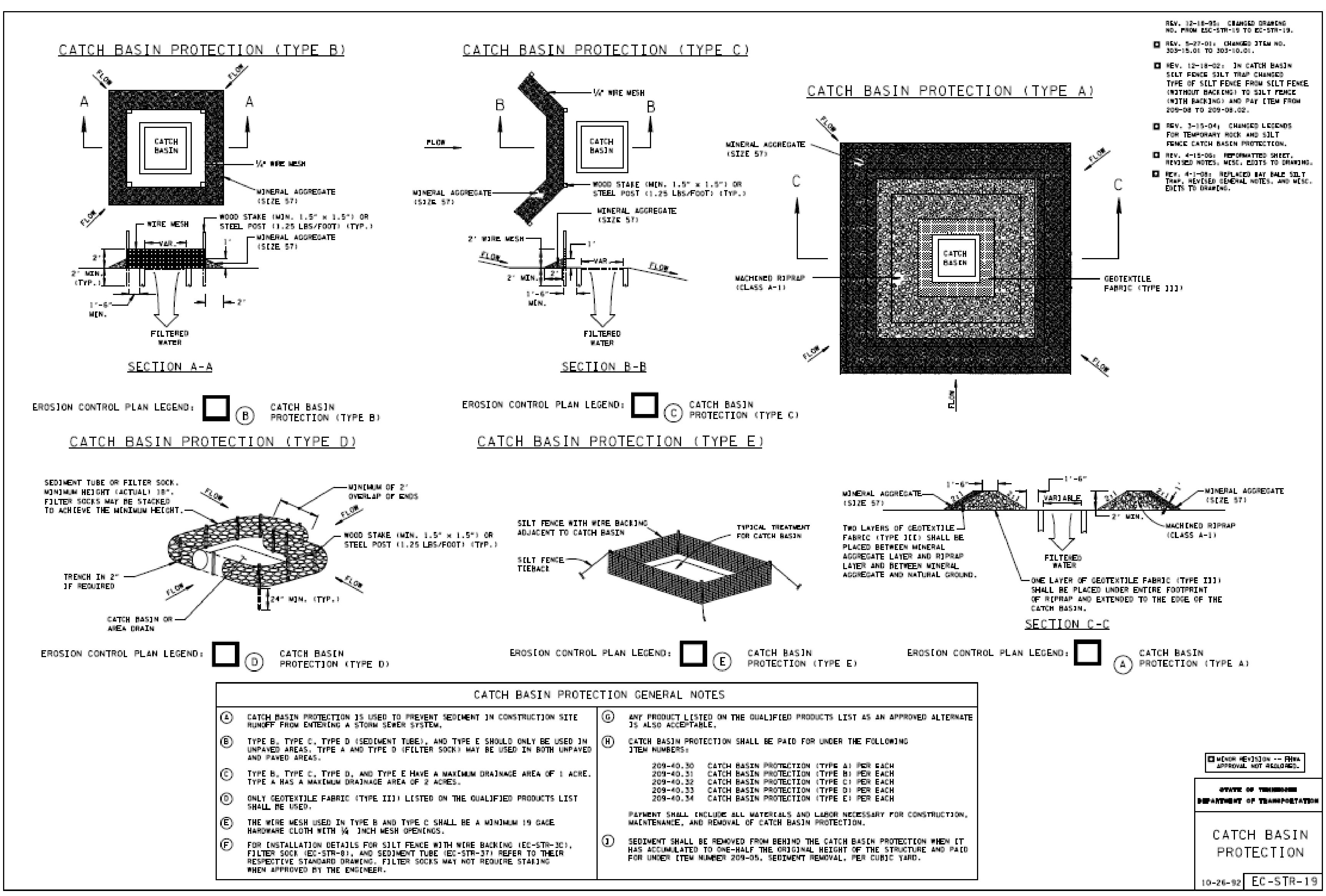
APPENDIX B

Tennessee:



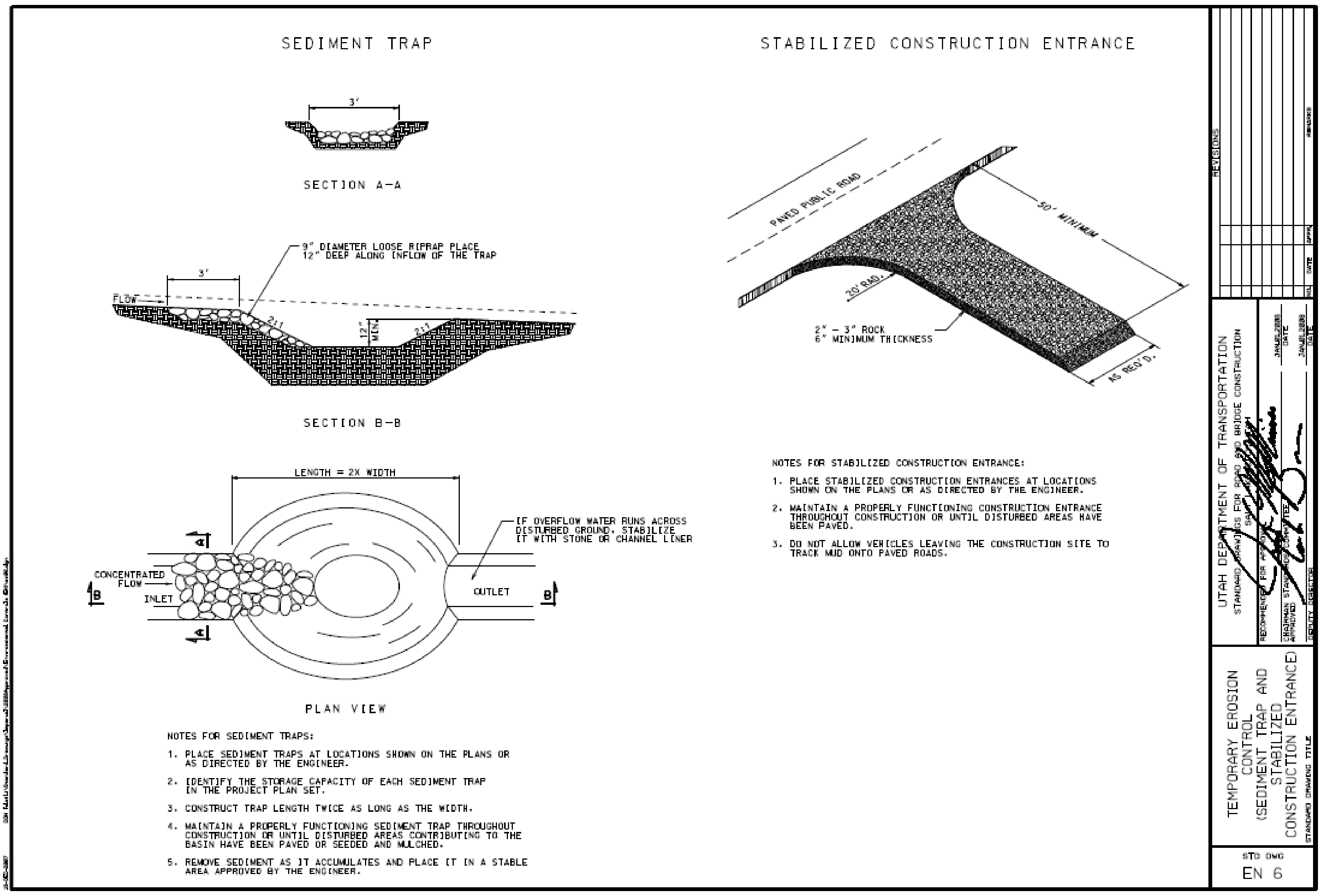



EXAMPLE PLAN VIEWS OF BAFFLE LOCATIONS IN SEDIMENT BASINS
SHAPE NO.1
SHAPE NO.2
SHAPE NO.3
EMBANKMENT WITH EMERGENCY SPILLWAY
SECTION A-A
EMBANKMENT WITHOUT EMERGENCY SPILLWAY
(TEMPORARY ONLY)
(TO BE USED FOR SMALL SEDIMENT VOLUMES ONLY)
SEDIMENT BASIN GENERAL NOTES
BAFFLE DETAIL
EROSION CONTROL PLAN LEGEND:
SEDIMENT BASIN
SEDIMENT BASIN EMBANKMENT DETAILS
10-26-92
EC-STR-17


CATCH BASIN PROTECTION (TYPE B)
CATCH BASIN PROTECTION (TYPE C)
CATCH BASIN PROTECTION (TYPE A)
SECTION A-A
SECTION B-B
EROSION CONTROL PLAN LEGEND:
CATCH BASIN PROTECTION (TYPE B)
CATCH BASIN PROTECTION (TYPE C)
CATCH BASIN PROTECTION (TYPE D)
CATCH BASIN PROTECTION (TYPE E)
SECTION C-C
CATCH BASIN PROTECTION (TYPE D)
CATCH BASIN PROTECTION (TYPE E)
CATCH BASIN PROTECTION (TYPE A)
CATCH BASIN PROTECTION GENERAL NOTES
CATCH BASIN PROTECTION
10-26-92
EC-STR-19

Utah:

APPENDIX B



APPENDIX C: HACH METHOD 8366

ANALYTICAL PROCEDURES

DETERMINING THE RELATIONSHIP BETWEEN TURBIDITY AND TOTAL SUSPENDED SOLIDS*

Method 8366

INTRODUCTION

The relationship between total suspended solids (TSS) and turbidity is typically used to monitor sample quality in process environments. Turbidity indicates sample stream contamination that occurs when filters become over saturated or a system becomes unbalanced. This procedure is suited for use on the 2100N, 2100AN, 2100P and SS6 Turbidimeter.

This procedure determines the relationship between TSS and turbidity on all types of samples that meet the following criteria:

- The sample must not contain solids that are extremely buoyant.
- The sample must be fluid enough so it will become homogeneous with mixing and can be accurately pipetted with a TenSette Pipet.
- The sample must contain solids that are representative of future samples to be tested.
- The sample constituents must be well known. Examples of samples that have been tested with this procedure are pulp and paper liquor, plating baths, metal refinery streams, and highly colored samples with high solids content.

Note: *This procedure is sample-site specific. With some samples, it may not be possible to draw predictable correlations between turbidity and TSS.*

This procedure is separated into four procedural sections, but has continuous step numbers:

1. Sample Dilution (Steps 1-9)

2. Determining TSS (Steps 10-21)

3. Measuring Turbidity (Step 22)

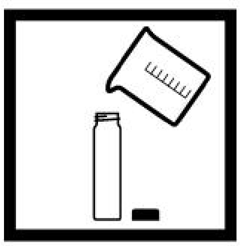
4. Comparing Turbidity and TSS (Step 23)

SAMPLE DILUTION

1. Fill a 250-mL beaker with sample. Place a Teflon magnetic stir bar into the sample. Place the beaker on a magnetic stirrer and mix so the solution is uniform throughout. Mix continuously during Steps 1 through 7.

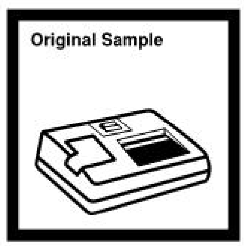
Note: *Thoroughly clean all glassware by washing with a laboratory detergent (e.g., Alconox®). Rinse several times with deionized water. Then rinse with 1:1 hydrochloric acid, followed by at least 10 rinsings with ultralow turbidity deionized water. See Washing Glassware for more information.*

Note: *See Mixing Samples following these steps for more information about the importance of mixing.*



2. Fill a sample cell to the line with mixed sample. Cap the cell.

Note: *A low light error can occur if the particles in the sample absorb so much incident light that the ratioing system fails to work properly. This is common with highly turbid or colored samples. Dilution usually solves the problem.*



3. Take a turbidity reading on the undiluted sample. If a "low light" error occurs or the turbidimeter overranges, proceed to Step 4.

Note: *The "low light" error refers to Hach's Ratio Turbidimeters. On other turbidimeters, this condition may cause little or no turbidity response.*

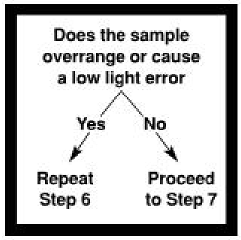
4. Dilute the sample 1:2 by pipetting 50 mL of original sample into a 100-mL volumetric flask. Dilute to the mark with low-turbidity water or solvent. Stopper. Invert several times to mix.

Note: *The 1-10 mL TenSette pipet should be used. Use five 10-mL aliquots of the stirred sample to obtain the 50 mL required.*

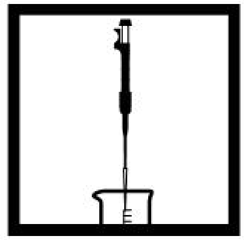
*Total Suspended Solids and Total Nonfilterable Residue are equivalent terms.

APPENDIX C

5. Pour the 1:2 diluted sample into a sample cell. Read the turbidity. If a "low light" error occurs, proceed to Step 6. If the turbidity is on the scale and no low light error occurs, use this 1:2 dilution as a beginning point for all further dilutions in Step 7.



6. If the turbidity is still too high in Step 5, make another 1:2 dilution of the sample from Step 5. Repeat the turbidity reading. Make successive 1:2 dilutions until the diluted sample no longer causes an overrange or low light error, or until the turbidimeter responds. Record the overall dilution of the original sample.

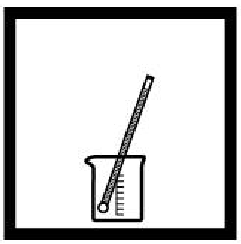


7. Make at least 500 mL of the appropriate sample dilution (as determined in Steps 4-6). **Be sure the sample is stirring when preparing this dilution.**

Note: *Prepare this dilution using a 500-mL volumetric flask. After mixing the contents, transfer these to a 600-mL beaker.*

Note: *In some cases, this dilution may be slightly different than the dilution in Step 6. Record the exact dilution used; it is used in Step 23.*

8. Using the table below as a guide, make series of prepared dilutions from the dilution in Step 7. Use a 1-10 mL TenSette Pipet to make these dilutions. Make at least 7 of the dilutions below.



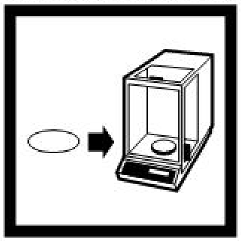
9. Be sure all the dilutions are at the same temperature during the measurement of turbidity and in the determination of Total Suspended Solids (Steps 10-20).

DILUTION TABLE

% of Sample from Step 8	mL to be Pipetted	Total Vol. (mL)	Dilution Factor
100%	100	100	1.000
80%	80	100	1.250
60%	60	100	1.667
40%	40	100	2.500
20%	20	100	5.000
10%	10	100	10.000
5%	5	100	20.000
2%	2	100	50.000

APPENDIX C

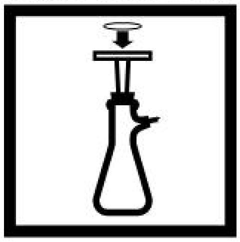
DETERMINING TOTAL SUSPENDED SOLIDS



10. Weigh a 47-mm preweighed and prewashed filter on an analytical balance. Record this weight to the nearest 0.0001 g.

Note: *This verifies the printed weight on the filter pan. Use clean tweezers to handle the filter. Fingers add moisture which will cause a weighing error.*

Note: *If the filters are not prewashed and preweighed, see Weighing Procedure for Filters following these steps.*



11. Place the filter disc on the filter holder of the filter apparatus with the wrinkled side upward.

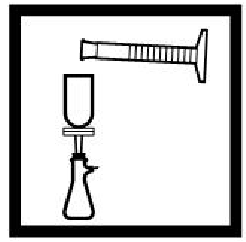
Attach the top funnel portion of the magnetic filter holder.

12. Accurately measure 50.0 mL of each dilution from Step 8. Be sure each dilution is well mixed (vortex is created without splashing) before measuring the 50-mL aliquot.

Note: *With samples of low turbidity (<100 NTU), try using a larger volume to determine TSS. Volumes from 100-300 mL may be used if the filter doesn't clog. When using larger volumes, the factor of "20" in the Total Suspended Solids calculation will be different. The new factor is calculated as follows:*

Factor in Step 20 =
(1000 mL)/(mL used in Step 12)

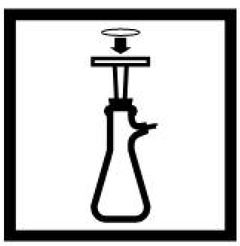
Note: *Save the remaining solution for turbidity measurement. (Prepared in Step 8.)*



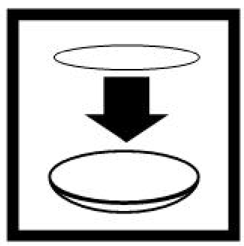
13. Using the filtering apparatus, filter the 50 mL aliquot of the dilution. Rinse the aliquot container several times with low-turbidity deionized water and add all rinses to the filter apparatus. Apply more vacuum to decrease the filtering time.

14. Rinse the filtrate on the filter with three 10-mL portions of low-turbidity deionized water.

Note: *Apply more vacuum if necessary, to decrease filtering time after each of the 3 rinsings.*



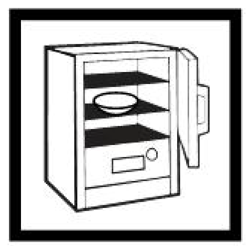
15. Slowly release the vacuum on the filtering apparatus. Gently remove the filter disc.



16. Place the disc on a clean watch glass.

Note: *Inspect the filtrate in the flask to make sure all the solids were trapped in the filter.*

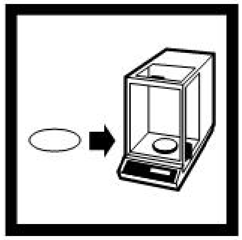
Note: *The filtrate in the flask may have some color but particles should be absent.*



17. Place the watch glass and disc in a drying oven at 103 °C for one hour.

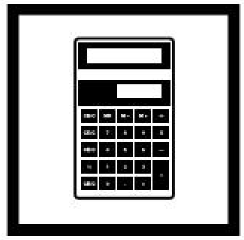
APPENDIX C

18. Remove the watch glass and disc from the oven. Place in a desiccator and allow to cool to room temperature.



19. Carefully remove the filter from the watch glass. Place the filter an analytical balance. Weigh the filter to the nearest 0.0001 g.

***Note:** Filters tend to stick to the watchglass. Be sure to remove the entire filter.*



20. Calculate the Total Suspended Solids (TSS) for the dilution:

TSS mg/L = (A – B) x 20

Where:

A = total weight of disc with solids (Step 19)

B = Preweighed filter weight before filtration (Step 10)

***Note:** If using large sample volumes (>100 mL), remember to recalculate the new factor and use it instead of 20 (see Step 12 note)*

Repeat Steps 10-20

21. Repeat Steps 10-20 for each dilution prepared in Step 8.

MEASURING TURBIDITY

22. Measure the turbidity of each dilution prepared in Step 8 using the remaining unfiltered dilution in each flask. Be sure to mix the dilution well before transferring it to the sample cell. Record the turbidity of each sample in a data table (see next Step).

***Note:** Transfer each sample to a turbidimeter sample cell and mix (DO NOT SHAKE). Immediately place the cell in the turbidimeter. Record the turbidity in 15-30 seconds. Record at the same time for each sample.*

***Note:** If samples are extremely noisy, take several measurements over a 15-60 second period and average these measurements. Use the average value for the turbidity of that sample.*

***Note:** Standardize the turbidimeter according to the calibration procedure given in the turbidimeter operators manual.*

COMPARING TURBIDITY AND TOTAL SUSPENDED SOLIDS

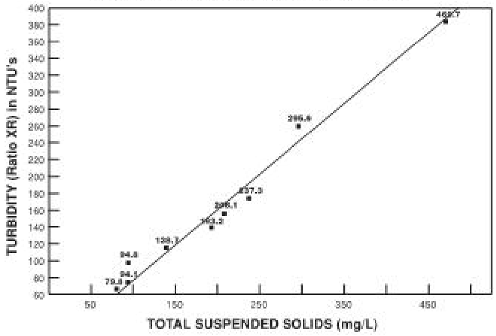
23. Plot the turbidity versus total suspended solids (TSS) of each sample dilution (See graph). A least squares analysis will show the relationship or correlation between the two values. A least-squares value of 0.9 or greater indicates a workable linear relationship (see the following example).

Example: The following data was generated using the procedure above:

Sample	TSS (mg/L)	Turbidity (NTU)
1	469.7	384
2	295.6	260
3	237.3	175
4	208.1	157
5	193.2	140
6	138.7	115.5
7	94.8	97.5
8	94.1	75
9	79.8	66.2

Graphing the data gives the following:

NTU vs TOTAL SUSPENDED SOLIDS



Least squares regression calculation of the data yields R = 0.9904.

For the most accurate determination of turbidity or TSS of the original sample, calculate the average of all the readings done on the 7 dilutions. Calculating the standard deviation determines the accuracy of the procedure. The example below shows how to calculate the average and standard deviation of the 7 turbidity readings on the dilutions from the Dilution Table.

Turbidity Reading NTU		Dilution Factor in Step 6		Dilution Factor in Step 8		Original Sample Turbidity
998	x	32	x	1.0	=	31936 NTU
794	x	32	x	1.250	=	31760 NTU
691	x	32	x	1.667	=	36860 NTU
327	x	32	x	2.500	=	26160 NTU
201	x	32	x	5	=	32160 NTU
90	x	32	x	10	=	28800 NTU
50	x	32	x	20	=	32000 NTU
		Sum of averages			=	219676 NTU

219676 ÷ 7 = 31382.4 NTU = Average NTU ($\bar{x}$)

Original Sample Turbidity (x)	$x - \bar{x}$	$(x - \bar{x})^2$
31936	553.6	306,472.96
31760	377.6	142,581.76
36861	5477.6	30,004,101.96
26160	-5222.4	27,273,461.76
32160	777.6	604,661.76
28800	-2582.4	6,668,789.76
32000	617.6	381429.76
219677 = sum of x or Σx		65,381,499.52 = $\Sigma(x - \bar{x})^2$

$$\text{Standard Deviation } (s) = \sqrt{\frac{\Sigma (x - \bar{x})^2}{n-1}} = \sqrt{\frac{65381499.52}{6}} = 3301.05$$

Where n = number of samples

In this example, the accuracy of the procedure is about 10%. This is calculated by dividing the standard deviation by the average and multiplying by 100:

3301.05 ÷ 31382.4 x 100 = 10.5%.

To determine the TSS and turbidity of a single original undiluted sample, multiplication by the dilution factors of both the TSS and turbidity readings is necessary. Each 1:2 dilution made in Steps 3-6 requires multiplication by 2. So, if three 1:2 dilutions were made, the turbidity and TSS results must be multiplied by 8 (2 x 2 x 2).

Also, any dilutions made in Step 8 must be accounted for by multiplying the answer from the above multiplication by the number in the "Dilution Factor" column.

Example:
Suppose five 1:2 dilutions were done on the original sample to get a turbidity reading (recorded in Step 6). Then this diluted sample was diluted to 5% in Step 8. The TSS and turbidity values based on the 5% dilution should be multiplied by 2 x 2 x 2 x 2 x 2 = 32 and then by the dilution factor in the table in Step 8 (which is 20) to obtain the TSS and turbidity of the original sample. If the TSS of the diluted sample is 50, the TSS of the original sample is 50 x 32 x 20 = 32000.

This procedure accurately determines the relationship of turbidity to total suspended solids. Least squares is a statistical way to verify this relationship and determine the actual turbidity of a sample within a certain amount of accuracy.

WASHING GLASSWARE

Thorough cleaning of glassware is especially important in the 0 -10 NTU range. Stringent cleanliness is not so important in the 0 -1000 NTU range.

Ultra-low turbidity water is deionized water that is filtered through a 0.2 micron filter or filtered with reverse osmosis. Using these devices ensures water that is less than 0.05 NTU when measured on a calibrated Ratio XR turbidimeter.

MIXING SAMPLES

It is very important to mix samples throughout this entire procedure! This is the key to obtaining highly linear results when comparing TSS and turbidity. Any time a sample is worked with, mix it thoroughly to ensure it is homogeneous. Always mix before diluting, transferring or measurement is done. Use a magnetic stirrer when possible, but inversion will work. The magnetic stirrer should create a vortex in the solution, but should not cause splashing. NEVER SHAKE TO MIX.

Highly viscous samples may require heating before any manipulation of the samples may occur (paint resins). If heating is required, it will likely change the turbidity of the sample.

APPENDIX C

WEIGHING PROCEDURE FOR FILTERS

If the filters used in the TSS determination are not preweighed and prewashed, use the following procedure:

1. Using tweezers, place the filter in the filtering apparatus with the wrinkled side up.

2. Pour 100 mL of ultra-low turbidity deionized water through the filter. Apply a vacuum until all the water is drawn through the filter.

3. Remove the disc from the apparatus and place on a clean watchglass.

4. Place the filter and watchglass in a drying oven at 103 °C for one hour.

5. Remove the disc form the oven and place in a desiccator. Allow to cool to room temperature. After it cools, proceed with Step 10. Be sure the entire filter comes off the watch glass when it is transferred to the balance in Step 10.

REQUIRED APPARATUS AND REAGENTS

Description	Unit	Cat. No
Aspirator, vacuum	each	2131-00
Balance, analytical	each	24339-00
Beaker, 250 mL	each	500-46
Beaker, 500 mL	each	500-52
Bottle, wash, 500 mL	each	620-11
Cylinder, graduated, 100 mL	each	508-42
Desiccator plate, 230 mm	each	14284-00
Desiccator, 250 mm, without stopcock	each	14285-00
Drierite, with indicator	454 g	20887-01
Filter Disc, glass fiber, 47 mm	100/pkg	2530-00
Filter Disc, preweighed	100/pkg	25461-00
Filter Holder, magnetic	each	13529-00
Flask, filtering, 1000 mL	each	546-53
Flask, Volumetric, Class B, 100 mL	6/pkg	547-72
Flask, Volumetric, Class B, 500 mL	each	547-49
Oven, laboratory, ambient to 200 °C	each	14289-00
Pipet, TenSette, 0.1-1.0 ml	each	19700-01
Pipet, TenSette, 1.0-10.0 ml	each	19700-10
Pipet Tips, for 19700-01 TenSette Pipet	50/pkg	21856-96
Pipet Tips, for 19700-10 TenSette Pipet	50/pkg	21997-96
Pump, vacuum, hand-operated	each	14283-00
Pump, vacuum/pressure, portable	each	14697-00
Stopper, rubber, one-hole, No. 8	6/pkg	2119-08
Stirrer, magnetic	each	23436-00
Stirring bar, 28.6 x 7.9 mm	each	20953-52
Tweezers, plastic	each	14282-00
Watch Glass, 100 mm	each	578-70
Water, deionized	3.78 L	272-17

OPTIONAL APPARATUS AND REAGENTS

Detergent, Liqui-nox	946 mL	20881-53
Hydrochloric Acid, 1:1	500 mL	884-49
Mini Capsule Filter, 0.2 µm	each	23631-00
Stirbar, Octagonal	each	20953-50
Thermometer	each	566-01

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APPENDIX D: RAW DATA

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APPENDIX D

Project: ALDOT 502
Site Name: Basin 4
Site Conditions: Damp, PAM blocks ineffectively placed at weir and covered with dust particles
Analysis Performed By: Chris Logan
Date of Analysis: 11/21/2011
TSS Sample Vol. : 20 mL
Turbidity Sample Vol. : 15 mL

Sampler	Sample #	Date/ Time of Sample	Time of Sample	(TIME)	Rainfall (in)	Level (m)	Inflow Rate (cfs)	Inflow Volume (cf)	Outflow Rate (cfs)	Measured Tubidity (on turbidimeter)	Turbidity Ratio (1:x)	Actual Turbidity	Clean Dish/ Filter Weight (g)	Dried Ladin Dish/ Filter Weight (g)	TSS Weight of Sample (mg)	TSS (mg/L)
A	1	11/16/2011	8:48	8.80	1.35	0.089	1.551	430.329	0	697	8	5576	1.4067	1.5119	105.2	5260
A	2	11/16/2011	8:51	8.85	1.35	0.104	1.951	761.995	0	895	8	7160	1.4109	1.5523	141.4	7070
A	3	11/16/2011	8:54	8.90	1.35	0.105	1.979	1119.894	0	932	8	7456	1.4084	1.5491	140.7	7035
A	4	11/16/2011	8:57	8.95	1.35	0.103	1.924	1466.175	0	883	8	7064	1.4132	1.5420	128.8	6440
A	5	11/16/2011	9:00	9.00	1.35	0.096	1.734	1792.873	0	831	8	6648	1.4161	1.5266	110.5	5525
A	6	11/16/2011	9:03	9.05	1.35	0.091	1.602	2084.450	0	700	8	5600	1.4036	1.5059	102.3	5115
A	7	11/16/2011	9:06	9.10	1.35	0.103	1.924	2398.441	0.001	588	8	4704	1.4144	1.5032	88.8	4440
A	8	11/16/2011	9:09	9.15	1.35	0.134	2.833	2831.445	0.002	724	8	5792	1.4065	1.5206	114.1	5705
A	9	11/16/2011	9:12	9.20	1.35	0.149	3.310	3421.419	0.003	537	16	8592	1.4054	1.5861	180.7	9035
A	10	11/16/2011	9:15	9.25	1.35	0.136	2.895	3976.920	0.004	666	16	10656	1.4033	1.6142	210.9	10545
A	11	11/16/2011	9:18	9.30	1.35	0.129	2.679	4487.000	0.004	561	16	8976	1.4058	1.5996	193.8	9690
A	12	11/16/2011	9:21	9.35	1.35	0.116	2.292	4915.395	0.004	563	16	9008	1.4014	1.5718	170.4	8520
A	13	11/16/2011	9:24	9.40	1.35	0.100	1.842	5275.182	0.005	516	16	8256	1.4043	1.5565	152.2	7610
A	14	11/16/2011	9:27	9.45	1.35	0.083	1.399	5556.118	0.005	992	8	7936	1.3930	1.5276	134.6	6730
A	15	11/16/2011	9:30	9.50	1.35	0.072	1.134	5777.288	0.005	830	8	6640	1.4060	1.5196	113.6	5680
A	16	11/16/2011	9:33	9.55	1.35	0.060	0.865	5947.476	0.005	692	8	5536	1.4012	1.4943	93.1	4655
A	17	11/16/2011	9:36	9.60	1.35	0.051	0.680	6080.856	0.005	575	8	4600	1.3992	1.4771	77.9	3895
A	18	11/16/2011	9:39	9.65	1.35	0.042	0.510	6183.760	0.005	467	8	3736	1.4040	1.4701	66.1	3305
A	19	11/16/2011	9:41	9.68	1.35	0.038	0.440	6238.590	0.005	819	4	3276	1.4064	1.4595	53.1	2655
A	20	11/16/2011	9:44	9.73	1.35	0.036	0.406	6314.650	0.005	652	4	2608	1.4052	1.4486	43.4	2170
A	21	11/16/2011	9:47	9.78	1.35	0.033	0.357	6380.761	0.005	539	4	2156	1.4011	1.4364	35.3	1765
A	22	11/16/2011	10:00	10.00	1.35	0.028	0.279	6615.028	0.005	830	2	1660	1.4030	1.4279	24.9	1245
A	23	11/16/2011	10:22	10.37	1.35	0.016	0.122	6895.636	0.005	515	2	1030	1.3959	1.4117	15.8	790
C	1	11/16/2011	9:07	9.12	1.35	0.016	2.063	2522.216	0.001	823	2	1646	1.4010	1.4189	17.9	895
C	2	11/16/2011	10:07	10.12	1.35	0.029	0.265	6733.304	0.005	951	1	951	1.3980	1.4067	8.7	435
C	3	11/16/2011	11:07	11.12	1.35	0.03	0.000	6940.755	0.005	674	1	674	1.3967	1.4032	6.5	325
C	4	11/16/2011	12:07	12.12	1.35	0.03	0.000	6940.755	0.005	623	1	623	1.3998	1.4056	5.8	290
C	5	11/16/2011	13:07	13.12	1.35	0.03	0.000	6940.755	0.006	609	1	609	1.4129	1.4193	6.4	320
C	6	11/16/2011	14:07	14.12	1.35	0.031	0.000	6940.755	0.006	596	1	596	1.4110	1.4164	5.4	270
C	7	11/16/2011	15:07	15.12	1.35	0.03	0.000	6940.755	0.006	558	1	558	1.4135	1.4187	5.2	260
C	8	11/16/2011	16:07	16.12	1.35	0.028	0.000	6940.755	0.005	597	1	597	1.4128	1.4174	4.6	230
C	9	11/16/2011	17:07	17.12	1.35	0.029	0.000	6940.755	0.005	521	1	521	1.4067	1.4113	4.6	230
C	10	11/16/2011	18:07	18.12	1.35	0.029	0.000	6940.755	0.005	472	1	472	1.4111	1.4154	4.3	215
C	11	11/16/2011	19:07	19.12	1.35	0.027	0.000	6940.755	0.005	434	1	434	1.4157	1.4197	4.0	200
C	12	11/16/2011	20:07	20.12	1.35	0.027	0.000	6940.755	0.005	411	1	411	1.4157	1.4197	4.0	200
C	13	11/16/2011	21:07	21.12	1.35	0.025	0.000	6940.755	0.004	439	1	439	1.4045	1.4080	3.5	175
C	14	11/16/2011	22:07	22.12	1.35	0.022	0.000	6940.755	0.003	417	1	417	1.3989	1.4020	3.1	155
C	15	11/16/2011	23:07	23.12	1.35	0.027	0.000	6940.755	0.005	387	1	387	1.4055	1.4086	3.1	155
C	16	11/17/2011	0:07	24.12	1.35	0.026	0.000	6940.755	0.004	351	1	351	1.3935	1.3969	3.4	170
C	17	11/17/2011	1:07	25.12	1.35	0.027	0.000	6940.755	0.004	345	1	345	1.3958	1.3986	2.8	140
C	18	11/17/2011	2:07	26.12	1.35	0.025	0.000	6940.755	0.004	315	1	315	1.4009	1.4040	3.1	155
C	19	11/17/2011	3:07	27.12	1.35	0.024	0.000	6940.755	0.004	297	1	297	1.4049	1.4075	2.6	130
C	20	11/17/2011	4:07	28.12	1.35	0.023	0.000	6940.755	0.003	283	1	283	1.4081	1.4110	2.9	145
C	21	11/17/2011	5:07	29.12	1.35	0.022	0.000	6940.755	0.003	267	1	267	1.4148	1.4172	2.4	120
C	22	11/17/2011	6:07	30.12	1.35	0.021	0.000	6940.755	0.003	260	1	260	1.4084	1.4110	2.6	130
C	23	11/17/2011	7:07	31.12	1.35	0.019	0.000	6940.755	0.002	248	1	248	1.3985	1.4012	2.7	135
C	24	11/17/2011	8:07	32.12	1.35	0.016	0.000	6940.755	0.002	239	1	239	1.3915	1.3940	2.5	125
D	1	11/16/2011	9:14	9.23	1.35	0.023	3.021	3803.21	0.003	964	4	3856	1.4065	1.4494	42.9	2145
D	2	11/16/2011	10:11	10.18	1.35	0.029	0.209	6789.188	0.005	611	2	1222	1.3912	1.4062	15.0	750
D	3	11/16/2011	11:11	11.18	1.35	0.03	0.000	6940.755	0.005	548	2	1096	1.3945	1.4060	11.5	575
D	4	11/16/2011	12:11	12.18	1.35	0.029	0.000	6940.755	0.005	454	2	908	1.4066	1.4161	9.5	475
D	5	11/16/2011	13:11	13.18	1.35	0.031	0.000	6940.755	0.006	950	1	950	1.3977	1.4067	9.0	450
D	6	11/16/2011	14:11	14.18	1.35	0.03	0.000	6940.755	0.005	860	1	860	1.4037	1.4118	8.1	405
D	7	11/16/2011	15:11	15.18	1.35	0.03	0.000	6940.755	0.005	790	1	790	1.4032	1.4109	7.7	385
D	8	11/16/2011	16:11	16.18	1.35	0.029	0.000	6940.755	0.005	731	1	731	1.4090	1.4164	7.4	370
D	9	11/16/2011	17:11	17.18	1.35	0.028	0.000	6940.755	0.005	706	1	706	1.3990	1.4056	6.6	330
D	10	11/16/2011	18:11	18.18	1.35	0.029	0.000	6940.755	0.005	687	1	687	1.4147	1.4211	6.4	320
D	11	11/16/2011	19:11	19.18	1.35	0.027	0.000	6940.755	0.004	648	1	648	1.4118	1.4180	6.2	310
D	12	11/16/2011	20:11	20.18	1.35	0.027	0.000	6940.755	0.004	513	1	513	1.3965	1.4014	4.9	245
D	13	11/16/2011	21:11	21.18	1.35	0.025	0.000	6940.755	0.004	450	1	450	1.4055	1.4096	4.1	205
D	14	11/16/2011	22:11	22.18	1.35	0.024	0.000	6940.755	0.004	398	1	398	1.4052	1.4087	3.5	175
D	15	11/16/2011	23:11	23.18	1.35	0.027	0.000	6940.755	0.004	381	1	381	1.3999	1.4037	3.8	190
D	16	11/17/2011	0:11	24.18	1.35	0.026	0.000	6940.755	0.004	378	1	378	1.3991	1.4027	3.6	180
D	18	11/17/2011	1:11	25.18	1.35	0.026	0.000	6940.755	0.004	350	1	350	1.4044	1.4075	3.1	155
D	17	11/17/2011	2:11	26.18	1.35	0.025	0.000	6940.755	0.004	364	1	364	1.3998	1.4026	2.8	140
D	19	11/17/2011	3:11	27.18	1.35	0.024	0.000	6940.755	0.004	320	1	320	1.4078	1.4108	3.0	150
D	20	11/17/2011	4:11	28.18	1.35	0.023	0.000	6940.755	0.003	319	1	319	1.4042	1.4069	2.7	135
D	21	11/17/2011	5:11	29.18	1.35	0.022	0.000	6940.755	0.003	290	1	290	1.4089	1.4113	2.4	120
D	22	11/17/2011	6:11	30.18	1.35	0.021	0.000	6940.755	0.003	265	1	265	1.4046	1.4070	2.4	120
D	23	11/17/2011	7:11	31.18	1.35	0.019	0.000	6940.755	0.002	254	1	254	1.4113	1.4136	2.3	115
D	24	11/17/2011	8:11	32.18	1.35	0.016	0.000	6940.755	0.002	247	1	247	1.4045	1.4067	2.2	110
E	1	11/16/2011	9:21	9.35	1.35	0.026	2.292	4915.395	0.004	699	8	5592	1.4011	1.4999	98.8	4940
E	2	11/16/2011	10:17	10.28	1.35	0.029	0.157	6854.179	0.005	476	2	952	1.3902	1.4022	12.0	600
E	3	11/16/2011	11:17	11.28	1.35	0.03	0.000	6940.755	0.006	846	1	846	1.4236	1.4323	8.7	435
E	4	11/16/2011	12:17	12.28	1.35	0.03	0.000	6940.755	0.006	768	1	768	1.4362	1.4440	7.8	390
E	5	11/16/2011	13:17	13.28	1.35	0.03	0.000	6940.755	0.005	720	1	720	1.4143	1.4213	7.0	350
E	6	11/16/2011	14:17	14.28	1.35	0.031	0.000	6940.755	0.006	671	1	671	1.4057	1.4129	7.2	360
E	7	11/16/2011	15:17	15.28	1.35	0.03	0.000	6940.755	0.005	611	1	611	1.4089	1.4154	6.5	325
E	8	11/16/2011	16:17	16.28	1.35	0.029	0.000	6940.755	0.005	593	1	593	1.4089	1.4148	5.9	295
E	9	11/16/2011	17:17	17.28	1.35	0.029	0.000	6940.755	0.005	579	1	579	1.4026	1.4086	6.0	300
E	10	11/16/2011	18:17	18.28	1.35	0.029	0.000	6940.755	0.005	509	1	509	1.3985	1.4040	5.5	275
E	11	11/16/2011	19:17	19.28	1.35	0.027	0.000	6940.755	0.004	488	1	488	1.4000	1.4047	4.7	235
E	12	11/16/2011	20:17	20.28	1.35	0.027	0.000	6940.755	0.004	412	1	412	1.3953	1.3991	3.8	190
E	13	11/16/2011	21:17	21.28	1.35	0.025	0.000	6940.755	0.004	420	1	420	1.3954	1.3996	4.2	210
E	14	11/16/2011	22:17	22.28	1.35	0.027	0.000	6940.755	0.005	376	1	376	1.4033	1.4069	3.6	180
E	15	11/16/2011	23:18	23.30	1.35	0.027	0.000	6940.755	0.004	371	1	371	1.4024	1.4059	3.5	175
E	16	11/17/2011	0:18	24.30	1.35	0.026	0.000	6940.755	0.004	346	1	346	1.3944	1.3976	3.2	160
E	17	11/17/2011	1:18	25.30	1.35	0.026	0.000	6940.755	0.004	345	1	345	1.4060	1.4090	3.0	150
E	18	11/17/2011	2:18	26.30	1.35	0.025	0.000	6940.755	0.004	313	1	313	1.4087	1.4117	3.0	150
E	19	11/17/2011	3:18	27.30	1.35	0.024	0.000	6940.755	0.004	299	1	299	1.4094	1.4127	3.3	165
E	20	11/17/2011	4:18	28.30	1.35	0.023	0.000	6940.755	0.003	284	1	284	1.4290	1.4318	2.8	140
E	21	11/17/2011	5:18	29.30	1.35	0.022	0.000	6940.755	0.003	264	1	264	1.4022	1.4049	2.7	135
E	22	11/17/2011	6:18	30.30	1.35	0.021	0.000	6940.755	0.003	258	1	258	1.4006	1.4031	2.5	125
E	23	11/17/2011	7:18	31.30	1.35	0.019	0.000	6940.755	0.002	249	1	249	1.4097	1.4122	2.5	125
E	24	11/17/2011	8:18	32.30	1.35	0.016	0.000	6940.755	0.002	235	1	235	1.4167	1.4194	2.7	135

Project: ALDOT 502

APPENDIX D

Site Name: Basin 4
Site Conditions: Damp ***Data not usable. Only inflow is good.***
Analysis Performed By: Chris Logan
Date of Analysis: 12/6/2011
TSS Sample Vol. : 20 mL
Turbidity Sample Vol. : 15 mL

Sampler	Sample #	Date of Sample	Time of Sample	(TIME)	Rainfall (in)	Level (m)	Inflow Rate (cfs)	Inflow Volume (cf)	Outflow Rate (cfs)	Measured Tubidity (on turbidimeter)	Turbidity Ratio (1:x)	Actual Turbidity	Clean Dish/Filter Weight (g)	Dried Ladin Dish/Filter Weight (g)	TSS Weight of Sample (mg)	TSS (mg/L)
A	1	11/27/2011	3:52	3.87	0.48	0.010	0.002	235.046	0.000	547	1	547	1.4141	1.4209	6.8	340
A	2	11/27/2011	23:50	23.83	0.93	0.012	0.002	470.927	0.001	188	1	188	1.3983	1.3999	1.6	80
A	3	11/28/2011	0:26	24.43	0.99	0.022	0.006	787.028	0.001	267	1	267	1.3964	1.3987	2.3	115
A	4	11/28/2011	0:54	24.90	1.02	0.020	0.005	1094.294	0.002	296	1	296	1.3921	1.3943	2.2	110
A	5	11/28/2011	1:24	25.40	1.06	0.020	0.005	1396.061	0.002	277	1	277	1.4222	1.4248	2.6	130
A	6	11/28/2011	16:13	40.22	1.11	0.008	0.001	1796.511	0.001	229	1	229	1.3996	1.4012	1.6	80
A	7	11/28/2011	16:51	40.85	1.39	0.014	0.003	1992.577	0.001	171	1	171	1.4106	1.4118	1.2	60
C	1	11/27/2011	8:07	8.12	0.58	0.013	0.000	334.734	0.001	61.5	1	61.5	1.4016	1.4017	0.1	5
C	2	11/27/2011	8:22	8.37	0.58	0.013	0.000	334.734	0.001	63.2	1	63.2	1.3968	1.3968	0	0
C	3	11/27/2011	8:26	8.43	0.58	0.013	0.000	334.734	0.001	65	1	65	1.3946	1.3945	-0.1	-5
C	4	11/27/2011	8:31	8.52	0.58	0.013	0.000	334.734	0.001	70.6	1	70.6	1.4058	1.4057	-0.1	-5
C	5	11/27/2011	8:35	8.58	0.58	0.013	0.000	334.734	0.001	74.8	1	74.8	1.3930	1.3932	0.2	10
C	6	11/27/2011	8:40	8.67	0.58	0.013	0.000	334.734	0.001	72.7	1	72.7	1.4058	1.3974	-8.4	-420
C	7	11/27/2011	8:45	8.75	0.58	0.013	0.000	334.734	0.001	81.8	1	81.8	1.3995	1.3994	-0.1	-5
C	8	11/27/2011	8:49	8.82	0.58	0.013	0.000	334.734	0.001	86.8	1	86.8	1.3962	1.3962	0	0
C	9	11/27/2011	8:54	8.90	0.58	0.013	0.000	334.734	0.001	84.3	1	84.3	1.4105	1.4103	-0.2	-10
C	10	11/27/2011	8:58	8.97	0.58	0.013	0.000	334.734	0.001	90.4	1	90.4	1.3989	1.3987	-0.2	-10
C	11	11/27/2011	9:03	9.05	0.58	0.013	0.000	334.734	0.001	88.1	1	88.1	1.4044	1.4045	0.1	5
C	12	11/27/2011	9:07	9.12	0.58	0.013	0.000	334.734	0.001	88.5	1	88.5	1.4065	1.4063	-0.2	-10
C	13	11/27/2011	9:12	9.20	0.58	0.013	0.000	334.734	0.001	94.5	1	94.5	1.4053	1.4054	0.1	5
C	14	11/27/2011	9:16	9.27	0.58	0.013	0.000	334.734	0.001	93.7	1	93.7	1.4017	1.4018	0.1	5
C	15	11/27/2011	9:20	9.33	0.58	0.013	0.000	334.734	0.001	97.8	1	97.8	1.4077	1.4077	0	0
C	16	11/27/2011	9:25	9.42	0.58	0.013	0.000	334.734	0.001	97.4	1	97.4	1.3869	1.3870	0.1	5
C	17	11/27/2011	9:29	9.48	0.58	0.013	0.000	334.734	0.001	102	1	102	1.3970	1.3966	-0.4	-20
C	18	11/27/2011	9:34	9.57	0.58	0.013	0.000	334.734	0.001	105	1	105	1.3912	1.3915	0.3	15
C	19	11/27/2011	9:38	9.63	0.58	0.013	0.000	334.734	0.001	107	1	107	1.4040	1.4044	0.4	20
C	20	11/27/2011	9:42	9.70	0.58	0.013	0.000	334.734	0.001	116	1	116	1.3927	1.3932	0.5	25
C	21	11/27/2011	9:47	9.78	0.58	0.013	0.000	334.734	0.001	122	1	122	1.4058	1.4064	0.6	30
C	22	11/27/2011	9:51	9.85	0.58	0.013	0.000	334.734	0.001	117	1	117	1.4115	1.4118	0.3	15
C	23	11/27/2011	9:56	9.93	0.58	0.013	0.000	334.734	0.001	113	1	113	1.4154	1.4160	0.6	30
C	24	11/27/2011	10:00	10.00	0.58	0.013	0.000	334.734	0.001	116	1	116	1.4184	1.4188	0.4	20
D	1	11/27/2011	8:13	8.22	0.58		0.000	334.734	0.001	233	1	233	1.4079	1.4097	1.8	90
D	2	11/27/2011	8:26	8.43	0.58		0.000	334.734	0.001	233	1	233	1.3923	1.3937	1.4	70
D	3	11/27/2011	8:30	8.50	0.58		0.000	334.734	0.001	234	1	234	1.4093	1.4109	1.6	80
D	4	11/27/2011	8:35	8.58	0.58		0.000	334.734	0.001	231	1	231	1.4042	1.4057	1.5	75
D	5	11/27/2011	8:39	8.65	0.58		0.000	334.734	0.001	238	1	238	1.4030	1.4046	1.6	80
D	6	11/27/2011	8:44	8.73	0.58		0.000	334.734	0.001	236	1	236	1.3992	1.4008	1.6	80
D	7	11/27/2011	8:49	8.82	0.58		0.000	334.734	0.001	224	1	224	1.4067	1.4084	1.7	85
D	8	11/27/2011	8:53	8.88	0.58		0.000	334.734	0.001	219	1	219	1.3931	1.3946	1.5	75
D	9	11/27/2011	8:58	8.97	0.58		0.000	334.734	0.001	216	1	216	1.3924	1.3935	1.1	55
D	10	11/27/2011	9:02	9.03	0.58		0.000	334.734	0.001	226	1	226	1.3925	1.3974	4.9	245
D	11	11/27/2011	9:06	9.10	0.58		0.000	334.734	0.001	221	1	221	1.4013	1.4031	1.8	90
D	12	11/27/2011	9:11	9.18	0.58		0.000	334.734	0.001	219	1	219	1.4017	1.4030	1.3	65
D	13	11/27/2011	9:15	9.25	0.58		0.000	334.734	0.001	220	1	220	1.4060	1.4073	1.3	65
D	14	11/27/2011	9:20	9.33	0.58		0.000	334.734	0.001	223	1	223	1.4199	1.4217	1.8	90
D	15	11/27/2011	9:24	9.40	0.58		0.000	334.734	0.001	219	1	219	1.3923	1.3935	1.2	60
D	16	11/27/2011	9:29	9.48	0.58		0.000	334.734	0.001	225	1	225	1.4053	1.4063	1	50
D	17	11/27/2011	9:33	9.55	0.58		0.000	334.734	0.001	234	1	234	1.4093	1.4110	1.7	85
D	18	11/27/2011	9:37	9.62	0.58		0.000	334.734	0.001	226	1	226	1.4185	1.4201	1.6	80
D	19	11/27/2011	9:42	9.70	0.58		0.000	334.734	0.001	221	1	221	1.3931	1.3944	1.3	65
D	20	11/27/2011	9:46	9.77	0.58		0.000	334.734	0.001	223	1	223	1.3998	1.4012	1.4	70
D	21	11/27/2011	9:51	9.85	0.58		0.000	334.734	0.001	233	1	233	1.3994	1.4009	1.5	75
D	22	11/27/2011	9:55	9.92	0.58		0.000	334.734	0.001	219	1	219	1.3968	1.3984	1.6	80
D	23	11/27/2011	9:59	9.98	0.58		0.000	334.734	0.001	226	1	226	1.3929	1.3945	1.6	80
D	24	11/27/2011	10:04	10.07	0.58		0.000	334.734	0.001	224	1	224	1.3912	1.3928	1.6	80
E	1	11/27/2011	8:20	8.33	0.58		0.000	334.734	0.001	241	1	241	1.4032	1.4055	2.3	115
E	2	11/27/2011	8:32	8.53	0.58		0.000	334.734	0.001	240	1	240	1.3947	1.3963	1.6	80
E	3	11/27/2011	8:36	8.60	0.58		0.000	334.734	0.001	223	1	223	1.4013	1.4030	1.7	85
E	4	11/27/2011	8:41	8.68	0.58		0.000	334.734	0.001	214	1	214	1.4009	1.4031	2.2	110
E	5	11/27/2011	8:46	8.77	0.58		0.000	334.734	0.001	220	1	220	1.4057	1.4081	2.4	120
E	6	11/27/2011	8:50	8.83	0.58		0.000	334.734	0.001	222	1	222	1.4033	1.4051	1.8	90
E	7	11/27/2011	8:55	8.92	0.58		0.000	334.734	0.001	221	1	221	1.4031	1.4053	2.2	110
E	8	11/27/2011	8:59	8.98	0.58		0.000	334.734	0.001	217	1	217	1.3990	1.4013	2.3	115
E	9	11/27/2011	9:04	9.07	0.58		0.000	334.734	0.001	210	1	210	1.4254	1.4278	2.4	120
E	10	11/27/2011	9:08	9.13	0.58		0.000	334.734	0.001	213	1	213	1.4425	1.4451	2.6	130
E	11	11/27/2011	9:13	9.22	0.58		0.000	334.734	0.001	223	1	223	1.4042	1.4066	2.4	120
E	12	11/27/2011	9:17	9.28	0.58		0.000	334.734	0.001	213	1	213	1.4147	1.4173	2.6	130
E	13	11/27/2011	9:22	9.37	0.58		0.000	334.734	0.001	227	1	227	1.4179	1.4206	2.7	135
E	14	11/27/2011	9:26	9.43	0.58		0.000	334.734	0.001	216	1	216	1.4372	1.4397	2.5	125
E	15	11/27/2011	9:30	9.50	0.58		0.000	334.734	0.001	223	1	223	1.3915	1.3941	2.6	130
E	16	11/27/2011	9:35	9.58	0.58		0.000	334.734	0.001	224	1	224	1.4314	1.4342	2.8	140
E	17	11/27/2011	9:39	9.65	0.58		0.000	334.734	0.001	225	1	225	1.4149	1.4174	2.5	125
E	18	11/27/2011	9:44	9.73	0.58		0.000	334.734	0.001	223	1	223	1.4300	1.4323	2.3	115
E	19	11/27/2011	9:48	9.80	0.58		0.000	334.734	0.001	223	1	223	1.3985	1.4013	2.8	140
E	20	11/27/2011	9:52	9.87	0.58		0.000	334.734	0.001	225	1	225	1.3945	1.3972	2.7	135
E	21	11/27/2011	9:57	9.95	0.58		0.000	334.734	0.001	222	1	222	1.3949	1.3974	2.5	125
E	22	11/27/2011	10:01	10.02	0.58		0.000	334.734	0.001	222	1	222	1.4154	1.4173	1.9	95
E	23	11/27/2011	10:06	10.10	0.58		0.000	334.734	0.001	210	1	210	1.4017	1.4038	2.1	105
E	24	11/27/2011	10:10	10.17	0.58		0.000	334.734	0.001	219	1	219	1.4080	1.4102	2.2	110

APPENDIX D

Project: ALDOT 502
Site Name: Basin 4
Site Conditions: Very Damp / Cold ; 4 new PAM blocks placed across top of inflow channel d/s of weir (wrong type)
Analysis Performed By: Chris Logan
Date of Analysis: 12/12/2011
TSS Sample Vol. : 20 mL
Turbidity Sample Vol. : 15 mL

Sampler	Sample #	Date of Sample	Time of Sample	(TIME)	Rainfall (in)	Level (m)	Inflow Rate (cfs)	Inflow Volume (cf)	Outflow Rate (cfs)	Measured Tubidity (on turbidimeter)	Turbidity Ratio (1:x)	Actual Turbidity	Clean Dish/Filter Weight (g)	Dried Ladin Dish & Filter Weight (g)	TSS Weight of Sample (mg)	TSS (mg/L)
A	0	12/5/2011	15:30	15.50	0.61	0.051	0.680	180.443	0.000	532	4	2,128	1.4080	1.4366	28.6	1,430
A	1	12/5/2011	15:37	15.62	0.68	0.054	0.740	474.506	0.001	474	4	1,896	1.4128	1.4356	22.8	1,140
A	2	12/5/2011	15:43	15.72	0.68	0.060	0.865	754.584	0.002	575	4	2,300	1.4107	1.4435	32.8	1,640
A	3	12/5/2011	15:48	15.80	0.76	0.067	1.019	1040.415	0.003	566	4	2,264	1.4016	1.4345	32.9	1,645
A	4	12/5/2011	15:53	15.88	0.76	0.072	1.134	1357.004	0.004	617	4	2,468	1.4006	1.4350	34.4	1,720
A	5	12/5/2011	15:57	15.95	0.83	0.073	1.157	1633.297	0.004	646	4	2,584	1.4026	1.4389	36.3	1,815
A	6	12/5/2011	16:01	16.02	0.83	0.076	1.228	1922.311	0.004	681	4	2,724	1.4369	1.4759	39	1,950
A	7	12/5/2011	16:06	16.10	0.88	0.073	1.157	2270.877	0.005	673	4	2,692	1.3974	1.4343	36.9	1,845
A	8	12/5/2011	16:10	16.17	0.88	0.069	1.064	2545.741	0.004	536	4	2,144	1.4081	1.4389	30.8	1,540
A	9	12/5/2011	16:15	16.25	0.95	0.065	0.974	2858.234	0.005	487	4	1,948	1.4201	1.4471	27	1,350
A	10	12/5/2011	16:21	16.35	0.95	0.063	0.930	3195.768	0.005	979	2	1,958	1.4315	1.4549	23.4	1,170
A	11	12/5/2011	16:26	16.43	1	0.063	0.930	3478.798	0.005	986	2	1,972	1.4163	1.4397	23.4	1,170
A	12	12/5/2011	16:31	16.52	1	0.068	1.042	3779.176	0.005	432	4	1,728	1.4147	1.4378	23.1	1,155
A	13	12/5/2011	16:35	16.58	1.05	0.068	1.042	4029.165	0.005	435	4	1,740	1.3963	1.4194	23.1	1,155
A	14	12/5/2011	16:40	16.67	1.05	0.068	1.042	4340.284	0.005	476	4	1,904	1.3889	1.4136	24.7	1,235
A	15	12/5/2011	16:45	16.75	1.08	0.065	0.974	4645.989	0.005	450	4	1,800	1.4196	1.4436	24	1,200
A	16	12/5/2011	16:51	16.85	1.08	0.060	0.865	4977.047	0.005	978	2	1,956	1.4238	1.4452	21.4	1,070
A	17	12/5/2011	16:57	16.95	1.08	0.052	0.700	5269.700	0.005	920	2	1,840	1.4139	1.4358	21.9	1,095
A	18	12/5/2011	17:06	17.10	1.09	0.038	0.440	5580.306	0.005	807	2	1,614	1.4305	1.4491	18.6	930
A	19	12/5/2011	17:22	17.37	1.09	0.025	0.236	5892.167	0.006	619	2	1,238	1.4045	1.4184	13.9	695
A	20	12/5/2011	17:45	17.75	1.09	0.014	0.100	6110.864	0.006	439	2	878	1.4083	1.4176	9.3	465
C	0	12/5/2011	15:37	15.62	0.68	0.013	0.740	474.506	0.001	60.2	1	60	1.4224	1.4226	0.2	10
C	1	12/5/2011	16:37	16.62	1.05	0.027	1.042	4154.155	0.005	236	1	236	1.4053	1.4072	1.9	95
C	2	12/5/2011	17:37	17.62	1.09	0.032	0.145	6051.546	0.006	489	2	978	1.4155	1.4249	9.4	470
C	3	12/5/2011	18:37	18.62	1.1	0.032	0.000	6218.334	0.006	552	2	1,104	1.4180	1.4284	10.4	520
C	4	12/5/2011	19:37	19.62	1.14	0.032	0.000	6218.334	0.006	556	2	1,112	1.4141	1.4239	9.8	490
C	5	12/5/2011	20:37	20.62	1.16	0.031	0.000	6218.334	0.006	514	2	1,028	1.4289	1.4376	8.7	435
C	6	12/5/2011	21:37	21.62	1.2	0.031	0.000	6218.334	0.006	482	2	964	1.4220	1.4308	8.8	440
C	7	12/5/2011	22:37	22.62	1.21	0.030	0.000	6218.334	0.006	458	2	916	1.4208	1.4290	8.2	410
C	8	12/5/2011	23:37	23.62	1.22	0.031	0.000	6218.334	0.006	481	2	962	1.4290	1.4375	8.5	425
C	9	12/6/2011	0:37	24.62	1.31	0.030	0.000	6218.334	0.006	477	2	954	1.4173	1.4256	8.3	415
C	10	12/6/2011	1:37	25.62	1.31	0.030	0.000	6218.334	0.005	444	2	888	1.4189	1.4262	7.3	365
C	11	12/6/2011	2:37	26.62	1.31	0.030	0.000	6218.334	0.005	403	2	806	1.4144	1.4211	6.7	335
C	12	12/6/2011	3:37	27.62	1.31	0.029	0.000	6218.334	0.005	399	2	798	1.4211	1.4274	6.3	315
C	13	12/6/2011	4:37	28.62	1.32	0.028	0.000	6218.334	0.005	834	1	834	1.4268	1.4330	6.2	310
C	14	12/6/2011	5:37	29.62	1.32	0.028	0.000	6218.334	0.005	802	1	802	1.4247	1.4305	5.8	290
C	15	12/6/2011	6:37	30.62	1.32	0.027	0.000	6218.334	0.005	775	1	775	1.4269	1.4320	5.1	255
C	16	12/6/2011	7:37	31.62	1.32	0.027	0.000	6218.334	0.004	726	1	726	1.4236	1.4287	5.1	255
C	17	12/6/2011	8:37	32.62	1.32	0.026	0.000	6218.334	0.004	719	1	719	1.4252	1.4304	5.2	260
C	18	12/6/2011	9:37	33.62	1.32	0.026	0.000	6218.334	0.004	708	1	708	1.4233	1.4285	5.2	260
C	19	12/6/2011	10:37	34.62	1.32	0.025	0.000	6218.334	0.004	708	1	708	1.4249	1.4294	4.5	225
C	20	12/6/2011	11:37	35.62	1.32	0.026	0.000	6218.334	0.004	646	1	646	1.4345	1.4388	4.3	215
C	21	12/6/2011	12:37	36.62	1.32	0.025	0.000	6218.334	0.004	633	1	633	1.4346	1.4391	4.5	225
C	22	12/6/2011	13:37	37.62	1.32	0.025	0.000	6218.334	0.004	621	1	621	1.4241	1.4287	4.6	230
C	23	12/6/2011	14:37	38.62	1.32	0.024	0.000	6218.334	0.004	593	1	593	1.4356	1.4398	4.2	210
D	0	12/5/2011	15:42	15.70	0.68	-	0.823	705.208	0.001	72.3	1	72	1.4240	1.4241	0.1	5
D	1	12/5/2011	16:41	16.68	1.05	-	1.019	4402.779	0.005	758	2	1,516	1.4387	1.4547	16	800
D	2	12/5/2011	17:41	17.68	1.09	-	0.122	6083.586	0.006	776	2	1,552	1.4317	1.4464	14.7	735
D	3	12/5/2011	18:41	18.68	1.1	-	0.000	6218.334	0.006	662	2	1,324	1.4261	1.4389	12.8	640
D	4	12/5/2011	19:41	19.68	1.14	-	0.000	6218.334	0.006	671	2	1,342	1.4167	1.4288	12.1	605
D	5	12/5/2011	20:41	20.68	1.16	-	0.000	6218.334	0.006	605	2	1,210	1.4221	1.4323	10.2	510
D	6	12/5/2011	21:41	21.68	1.2	-	0.000	6218.334	0.006	578	2	1,156	1.4202	1.4307	10.5	525
D	7	12/5/2011	22:41	22.68	1.21	-	0.000	6218.334	0.006	597	2	1,194	1.4213	1.4311	9.8	490
D	8	12/5/2011	23:41	23.68	1.22	-	0.000	6218.334	0.006	565	2	1,130	1.4166	1.4263	9.7	485
D	9	12/6/2011	0:41	24.68	1.31	-	0.000	6218.334	0.006	524	2	1,048	1.4247	1.4331	8.4	420
D	10	12/6/2011	1:41	25.68	1.31	-	0.000	6218.334	0.005	439	2	878	1.4269	1.4332	6.3	315
D	11	12/6/2011	2:41	26.68	1.31	-	0.000	6218.334	0.005	876	1	876	1.4180	1.4242	6.2	310
D	12	12/6/2011	3:41	27.68	1.31	-	0.000	6218.334	0.005	940	1	940	1.4328	1.4403	7.5	375
D	13	12/6/2011	4:41	28.68	1.32	-	0.000	6218.334	0.005	918	1	918	1.4287	1.4357	7	350
D	14	12/6/2011	5:41	29.68	1.32	-	0.000	6218.334	0.005	856	1	856	1.4314	1.4378	6.4	320
D	15	12/6/2011	6:41	30.68	1.32	-	0.000	6218.334	0.005	779	1	779	1.4241	1.4296	5.5	275
D	16	12/6/2011	7:41	31.68	1.32	-	0.000	6218.334	0.004	699	1	699	1.4247	1.4300	5.3	265
D	17	12/6/2011	8:41	32.68	1.32	-	0.000	6218.334	0.004	664	1	664	1.4198	1.4249	5.1	255
D	18	12/6/2011	9:41	33.68	1.32	-	0.000	6218.334	0.004	642	1	642	1.4252	1.4300	4.8	240
D	19	12/6/2011	10:41	34.68	1.32	-	0.000	6218.334	0.004	642	1	642	1.4245	1.4295	5	250
D	20	12/6/2011	11:41	35.68	1.32	-	0.000	6218.334	0.004	631	1	631	1.4319	1.4366	4.7	235
D	21	12/6/2011	12:41	36.68	1.32	-	0.000	6218.334	0.004	626	1	626	1.4181	1.4229	4.8	240
D	22	12/6/2011	13:41	37.68	1.32	-	0.000	6218.334	0.004	616	1	616	1.4308	1.4353	4.5	225
D	23	12/6/2011	14:41	38.68	1.32	-	0.000	6218.334	0.004	615	1	615	1.4210	1.4261	5.1	255
E	0	12/5/2011	15:49	15.82	0.68	-	1.042	1101.554	0.001	83.2	1	83	1.4214	1.4214	0	0
E	1	12/5/2011	16:47	16.78	1.05	-	0.930	4762.901	0.005	776	2	1,552	1.4189	1.4355	16.6	830
E	2	12/5/2011	17:47	17.78	1.09	-	0.100	6123.526	0.006	821	2	1,642	1.4192	1.4369	17.7	885
E	3	12/5/2011	18:47	18.78	1.1	-	0.000	6218.334	0.006	684	2	1,368	1.4195	1.4321	12.6	630
E	4	12/5/2011	19:47	19.78	1.14	-	0.000	6218.334	0.006	636	2	1,272	1.4216	1.4330	11.4	570
E	5	12/5/2011	20:47	20.78	1.16	-	0.000	6218.334	0.006	652	2	1,304	1.4279	1.4391	11.2	560
E	6	12/5/2011	21:47	21.78	1.2	-	0.000	6218.334	0.006	615	2	1,230	1.4273	1.4377	10.4	520
E	7	12/5/2011	22:47	22.78	1.21	-	0.000	6218.334	0.006	571	2	1,142	1.4207	1.4302	9.5	475
E	8	12/5/2011	23:47	23.78	1.22	-	0.000	6218.334	0.006	533	2	1,066	1.4185	1.4271	8.6	430
E	9	12/6/2011	0:47	24.78	1.31	-	0.000	6218.334	0.006	548	2	1,096	1.4206	1.4289	8.3	415
E	10	12/6/2011	1:47	25.78	1.31	-	0.000	6218.334	0.005	497	2	994	1.4212	1.4293	8.1	405
E	11	12/6/2011	2:47	26.78	1.31	-	0.000	6218.334	0.005	469	2	938	1.4190	1.4260	7	350
E	12	12/6/2011	3:47	27.78	1.31	-	0.000	6218.334	0.005	361	2	722	1.4196	1.4243	4.7	235
E	13	12/6/2011	4:47	28.78	1.32	-	0.000	6218.334	0.005	770	1	770	1.4232	1.4283	5.1	255
E	14	12/6/2011	5:47	29.78	1.32	-	0.000	6218.334	0.005	710	1	710	1.4202	1.4248	4.6	230
E	15	12/6/2011	6:47	30.78	1.32	-	0.000	6218.334	0.005	648	1	648	1.4296	1.4342	4.6	230
E	16	12/6/2011	7:47	31.78	1.32	-	0.000	6218.334	0.004	634	1	634	1.4324	1.4371	4.7	235
E	17	12/6/2011	8:47	32.78	1.32	-	0.000	6218.334	0.004	627	1	627	1.4254	1.4300	4.6	230
E	18	12/6/2011	9:47	33.78	1.32	-	0.000	6218.334	0.004	625	1	625	1.4272	1.4313	4.1	205
E	19	12/6/2011	10:47	34.78	1.32	-	0.000	6218.334	0.004	607	1	607	1.4274	1.4318	4.4	220
E	20	12/6/2011	11:47	35.78	1.32	-	0.000	6218.334	0.004	600	1	600	1.4327	1.4364	3.7	185
E	21	12/6/2011	12:47	36.78	1.32	-	0.000	6218.334	0.004	614	1	614	1.4266	1.4305	3.9	195
E	22	12/6/2011	13:47	37.78	1.32	-	0.000	6218.334	0.004	618	1	618	1.4215	1.4250	3.5	175
E	23	12/6/2011	14:47	38.78	1.32	-	0.000	6218.334	0.004	590	1	590	1.4211	1.4253	4.2	210

APPENDIX D

Project: ALDOT 502
Site Name: Basin 4
Site Conditions: Damp / Cold
Analysis Performed By: Chris Logan
Date of Analysis: 12/19/2011
TSS Sample Vol. : 20 mL
Turbidity Sample Vol. : 15 mL

Sampler	Sample #	Date of Sample	Time of Sample	(TIME)	Rainfall (in)	Level (m)	Inflow Rate (cfs)	Inflow Volume (cf)	Outflow Rate (cfs)	Measured Tubidity (on turbidimeter)	Turbidity Ratio (1:x)	Actual Turbidity	Clean Dish/Filter Weight (g)	Dried Ladin Dish/Filter Weight (g)	TSS Weight of Sample (mg)	TSS (mg/L)
C	5	12/10/2011	8:04	8.07	0	0.0280	0.0000	0.000	0.005	333	1	333	1.4101	1.4147	4.6	230
C	6	12/10/2011	9:04	9.07	0	0.0000	0.0000	0.000	0.000	191	1	191	1.4150	1.4165	1.5	75
C	7	12/10/2011	10:04	10.07	0	0.0000	0.0000	0.000	0.000	194	1	194	1.4286	1.4295	0.9	45
C	8	12/10/2011	11:04	11.07	0	0.0000	0.0000	0.000	0.000	184	1	184	1.4079	1.4099	2	100
C	9	12/10/2011	12:04	12.07	0	0.0000	0.0000	0.000	0.000	188	1	188	1.4128	1.4156	2.8	140
C	10	12/10/2011	13:04	13.07	0	0.0000	0.0000	0.000	0.000	184	1	184	1.4008	1.4045	3.7	185
C	11	12/10/2011	14:04	14.07	0	0.0000	0.0000	0.000	0.000	185	1	185	1.4211	1.4245	3.4	170
C	12	12/10/2011	15:04	15.07	0	0.0000	0.0000	0.000	0.000	180	1	180	1.4195	1.4236	4.1	205
C	13	12/10/2011	16:04	16.07	0	0.0000	0.0000	0.000	0.000	181	1	181	1.4082	1.4127	4.5	225
C	14	12/10/2011	17:04	17.07	0	0.0000	0.0000	0.000	0.000	177	1	177	1.3950	1.3982	3.2	160
C	15	12/10/2011	18:04	18.07	0	0.0000	0.0000	0.000	0.000	176	1	176	1.4087	1.4119	3.2	160
C	16	12/10/2011	19:04	19.07	0	0.0000	0.0000	0.000	0.000	182	1	182	1.4045	1.4076	3.1	155
C	17	12/10/2011	20:04	20.07	0	0.0000	0.0000	0.000	0.000	186	1	186	1.4029	1.4058	2.9	145
C	18	12/10/2011	21:04	21.07	0	0.0000	0.0000	0.000	0.000	183	1	183	1.4134	1.4172	3.8	190
C	19	12/10/2011	22:04	22.07	0	0.0000	0.0000	0.000	0.000	182	1	182	1.4031	1.4067	3.6	180
C	20	12/10/2011	23:04	23.07	0	0.0000	0.0000	0.000	0.000	180	1	180	1.4156	1.4176	2	100
D	3	12/10/2011	4:24	4.40	0	-	0.0000	0.000	0.023	202	1	202	1.4205	1.4256	5.1	255
D	4	12/10/2011	5:21	5.35	0	-	0.0000	0.000	0.053	202	1	202	1.4130	1.4169	3.9	195
D	5	12/10/2011	6:21	6.35	0	-	0.0000	0.000	0.000	197	1	197	1.4009	1.4054	4.5	225
D	6	12/10/2011	7:17	7.28	0	-	0.0000	0.000	0.000	197	1	197	1.4165	1.4201	3.6	180
D	7	12/10/2011	8:15	8.25	0	-	0.0000	0.000	0.000	193	1	193	1.4157	1.4194	3.7	185
D	8	12/10/2011	9:08	9.13	0	-	0.0000	0.000	0.000	203	1	203	1.4174	1.4212	3.8	190
D	9	12/10/2011	10:08	10.13	0	-	0.0000	0.000	0.000	194	1	194	1.4186	1.4215	2.9	145
D	10	12/10/2011	11:08	11.13	0	-	0.0000	0.000	0.000	185	1	185	1.4138	1.4175	3.7	185
D	11	12/10/2011	12:08	12.13	0	-	0.0000	0.000	0.000	189	1	189	1.4229	1.4271	4.2	210
D	12	12/10/2011	13:08	13.13	0	-	0.0000	0.000	0.000	185	1	185	1.4144	1.4176	3.2	160
D	13	12/10/2011	14:08	14.13	0	-	0.0000	0.000	0.000	199	1	199	1.4245	1.4266	2.1	105
D	14	12/10/2011	15:08	15.13	0	-	0.0000	0.000	0.000	189	1	189	1.4194	1.4210	1.6	80
D	15	12/10/2011	16:08	16.13	0	-	0.0000	0.000	0.000	186	1	186	1.4211	1.4224	1.3	65
D	16	12/10/2011	17:08	17.13	0	-	0.0000	0.000	0.000	191	1	191	1.4158	1.4172	1.4	70
D	17	12/10/2011	18:08	18.13	0	-	0.0000	0.000	0.000	186	1	186	1.4185	1.4194	0.9	45
D	18	12/10/2011	19:08	19.13	0	-	0.0000	0.000	0.000	186	1	186	1.4228	1.4233	0.5	25
D	19	12/10/2011	20:08	20.13	0	-	0.0000	0.000	0.000	192	1	192	1.4265	1.4271	0.6	30
D	20	12/10/2011	21:08	21.13	0	-	0.0000	0.000	0.000	185	1	185	1.4126	1.4135	0.9	45
D	21	12/10/2011	22:09	22.15	0	-	0.0000	0.000	0.000	185	1	185	1.4173	1.4182	0.9	45
D	22	12/10/2011	23:13	23.22	0	-	0.0000	0.000	0.007	182	1	182	1.4110	1.4120	1	50
D	23	12/11/2011	0:21	24.35	0	-	0.0000	0.000	0.000	178	1	178	1.4215	1.4220	0.5	25
D	24	12/11/2011	1:21	25.35	0	-	0.0000	0.000	0.000	194	1	194	1.4100	1.4115	1.5	75
E	3	12/10/2011	4:24	4.40	0	-	0.0000	0.000	0.023	204	1	204	1.4101	1.4149	4.8	240
E	4	12/10/2011	5:21	5.35	0	-	0.0000	0.000	0.053	201	1	201	1.4048	1.4090	4.2	210
E	5	12/10/2011	6:21	6.35	0	-	0.0000	0.000	0.000	201	1	201	1.4112	1.4158	4.6	230
E	6	12/10/2011	7:17	7.28	0	-	0.0000	0.000	0.000	196	1	196	1.4267	1.4311	4.4	220
E	7	12/10/2011	8:15	8.25	0	-	0.0000	0.000	0.000	200	1	200	1.4091	1.4139	4.8	240
E	8	12/10/2011	9:08	9.13	0	-	0.0000	0.000	0.000	188	1	188	1.4150	1.4192	4.2	210
E	9	12/10/2011	10:08	10.13	0	-	0.0000	0.000	0.000	193	1	193	1.4131	1.4173	4.2	210
E	10	12/10/2011	11:08	11.13	0	-	0.0000	0.000	0.000	182	1	182	1.4211	1.4254	4.3	215
E	11	12/10/2011	12:08	12.13	0	-	0.0000	0.000	0.000	183	1	183	1.4128	1.4168	4	200
E	12	12/10/2011	13:08	13.13	0	-	0.0000	0.000	0.000	186	1	186	1.4146	1.4184	3.8	190
E	13	12/10/2011	14:08	14.13	0	-	0.0000	0.000	0.000	184	1	184	1.4070	1.4104	3.4	170
E	14	12/10/2011	15:08	15.13	0	-	0.0000	0.000	0.000	185	1	185	1.4059	1.4099	4	200
E	15	12/10/2011	16:08	16.13	0	-	0.0000	0.000	0.000	184	1	184	1.4107	1.4142	3.5	175
E	16	12/10/2011	17:08	17.13	0	-	0.0000	0.000	0.000	184	1	184	1.4151	1.4187	3.6	180
E	17	12/10/2011	18:08	18.13	0	-	0.0000	0.000	0.000	179	1	179	1.4170	1.4206	3.6	180
E	18	12/10/2011	19:08	19.13	0	-	0.0000	0.000	0.000	180	1	180	1.4073	1.4110	3.7	185
E	19	12/10/2011	20:08	20.13	0	-	0.0000	0.000	0.000	185	1	185	1.4348	1.4384	3.6	180
E	20	12/10/2011	21:08	21.13	0	-	0.0000	0.000	0.000	178	1	178	1.4251	1.4288	3.7	185
E	21	12/10/2011	22:09	22.15	0	-	0.0000	0.000	0.000	178	1	178	1.4197	1.4231	3.4	170
E	22	12/10/2011	23:13	23.22	0	-	0.0000	0.000	0.007	180	1	180	1.4230	1.4267	3.7	185
E	23	12/11/2011	0:21	24.35	0	-	0.0000	0.000	0.000	182	1	182	1.4219	1.4256	3.7	185
E	24	12/11/2011	1:21	25.35	0	-	0.0000	0.000	0.000	181	1	181	1.4219	1.4258	3.9	195

APPENDIX D

Project: ALDOT 502
Site Name: Basin 4
Site Conditions: Inflow Channel not working properly / freezing conditions caused some samples to be missed
Analysis Performed By: Chris Logan
Date of Analysis: 12/27/2011
TSS Sample Vol. : 20 mL
Turbidity Sample Vol. : 15 mL

Sampler	Sample #	Date of Sample	Time of Sample	(TIME)	Rainfall (in)	Level (m)	Inflow Rate (cfs)	Inflow Volume (cf)	Outflow Rate (cfs)	Measured Tubidity (on turbidimeter)	Turbidity Ratio (1:x)	Actual Turbidity	Clean Dish/Filter Weight (g)	Dried Ladin Dish/Filter Weight (g)	TSS Weight of Sample (mg)	TSS (mg/L)
A	1	12/22/2011	10:03	106.05	1.87	0.014	0.100	99.613	0.005	716	2	1432	1.4186	1.4340	15.4	770
A	2	12/22/2011	10:57	106.95	2.31	0.018	0.145	449.796	0.006	774	2	1548	1.4025	1.4172	14.7	735
A	3	12/22/2011	11:36	107.60	2.55	0.013	0.090	719.571	0.007	647	2	1294	1.4222	1.4348	12.6	630
C	5	12/18/2011	10:01	10.02	1.19	0.000	0.000	89.392	0.000	138	1	138	1.3960	1.3975	1.5	75
C	6	12/18/2011	11:01	11.02	1.19	0.001	0.133	481.130	0.000	128	1	128	1.4163	1.4179	1.6	80
C	7	12/18/2011	12:01	12.02	1.19	0.005	0.052	807.743	0.000	135	1	135	1.4066	1.4079	1.3	65
C	8	12/18/2011	13:01	13.02	1.19	0.007	0.000	833.228	0.000	124	1	124	1.4051	1.4067	1.6	80
C	9	12/18/2011	14:01	14.02	1.19	0.007	0.000	833.228	0.000	124	1	124	1.4081	1.4095	1.4	70
C	10	12/18/2011	15:01	15.02	1.19	0.005	0.000	833.228	0.000	121	1	121	1.4145	1.4163	1.8	90
C	11	12/18/2011	16:01	16.02	1.19	0.003	0.000	833.228	0.000	122	1	122	1.3994	1.4018	2.4	120
C	12	12/18/2011	17:01	17.02	1.19	0.001	0.000	833.228	0.000	122	1	122	1.4145	1.4166	2.1	105
C	13	12/18/2011	18:01	18.02	1.19	0.000	0.000	833.228	0.000	122	1	122	1.4140	1.4159	1.9	95
C	14	12/18/2011	19:01	19.02	1.19	0.000	0.000	833.228	0.000	122	1	122	1.4207	1.4224	1.7	85
C	15	12/18/2011	20:01	20.02	1.19	0.000	0.000	833.228	0.000	120	1	120	1.4111	1.4131	2	100
C	16	12/18/2011	21:01	21.02	1.19	0.000	0.000	833.228	0.000	119	1	119	1.4087	1.4103	1.6	80
C	17	12/18/2011	22:01	22.02	1.19	0.000	0.000	833.228	0.000	116	1	116	1.4139	1.4152	1.3	65
C	18	12/18/2011	23:01	23.02	1.19	0.000	0.000	833.228	0.000	127	1	127	1.4186	1.4199	1.3	65
C	19	12/19/2011	0:01	24.02	1.19	0.000	0.000	833.228	0.000	121	1	121	1.4052	1.4073	2.1	105
C	20	12/19/2011	1:01	25.02	1.19	0.000	0.000	833.228	0.000	117	1	117	1.4096	1.4113	1.7	85
C	21	12/19/2011	2:01	26.02	1.19	0.000	0.000	833.228	0.000	113	1	113	1.3987	1.4002	1.5	75
C	22	12/19/2011	3:01	27.02	1.19	0.000	0.000	833.228	0.000	119	1	119	1.3987	1.4010	2.3	115
C	23	12/19/2011	4:01	28.02	1.19	0.000	0.000	833.228	0.000	118	1	118	1.4277	1.4293	1.6	80
C	24	12/19/2011	5:01	29.02	1.19	0.000	0.000	833.228	0.000	117	1	117	1.4059	1.4076	1.7	85
D	4	12/18/2011	9:17	9.28	1.19		0.011	89.015	0.000	126	1	126	1.3923	1.3941	1.8	90
D	5	12/18/2011	10:04	10.07	1.19		0.000	89.392	0.000	137	1	137	1.3984	1.4010	2.6	130
D	6	12/18/2011	11:05	11.08	1.19		0.122	510.406	0.000	130	1	130	1.3921	1.3946	2.5	125
D	7	12/18/2011	12:05	12.08	1.19		0.036	817.836	0.000	131	1	131	1.3946	1.3970	2.4	120
D	8	12/18/2011	13:05	13.08	1.19		0.000	833.228	0.000	130	1	130	1.3935	1.3953	1.8	90
D	9	12/18/2011	14:05	14.08	1.19		0.000	833.228	0.000	133	1	133	1.3914	1.3932	1.8	90
D	10	12/18/2011	15:05	15.08	1.19		0.000	833.228	0.000	127	1	127	1.3876	1.3892	1.6	80
D	11	12/18/2011	16:05	16.08	1.19		0.000	833.228	0.000	126	1	126	1.3919	1.3947	2.8	140
D	12	12/18/2011	17:05	17.08	1.19		0.000	833.228	0.000	133	1	133	1.4082	1.4102	2	100
D	13	12/18/2011	18:05	18.08	1.19		0.000	833.228	0.000	133	1	133	1.4135	1.4162	2.7	135
D	14	12/18/2011	19:05	19.08	1.19		0.000	833.228	0.000	134	1	134	1.3982	1.4000	1.8	90
D	15	12/18/2011	20:05	20.08	1.19		0.000	833.228	0.000	135	1	135	1.4143	1.4166	2.3	115
D	16	12/18/2011	21:05	21.08	1.19		0.000	833.228	0.000	126	1	126	1.3981	1.3995	1.4	70
D	17	12/18/2011	22:05	22.08	1.19		0.000	833.228	0.000	122	1	122	1.4098	1.4116	1.8	90
D	18	12/18/2011	23:05	23.08	1.19		0.000	833.228	0.000	124	1	124	1.4032	1.4050	1.8	90
D	19	12/19/2011	0:05	24.08	1.19		0.000	833.228	0.000	125	1	125	1.4036	1.4050	1.4	70
D	20	12/19/2011	1:05	25.08	1.19		0.000	833.228	0.000	125	1	125	1.4080	1.4093	1.3	65
D	21	12/19/2011	2:05	26.08	1.19		0.000	833.228	0.000	123	1	123	1.4077	1.4101	2.4	120
D	22	12/19/2011	3:05	27.08	1.19		0.000	833.228	0.000	122	1	122	1.4068	1.4078	1	50
D	23	12/19/2011	4:05	28.08	1.19		0.000	833.228	0.000	119	1	119	1.4173	1.4195	2.2	110
D	24	12/19/2011	5:04	29.07	1.19		0.000	833.228	0.000	120	1	120	1.4161	1.4182	2.1	105
E	5	12/18/2011	10:11	10.18	1.19		0.000	89.392	0.000	129	1	129	1.4277	1.4300	2.3	115
E	6	12/18/2011	11:11	11.18	1.19		0.111	550.324	0.000	133	1	133	1.4186	1.4209	2.3	115
E	7	12/18/2011	12:11	12.18	1.19		0.029	828.291	0.000	143	1	143	1.4124	1.4149	2.5	125
E	8	12/18/2011	13:11	13.18	1.19		0.000	833.228	0.000	137	1	137	1.4112	1.4131	1.9	95
E	9	12/18/2011	14:11	14.18	1.19		0.000	833.228	0.000	128	1	128	1.4214	1.4240	2.6	130
E	10	12/18/2011	15:11	15.18	1.19		0.000	833.228	0.000	138	1	138	1.4276	1.4297	2.1	105
E	11	12/18/2011	16:11	16.18	1.19		0.000	833.228	0.000	138	1	138	1.4098	1.4117	1.9	95
E	12	12/18/2011	17:11	17.18	1.19		0.000	833.228	0.000	133	1	133	1.3990	1.4009	1.9	95
E	13	12/18/2011	18:11	18.18	1.19		0.000	833.228	0.000	138	1	138	1.3948	1.3966	1.8	90
E	14	12/18/2011	19:11	19.18	1.19		0.000	833.228	0.000	136	1	136	1.3920	1.3939	1.9	95
E	15	12/18/2011	20:11	20.18	1.19		0.000	833.228	0.000	132	1	132	1.3918	1.3948	3	150
E	16	12/18/2011	21:11	21.18	1.19		0.000	833.228	0.000	128	1	128	1.4200	1.4223	2.3	115
E	17	12/18/2011	22:11	22.18	1.19		0.000	833.228	0.000	129	1	129	1.3922	1.3941	1.9	95
E	18	12/18/2011	23:11	23.18	1.19		0.000	833.228	0.000	128	1	128	1.4048	1.4070	2.2	110
E	19	12/19/2011	0:11	24.18	1.19		0.000	833.228	0.000	124	1	124	1.4155	1.4179	2.4	120
E	20	12/19/2011	1:11	25.18	1.19		0.000	833.228	0.000	130	1	130	1.4259	1.4278	1.9	95
E	21	12/19/2011	2:11	26.18	1.19		0.000	833.228	0.000	127	1	127	1.4202	1.4221	1.9	95
E	22	12/19/2011	3:11	27.18	1.19		0.000	833.228	0.000	125	1	125	1.4254	1.4277	2.3	115
E	23	12/19/2011	4:11	28.18	1.19		0.000	833.228	0.000	121	1	121	1.4058	1.4080	2.2	110
E	24	12/19/2011	5:11	29.18	1.19		0.000	833.228	0.000	130	1	130	1.4230	1.4251	2.1	105

APPENDIX D

Project: ALDOT 502
Site Name: Basin 4
Site Conditions: Inflow Channel Not working as Designed - Primary Inflow not flowing through channel.
Analysis Performed By: Chris Logan
Date of Analysis: 12/27/2011
TSS Sample Vol. : 20 mL
Turbidity Sample Vol. : 15 mL

Sampler	Sample #	Date of Sample	Time of Sample	(TIME)	Rainfall (in)	Level (m)	Inflow Rate (cfs)	Inflow Volume (cf)	Outflow Rate (cfs)	Measured Tubidity (on turbidimeter)	Turbidity Ratio (1:x)	Actual Turbidity	Clean Dish/Filter Weight (g)	Dried Ladin Dish/Filter Weight (g)	TSS Weight of Sample (mg)	TSS (mg/L)
A	1	12/22/2011	10:03	106.05	1.87	0.014	0.100	99.613	0.005	716	2	1432	1.4186	1.4340	15.4	770
A	2	12/22/2011	10:57	106.95	2.31	0.018	0.145	449.796	0.006	774	2	1548	1.4025	1.4172	14.7	735
A	3	12/22/2011	11:36	107.60	2.55	0.013	0.090	719.571	0.007	647	2	1294	1.4222	1.4348	12.6	630
C	1	12/23/2011	13:02	13.03	1.7	0.021	0.000	833.228	0.003	382	1	382	1.3942	1.3973	3.1	155
C	2	12/23/2011	14:02	14.03	1.7	0.018	0.000	833.228	0.002	411	1	411	1.4108	1.4139	3.1	155
C	3	12/23/2011	15:02	15.03	1.7	0.018	0.000	833.228	0.002	398	1	398	1.4045	1.4077	3.2	160
C	4	12/23/2011	16:02	16.03	1.7	0.017	0.000	833.228	0.002	391	1	391	1.4007	1.4034	2.7	135
C	5	12/23/2011	17:02	17.03	1.7	0.017	0.000	833.228	0.002	391	1	391	1.3957	1.3989	3.2	160
C	6	12/23/2011	18:02	18.03	1.7	0.015	0.000	833.228	0.001	401	1	401	1.4026	1.4061	3.5	175
C	7	12/23/2011	19:02	19.03	1.7	0.014	0.000	833.228	0.001	386	1	386	1.4131	1.4166	3.5	175
C	8	12/23/2011	20:02	20.03	1.7	0.011	0.000	833.228	0.001	370	1	370	1.4154	1.4187	3.3	165
C	9	12/23/2011	21:02	21.03	1.7	0.010	0.000	833.228	0.001	371	1	371	1.4088	1.4118	3	150
C	10	12/23/2011	22:02	22.03	1.7	0.008	0.000	833.228	0.000	368	1	368	1.4092	1.4129	3.7	185
C	11	12/23/2011	23:02	23.03	1.7	0.009	0.000	833.228	0.000	362	1	362	1.4131	1.4163	3.2	160
C	12	12/24/2011	0:02	24.03	1.7	0.008	0.000	833.228	0.000	349	1	349	1.4099	1.4131	3.2	160
C	13	12/24/2011	1:02	25.03	1.7	0.008	0.000	833.228	0.000	337	1	337	1.3918	1.3950	3.2	160
C	14	12/24/2011	2:02	26.03	1.7	0.008	0.000	833.228	0.000	339	1	339	1.4131	1.4159	2.8	140
C	15	12/24/2011	3:02	27.03	1.7	0.008	0.000	833.228	0.000	322	1	322	1.3998	1.4030	3.2	160
C	16	12/24/2011	4:02	28.03	1.7	0.007	0.000	833.228	0.000	320	1	320	1.3946	1.3975	2.9	145
C	17	12/24/2011	5:02	29.03	1.7	0.005	0.000	833.228	0.000	326	1	326	1.4080	1.4107	2.7	135
C	18	12/24/2011	6:02	30.03	1.7	0.005	0.000	833.228	0.000	320	1	320	1.4064	1.4091	2.7	135
C	19	12/24/2011	7:02	31.03	1.7	0.004	0.000	833.228	0.000	325	1	325	1.4016	1.4043	2.7	135
C	20	12/24/2011	8:02	32.03	1.7	0.004	0.000	833.228	0.000	303	1	303	1.3991	1.4020	2.9	145
C	21	12/24/2011	9:02	33.03	1.7	0.004	0.000	833.228	0.000	280	1	280	1.4231	1.4263	3.2	160
C	22	12/24/2011	10:02	34.03	1.7	0.004	0.000	833.228	0.000	266	1	266	1.3958	1.3981	2.3	115
C	23	12/24/2011	11:02	35.03	1.7	0.005	0.000	833.228	0.000	280	1	280	1.4143	1.4166	2.3	115
C	24	12/24/2011	12:02	36.03	1.7	0.008	0.000	833.228	0.000	280	1	280	1.4227	1.4253	2.6	130
D	1	12/23/2011	13:08	13.13	1.7	-	0.000	833.228	0.003	482	1	482	1.4029	1.4070	4.1	205
D	2	12/23/2011	14:06	14.10	1.7	-	0.000	833.228	0.002	460	1	460	1.4133	1.4168	3.5	175
D	3	12/23/2011	15:06	15.10	1.7	-	0.000	833.228	0.002	445	1	445	1.4219	1.4257	3.8	190
D	4	12/23/2011	16:06	16.10	1.7	-	0.000	833.228	0.002	420	1	420	1.4185	1.4224	3.9	195
D	5	12/23/2011	17:06	17.10	1.7	-	0.000	833.228	0.002	376	1	376	1.3993	1.4030	3.7	185
D	6	12/23/2011	18:06	18.10	1.7	-	0.000	833.228	0.001	415	1	415	1.3951	1.3989	3.8	190
D	7	12/23/2011	19:06	19.10	1.7	-	0.000	833.228	0.001	396	1	396	1.4230	1.4262	3.2	160
D	8	12/23/2011	20:06	20.10	1.7	-	0.000	833.228	0.001	393	1	393	1.4100	1.4134	3.4	170
D	9	12/23/2011	21:06	21.10	1.7	-	0.000	833.228	0.001	393	1	393	1.4023	1.4055	3.2	160
D	10	12/23/2011	22:07	22.12	1.7	-	0.000	833.228	0.000	390	1	390	1.3940	1.3973	3.3	165
D	11	12/23/2011	23:07	23.12	1.7	-	0.000	833.228	0.000	389	1	389	1.4028	1.4060	3.2	160
D	12	12/24/2011	0:07	24.12	1.7	-	0.000	833.228	0.000	386	1	386	1.4145	1.4173	2.8	140
D	13	12/24/2011	1:07	25.12	1.7	-	0.000	833.228	0.000	377	1	377	1.4106	1.4140	3.4	170
D	14	12/24/2011	2:07	26.12	1.7	-	0.000	833.228	0.000	384	1	384	1.4256	1.4285	2.9	145
D	15	12/24/2011	3:07	27.12	1.7	-	0.000	833.228	0.000	361	1	361	1.3886	1.3919	3.3	165
D	16	12/24/2011	4:07	28.12	1.7	-	0.000	833.228	0.000	384	1	384	1.3904	1.3934	3	150
D	17	12/24/2011	5:07	29.12	1.7	-	0.000	833.228	0.000	371	1	371	1.4176	1.4205	2.9	145
D	18	12/24/2011	6:07	30.12	1.7	-	0.000	833.228	0.000	369	1	369	1.4118	1.4149	3.1	155
D	19	12/24/2011	7:07	31.12	1.7	-	0.000	833.228	0.000	365	1	365	1.4102	1.4133	3.1	155
D	20	12/24/2011	8:07	32.12	1.7	-	0.000	833.228	0.000	361	1	361	1.4234	1.4261	2.7	135
D	21	12/24/2011	9:06	33.10	1.7	-	0.000	833.228	0.000	364	1	364	1.3961	1.3998	3.7	185
D	22	12/24/2011	10:06	34.10	1.7	-	0.000	833.228	0.000	361	1	361	1.4128	1.4160	3.2	160
D	23	12/24/2011	11:06	35.10	1.7	-	0.000	833.228	0.000	352	1	352	1.3947	1.3977	3	150
D	24	12/24/2011	12:06	36.10	1.7	-	0.000	833.228	0.000	375	1	375	1.3902	1.3932	3	150
E	1	12/23/2011	13:36	13.60	1.7	-	0.000	833.228	0.003	483	1	483	1.4181	1.4228	4.7	235
E	2	12/23/2011	14:34	14.57	1.7	-	0.000	833.228	0.002	439	1	439	1.4128	1.4169	4.1	205
E	3	12/23/2011	15:34	15.57	1.7	-	0.000	833.228	0.002	441	1	441	1.4123	1.4163	4	200
E	4	12/23/2011	16:34	16.57	1.7	-	0.000	833.228	0.002	422	1	422	1.4143	1.4184	4.1	205
E	5	12/23/2011	17:34	17.57	1.7	-	0.000	833.228	0.002	403	1	403	1.4148	1.4186	3.8	190
E	6	12/23/2011	18:34	18.57	1.7	-	0.000	833.228	0.001	415	1	415	1.4128	1.4168	4	200
E	7	12/23/2011	19:34	19.57	1.7	-	0.000	833.228	0.001	395	1	395	1.4091	1.4128	3.7	185
E	8	12/23/2011	20:34	20.57	1.7	-	0.000	833.228	0.001	388	1	388	1.4222	1.4257	3.5	175
E	9	12/23/2011	21:34	21.57	1.7	-	0.000	833.228	0.001	385	1	385	1.4311	1.4355	4.4	220
E	10	12/23/2011	22:34	22.57	1.7	-	0.000	833.228	0.000	382	1	382	1.4216	1.4249	3.3	165
E	11	12/23/2011	23:34	23.57	1.7	-	0.000	833.228	0.000	385	1	385	1.4218	1.4252	3.4	170
E	12	12/24/2011	0:34	24.57	1.7	-	0.000	833.228	0.000	363	1	363	1.4011	1.4051	4	200
E	13	12/24/2011	1:34	25.57	1.7	-	0.000	833.228	0.000	361	1	361	1.3988	1.4018	3	150
E	14	12/24/2011	2:34	26.57	1.7	-	0.000	833.228	0.000	370	1	370	1.3937	1.3972	3.5	175
E	15	12/24/2011	3:34	27.57	1.7	-	0.000	833.228	0.000	366	1	366	1.3924	1.3962	3.8	190
E	16	12/24/2011	4:34	28.57	1.7	-	0.000	833.228	0.000	357	1	357	1.4230	1.4263	3.3	165
E	17	12/24/2011	5:34	29.57	1.7	-	0.000	833.228	0.000	345	1	345	1.4138	1.4167	2.9	145
E	18	12/24/2011	6:34	30.57	1.7	-	0.000	833.228	0.000	336	1	336	1.4296	1.4326	3	150
E	19	12/24/2011	7:34	31.57	1.7	-	0.000	833.228	0.000	298	1	298	1.4043	1.4070	2.7	135
E	20	12/24/2011	8:34	32.57	1.7	-	0.000	833.228	0.000	305	1	305	1.4002	1.4032	3	150
E	21	12/24/2011	9:34	33.57	1.7	-	0.000	833.228	0.000	350	1	350	1.4162	1.4192	3	150
E	22	12/24/2011	10:34	34.57	1.7	-	0.000	833.228	0.000	341	1	341	1.4006	1.4032	2.6	130
E	23	12/24/2011	11:34	35.57	1.7	-	0.000	833.228	0.000	339	1	339	1.4108	1.4137	2.9	145
E	24	12/24/2011	12:34	36.57	1.7	-	0.000	833.228	0.000	344	1	344	1.3951	1.3981	3	150

APPENDIX D

Project: ALDOT 502
Site Name: Basin 4
Site Conditions: Inflow Channel Not working as Designed - Primary Inflow not flowing through channel
Analysis Performed By: Chris Logan
Date of Analysis: 12/31/2011
TSS Sample Vol. : 20 mL
Turbidity Sample Vol. : 15 mL

Sampler	Sample #	Date of Sample	Time of Sample	(TIME)	Rainfall (in)	Level (m)	Inflow Rate (cfs)	Inflow Volume (cf)	Outflow Rate (cfs)	Measured Tubidity (on turbidimeter)	Turbidity Ratio (1:x)	Actual Turbidity	Clean Dish/Filter Weight (g)	Dried Ladin Dish/Filter Weight (g)	TSS Weight of Sample (mg)	TSS (mg/L)
A	1	12/26/2011	20:23	20.38	0.77	0.017	0.133	215.065	0.003	610	2	1,220	1.4086	1.4218	13.2	660
A	2	12/26/2011	21:45	21.75	0.98	0.007	0.039	413.242	0.004	955	1	955	1.3941	1.4017	7.6	380
C	1	12/26/2011	19:37	19.62	0.38	0.019	0.000	0.000	0.002	191	1	191	1.3991	1.4002	1.1	55
C	2	12/26/2011	20:37	20.62	0.81	0.024	0.061	289.873	0.004	215	1	215	1.4078	1.4089	1.1	55
C	3	12/26/2011	21:37	21.62	0.98	0.027	0.000	376.178	0.004	268	1	268	1.4013	1.4029	1.6	80
C	4	12/26/2011	22:37	22.62	1.22	0.028	0.000	501.656	0.005	255	1	255	1.3960	1.3976	1.6	80
C	5	12/26/2011	23:37	23.62	1.34	0.029	0.000	501.656	0.005	261	1	261	1.3999	1.4019	2	100
C	6	12/27/2011	0:37	24.62	1.49	0.030	0.000	501.656	0.005	252	1	252	1.3995	1.4010	1.5	75
C	7	12/27/2011	1:37	25.62	1.59	0.031	0.000	501.656	0.006	278	1	278	1.3962	1.3978	1.6	80
C	8	12/27/2011	2:37	26.62	1.6	0.030	0.000	501.656	0.006	265	1	265	1.3984	1.3998	1.4	70
C	9	12/27/2011	3:37	27.62	1.6	0.030	0.000	501.656	0.006	273	1	273	1.3946	1.3959	1.3	65
C	10	12/27/2011	4:37	28.62	1.6	0.030	0.000	501.656	0.005	295	1	295	1.3925	1.3938	1.3	65
C	11	12/27/2011	5:37	29.62	1.61	0.029	0.000	501.656	0.005	267	1	267	1.4008	1.4026	1.8	90
C	12	12/27/2011	6:37	30.62	1.62	0.029	0.000	501.656	0.005	260	1	260	1.4003	1.4016	1.3	65
C	13	12/27/2011	7:37	31.62	1.62	0.027	0.000	501.656	0.005	261	1	261	1.4002	1.4018	1.6	80
C	14	12/27/2011	8:37	32.62	1.62	0.027	0.000	501.656	0.005	255	1	255	1.3927	1.3940	1.3	65
C	15	12/27/2011	9:37	33.62	1.62	0.026	0.000	501.656	0.004	269	1	269	1.3974	1.3988	1.4	70
C	16	12/27/2011	10:37	34.62	1.62	0.026	0.000	501.656	0.004	292	1	292	1.3956	1.3972	1.6	80
C	17	12/27/2011	11:37	35.62	1.62	0.026	0.000	501.656	0.004	280	1	280	1.4045	1.4055	1	50
C	18	12/27/2011	12:37	36.62	1.62	0.026	0.000	501.656	0.004	284	1	284	1.3955	1.3966	1.1	55
C	19	12/27/2011	13:37	37.62	1.62	0.026	0.000	501.656	0.004	293	1	293	1.3960	1.3975	1.5	75
C	20	12/27/2011	14:37	38.62	1.62	0.026	0.000	501.656	0.004	295	1	295	1.3900	1.3917	1.7	85
C	21	12/27/2011	15:37	39.62	1.62	0.025	0.000	501.656	0.004	297	1	297	1.3971	1.3981	1	50
C	22	12/27/2011	16:37	40.62	1.62	0.024	0.000	501.656	0.004	302	1	302	1.3943	1.3960	1.7	85
C	23	12/27/2011	17:37	41.62	1.62	0.023	0.000	501.656	0.003	306	1	306	1.3996	1.4007	1.1	55
C	24	12/27/2011	18:37	42.62	1.62	0.021	0.000	501.656	0.003	306	1	306	1.4083	1.4097	1.4	70
D	1	12/26/2011	19:43	19.72	0.46	-	0.000	0.000	0.002	229	1	229	1.4039	1.4053	1.4	70
D	2	12/26/2011	20:41	20.68	0.83	-	0.061	305.068	0.004	267	1	267	1.3996	1.4010	1.4	70
D	3	12/26/2011	21:41	21.68	0.98	-	0.000	376.178	0.004	325	1	325	1.3917	1.3931	1.4	70
D	4	12/26/2011	22:41	22.68	1.22	-	0.000	501.656	0.005	383	1	383	1.4039	1.4063	2.4	120
D	5	12/26/2011	23:41	23.68	1.35	-	0.000	501.656	0.005	428	1	428	1.4102	1.4134	3.2	160
D	6	12/27/2011	0:41	24.68	1.51	-	0.000	501.656	0.005	430	1	430	1.3942	1.3968	2.6	130
D	7	12/27/2011	1:41	25.68	1.6	-	0.000	501.656	0.006	446	1	446	1.4099	1.4117	1.8	90
D	8	12/27/2011	2:41	26.68	1.6	-	0.000	501.656	0.006	427	1	427	1.4002	1.4030	2.8	140
D	9	12/27/2011	3:41	27.68	1.6	-	0.000	501.656	0.006	408	1	408	1.4056	1.4082	2.6	130
D	10	12/27/2011	4:41	28.68	1.6	-	0.000	501.656	0.005	408	1	408	1.3968	1.3997	2.9	145
D	11	12/27/2011	5:41	29.68	1.61	-	0.000	501.656	0.005	391	1	391	1.3987	1.4011	2.4	120
D	12	12/27/2011	6:41	30.68	1.62	-	0.000	501.656	0.005	391	1	391	1.3932	1.3954	2.2	110
D	13	12/27/2011	7:41	31.68	1.62	-	0.000	501.656	0.005	389	1	389	1.3888	1.3908	2	100
D	14	12/27/2011	8:41	32.68	1.62	-	0.000	501.656	0.005	384	1	384	1.3889	1.3908	1.9	95
D	15	12/27/2011	9:41	33.68	1.62	-	0.000	501.656	0.004	359	1	359	1.3889	1.3909	2	100
D	16	12/27/2011	10:41	34.68	1.62	-	0.000	501.656	0.004	350	1	350	1.3904	1.3920	1.6	80
D	17	12/27/2011	11:41	35.68	1.62	-	0.000	501.656	0.004	361	1	361	1.3952	1.3967	1.5	75
D	18	12/27/2011	12:41	36.68	1.62	-	0.000	501.656	0.004	350	1	350	1.3979	1.3998	1.9	95
D	19	12/27/2011	13:41	37.68	1.62	-	0.000	501.656	0.004	340	1	340	1.4006	1.4020	1.4	70
D	20	12/27/2011	14:41	38.68	1.62	-	0.000	501.656	0.004	332	1	332	1.4008	1.4028	2	100
D	21	12/27/2011	15:41	39.68	1.62	-	0.000	501.656	0.004	333	1	333	1.4001	1.4018	1.7	85
D	22	12/27/2011	16:41	40.68	1.62	-	0.000	501.656	0.004	331	1	331	1.3972	1.3989	1.7	85
D	23	12/27/2011	17:41	41.68	1.62	-	0.000	501.656	0.003	326	1	326	1.4076	1.4095	1.9	95
D	24	12/27/2011	18:41	42.68	1.62	-	0.000	501.656	0.003	332	1	332	1.3910	1.3927	1.7	85
E	1	12/26/2011	20:11	20.18	0.68	-	0.133	88.567	0.002	227	1	227	1.4145	1.4153	0.8	40
E	2	12/26/2011	21:08	21.13	0.93	-	0.036	368.746	0.004	290	1	290	1.4147	1.4161	1.4	70
E	3	12/26/2011	22:08	22.13	1.15	-	0.090	406.869	0.004	361	1	361	1.3980	1.4007	2.7	135
E	4	12/26/2011	23:08	23.13	1.26	-	0.000	501.656	0.005	385	1	385	1.4048	1.4082	3.4	170
E	5	12/26/2011	0:08	24.13	1.42	-	0.000	501.656	0.005	382	1	382	1.3975	1.4002	2.7	135
E	6	12/27/2011	1:08	25.13	1.56	-	0.000	501.656	0.005	417	1	417	1.4057	1.4091	3.4	170
E	7	12/27/2011	2:08	26.13	1.6	-	0.000	501.656	0.006	420	1	420	1.4027	1.4060	3.3	165
E	8	12/27/2011	3:08	27.13	1.6	-	0.000	501.656	0.006	415	1	415	1.4125	1.4153	2.8	140
E	9	12/27/2011	4:08	28.13	1.6	-	0.000	501.656	0.006	408	1	408	1.4012	1.4040	2.8	140
E	10	12/27/2011	5:08	29.13	1.61	-	0.000	501.656	0.005	377	1	377	1.3954	1.3981	2.7	135
E	11	12/27/2011	6:08	30.13	1.61	-	0.000	501.656	0.005	370	1	370	1.3973	1.3994	2.1	105
E	12	12/27/2011	7:08	31.13	1.62	-	0.000	501.656	0.005	372	1	372	1.4005	1.4029	2.4	120
E	13	12/27/2011	8:08	32.13	1.62	-	0.000	501.656	0.005	361	1	361	1.3977	1.4002	2.5	125
E	14	12/27/2011	9:08	33.13	1.62	-	0.000	501.656	0.005	361	1	361	1.4021	1.4042	2.1	105
E	15	12/27/2011	10:08	34.13	1.62	-	0.000	501.656	0.004	342	1	342	1.4001	1.4027	2.6	130
E	16	12/27/2011	11:08	35.13	1.62	-	0.000	501.656	0.004	347	1	347	1.4010	1.4029	1.9	95
E	17	12/27/2011	12:08	36.13	1.62	-	0.000	501.656	0.004	341	1	341	1.3951	1.3972	2.1	105
E	18	12/27/2011	13:08	37.13	1.62	-	0.000	501.656	0.004	325	1	325	1.3919	1.3938	1.9	95
E	19	12/27/2011	14:08	38.13	1.62	-	0.000	501.656	0.004	332	1	332	1.3890	1.3909	1.9	95
E	20	12/27/2011	15:08	39.13	1.62	-	0.000	501.656	0.004	318	1	318	1.3981	1.4000	1.9	95
E	21	12/27/2011	16:08	40.13	1.62	-	0.000	501.656	0.004	331	1	331	1.3982	1.4001	1.9	95
E	22	12/27/2011	17:08	41.13	1.62	-	0.000	501.656	0.004	325	1	325	1.3921	1.3940	1.9	95
E	23	12/27/2011	18:08	42.13	1.62	-	0.000	501.656	0.003	320	1	320	1.3988	1.4007	1.9	95
E	24	12/27/2011	19:08	43.13	1.62	-	0.000	501.656	0.003	321	1	321	1.4037	1.4052	1.5	75

APPENDIX D

Project: ALDOT 502
Site Name: Basin 4
Site Conditions: Inflow Channel Not working as Designed - Inflow not flowing through channel.
Analysis Performed By: Chris Logan
Date of Analysis: 1/10/2012
TSS Sample Vol. : 20 mL
Turbidity Sample Vol. : 15 mL

Sampler	Sample #	Date of Sample	Time of Sample	(TIME)	Rainfall (in)	Level (m)	Inflow Rate (cfs)	Inflow Volume (cf)	Outflow Rate (cfs)	Measured Tubidity (on turbidimeter)	Turbidity Ratio (1:x)	Actual Turbidity	Clean Dish/Filter Weight (g)	Dried Ladin Dish/Filter Weight (g)	TSS Weight of Sample (mg)	TSS (mg/L)
C	1	1/7/2012	12:56	12.93	0.27	0.019	-	-	0.002	505	2	1,010	1.4145	1.4231	8.6	430
C	2	1/7/2012	13:56	13.93	0.27	0.023	-	-	0.003	104	1	104	1.4046	1.4046	0	0
C	3	1/7/2012	14:56	14.93	0.27	0.022	-	-	0.003	118	1	118	1.4151	1.4151	0	0
C	4	1/7/2012	15:56	15.93	0.28	0.021	-	-	0.003	126	1	126	1.3919	1.3919	0	0
C	5	1/7/2012	16:56	16.93	0.47	0.025	-	-	0.004	136	1	136	1.4125	1.4125	0	0
C	6	1/7/2012	17:56	17.93	0.48	0.029	-	-	0.005	132	1	132	1.4115	1.4116	0.1	5
C	7	1/7/2012	18:56	18.93	0.48	0.030	-	-	0.006	428	1	428	1.4147	1.4179	3.2	160
C	8	1/7/2012	19:56	19.93	0.49	0.031	-	-	0.006	601	1	601	1.4213	1.4258	4.5	225
C	9	1/7/2012	20:56	20.93	0.49	0.031	-	-	0.006	847	1	847	1.4112	1.4176	6.4	320
C	10	1/7/2012	21:56	21.93	0.51	0.031	-	-	0.006	934	1	934	1.4154	1.4226	7.2	360
C	11	1/7/2012	22:56	22.93	0.51	0.031	-	-	0.006	877	1	877	1.4092	1.4155	6.3	315
C	12	1/7/2012	23:56	23.93	0.51	0.031	-	-	0.006	833	1	833	1.3900	1.3964	6.4	320
C	13	1/8/2012	0:56	24.93	0.51	0.030	-	-	0.006	913	1	913	1.4105	1.4171	6.6	330
C	14	1/8/2012	1:56	25.93	0.53	0.029	-	-	0.005	927	1	927	1.4112	1.4180	6.8	340
C	15	1/8/2012	2:56	26.93	0.53	0.029	-	-	0.005	995	1	995	1.4128	1.4204	7.6	380
C	16	1/8/2012	3:56	27.93	0.53	0.029	-	-	0.005	946	1	946	1.4031	1.4100	6.9	345
C	17	1/8/2012	4:56	28.93	0.53	0.028	-	-	0.005	897	1	897	1.4159	1.4227	6.8	340
C	18	1/8/2012	5:56	29.93	0.53	0.028	-	-	0.005	841	1	841	1.4086	1.4151	6.5	325
C	19	1/8/2012	6:56	30.93	0.53	0.027	-	-	0.004	865	1	865	1.4008	1.4068	6	300
C	20	1/8/2012	7:56	31.93	0.53	0.026	-	-	0.004	819	1	819	1.3967	1.4033	6.6	330
C	21	1/8/2012	8:56	32.93	0.71	0.026	-	-	0.004	820	1	820	1.4045	1.4105	6	300
C	22	1/8/2012	9:56	33.93	0.76	0.031	-	-	0.006	814	1	814	1.4001	1.4062	6.1	305
C	23	1/8/2012	10:56	34.93	0.76	0.031	-	-	0.006	992	1	992	1.3991	1.4061	7	350
C	24	1/8/2012	11:56	35.93	0.76	0.031	-	-	0.006	511	2	1,022	1.4008	1.4092	8.4	420
D	1	1/7/2012	13:01	13.02	0.27	-	-	-	0.002	153	1	153	1.4065	1.4071	0.6	30
D	2	1/7/2012	14:00	14.00	0.27	-	-	-	0.003	232	1	232	1.3979	1.3990	1.1	55
D	3	1/7/2012	15:00	15.00	0.27	-	-	-	0.003	418	1	418	1.3946	1.3976	3	150
D	4	1/7/2012	16:00	16.00	0.28	-	-	-	0.003	477	1	477	1.3974	1.4007	3.3	165
D	5	1/7/2012	17:00	17.00	0.47	-	-	-	0.004	508	1	508	1.4004	1.4041	3.7	185
D	6	1/7/2012	18:00	18.00	0.48	-	-	-	0.005	558	4	2,232	1.3943	1.4168	22.5	1125
D	7	1/7/2012	19:00	19.00	0.48	-	-	-	0.006	533	4	2,132	1.4070	1.4291	22.1	1105
D	8	1/7/2012	20:00	20.00	0.49	-	-	-	0.006	511	4	2,044	1.3918	1.4110	19.2	960
D	9	1/7/2012	21:00	21.00	0.49	-	-	-	0.006	989	2	1,978	1.4052	1.4226	17.4	870
D	10	1/7/2012	22:00	22.00	0.51	-	-	-	0.006	969	2	1,938	1.4000	1.4157	15.7	785
D	11	1/7/2012	23:00	23.00	0.51	-	-	-	0.006	901	2	1,802	1.4044	1.4197	15.3	765
D	12	1/8/2012	0:00	24.00	0.51	-	-	-	0.006	849	2	1,698	1.4080	1.4218	13.8	690
D	13	1/8/2012	1:00	25.00	0.51	-	-	-	0.006	845	2	1,690	1.3970	1.4102	13.2	660
D	14	1/8/2012	2:00	26.00	0.53	-	-	-	0.005	754	2	1,508	1.4187	1.4308	12.1	605
D	15	1/8/2012	3:00	27.00	0.53	-	-	-	0.005	715	2	1,430	1.4043	1.4160	11.7	585
D	16	1/8/2012	4:00	28.00	0.53	-	-	-	0.005	711	2	1,422	1.3956	1.4069	11.3	565
D	17	1/8/2012	5:00	29.00	0.53	-	-	-	0.005	645	2	1,290	1.4078	1.4182	10.4	520
D	18	1/8/2012	6:00	30.00	0.53	-	-	-	0.005	649	2	1,298	1.3955	1.4055	10	500
D	19	1/8/2012	7:00	31.00	0.53	-	-	-	0.004	618	2	1,236	1.4004	1.4096	9.2	460
D	20	1/8/2012	8:00	32.00	0.53	-	-	-	0.004	588	2	1,176	1.4021	1.4115	9.4	470
D	21	1/8/2012	9:00	33.00	0.73	-	-	-	0.004	573	2	1,146	1.4033	1.4127	9.4	470
D	22	1/8/2012	10:00	34.00	0.76	-	-	-	0.006	843	2	1,686	1.3961	1.4106	14.5	725
D	23	1/8/2012	11:00	35.00	0.76	-	-	-	0.006	852	2	1,704	1.4200	1.4351	15.1	755
D	24	1/8/2012	12:00	36.00	0.76	-	-	-	0.006	759	2	1,518	1.3974	1.4096	12.2	610
E	1	1/7/2012	13:30	13.50	0.27	-	-	-	0.002	327	1	327	1.3987	1.4008	2.1	105
E	2	1/7/2012	14:27	14.45	0.27	-	-	-	0.003	506	1	506	1.4018	1.4051	3.3	165
E	3	1/7/2012	15:27	15.45	0.27	-	-	-	0.003	555	1	555	1.3968	1.4006	3.8	190
E	4	1/7/2012	16:27	16.45	0.28	-	-	-	0.003	533	1	533	1.3986	1.4025	3.9	195
E	5	1/7/2012	17:27	17.45	0.48	-	-	-	0.004	556	1	556	1.3985	1.4025	4	200
E	6	1/7/2012	18:27	18.45	0.48	-	-	-	0.005	659	4	2,636	1.3930	1.4193	26.3	1315
E	7	1/7/2012	19:27	19.45	0.48	-	-	-	0.006	576	4	2,304	1.4087	1.4302	21.5	1075
E	8	1/7/2012	20:27	20.45	0.49	-	-	-	0.006	532	4	2,128	1.4082	1.4273	19.1	955
E	9	1/7/2012	21:27	21.45	0.51	-	-	-	0.006	490	4	1,960	1.4050	1.4228	17.8	890
E	10	1/7/2012	22:27	22.45	0.51	-	-	-	0.006	448	4	1,792	1.4127	1.4292	16.5	825
E	11	1/7/2012	23:27	23.45	0.51	-	-	-	0.006	448	4	1,792	1.4133	1.4289	15.6	780
E	12	1/7/2012	0:27	24.45	0.51	-	-	-	0.006	396	4	1,584	1.4289	1.4435	14.6	730
E	13	1/8/2012	1:27	25.45	0.53	-	-	-	0.006	882	2	1,764	1.4030	1.4167	13.7	685
E	14	1/8/2012	2:27	26.45	0.53	-	-	-	0.005	801	2	1,602	1.4099	1.4229	13	650
E	15	1/8/2012	3:27	27.45	0.53	-	-	-	0.005	799	2	1,598	1.4236	1.4361	12.5	625
E	16	1/8/2012	4:28	28.47	0.53	-	-	-	0.005	747	2	1,494	1.3943	1.4058	11.5	575
E	17	1/8/2012	5:28	29.47	0.53	-	-	-	0.005	716	2	1,432	1.4160	1.4270	11	550
E	18	1/8/2012	6:28	30.47	0.53	-	-	-	0.005	676	2	1,352	1.4079	1.4186	10.7	535
E	19	1/8/2012	7:28	31.47	0.53	-	-	-	0.004	669	2	1,338	1.4121	1.4224	10.3	515
E	20	1/8/2012	8:28	32.47	0.59	-	-	-	0.004	664	2	1,328	1.4288	1.4392	10.4	520
E	21	1/8/2012	9:28	33.47	0.76	-	-	-	0.004	618	2	1,236	1.4273	1.4371	9.8	490
E	22	1/8/2012	10:28	34.47	0.76	-	-	-	0.006	895	2	1,790	1.4039	1.4207	16.8	840
E	23	1/8/2012	11:28	35.47	0.76	-	-	-	0.006	863	2	1,726	1.4008	1.4159	15.1	755
E	24	1/8/2012	12:27	36.45	0.76	-	-	-	0.006	772	2	1,544	1.4022	1.4155	13.3	665

APPENDIX D

Project: ALDOT 502
Site Name: Basin 4
Site Conditions: Inflow Channel & Weir Improperly Installed - No Accurate Inflow #'s
Analysis Performed By: Chris Logan
Date of Analysis: 1/12/2012
TSS Sample Vol. : 20 mL
Turbidity Sample Vol. : 15 mL

Sampler	Sample #	Date of Sample	Time of Sample	(TIME)	Rainfall (in)	Level (m)	Inflow Rate (cfs)	Inflow Volume (cf)	Outflow Rate (cfs)	Measured Tubidity (on turbidimeter)	Turbidity Ratio (1:x)	Actual Turbidity	Clean Dish/Filter Weight (g)	Dried Ladin Dish/Filter Weight (g)	TSS Weight of Sample (mg)	TSS (mg/L)
C	1	1/9/2012	17:23	17.38	0.05	0.020	-	-	0.003	204	1	204	1.4206	1.4217	1.1	55
C	2	1/9/2012	18:23	18.38	0.11	0.021	-	-	0.003	407	1	407	1.4051	1.4077	2.6	130
C	3	1/9/2012	19:23	19.38	0.19	0.025	-	-	0.004	402	1	402	1.4092	1.4113	2.1	105
C	4	1/9/2012	20:23	20.38	0.19	0.027	-	-	0.004	382	1	382	1.3997	1.4022	2.5	125
C	5	1/9/2012	21:23	21.38	0.19	0.027	-	-	0.004	404	1	404	1.3977	1.4006	2.9	145
C	6	1/9/2012	22:23	22.38	0.20	0.027	-	-	0.005	501	1	501	1.4080	1.4115	3.5	175
C	7	1/9/2012	23:23	23.38	0.22	0.027	-	-	0.005	499	1	499	1.4076	1.4119	4.3	215
C	8	1/10/2012	0:23	24.38	0.25	0.028	-	-	0.005	453	1	453	1.4221	1.4258	3.7	185
C	9	1/10/2012	1:23	25.38	0.25	0.027	-	-	0.005	384	1	384	1.4043	1.4075	3.2	160
C	10	1/10/2012	2:23	26.38	0.25	0.027	-	-	0.004	345	1	345	1.4027	1.4053	2.6	130
C	11	1/10/2012	3:23	27.38	0.25	0.026	-	-	0.004	304	1	304	1.4048	1.4074	2.6	130
C	12	1/10/2012	4:23	28.38	0.25	0.027	-	-	0.004	286	1	286	1.3965	1.3992	2.7	135
C	13	1/10/2012	5:23	29.38	0.26	0.026	-	-	0.004	274	1	274	1.3982	1.3997	1.5	75
C	14	1/10/2012	6:23	30.38	0.26	0.025	-	-	0.004	253	1	253	1.4001	1.4020	1.9	95
C	15	1/10/2012	7:23	31.38	0.26	0.025	-	-	0.004	246	1	246	1.3995	1.4012	1.7	85
C	16	1/10/2012	8:23	32.38	0.26	0.025	-	-	0.004	237	1	237	1.4114	1.4129	1.5	75
C	17	1/10/2012	9:23	33.38	0.26	0.025	-	-	0.004	228	1	228	1.4025	1.4041	1.6	80
C	18	1/10/2012	10:23	34.38	0.26	0.024	-	-	0.004	224	1	224	1.3971	1.3987	1.6	80
C	19	1/10/2012	11:23	35.38	0.27	0.024	-	-	0.004	226	1	226	1.3970	1.3989	1.9	95
C	20	1/10/2012	12:23	36.38	0.27	0.024	-	-	0.004	222	1	222	1.3957	1.3970	1.3	65
C	21	1/10/2012	13:23	37.38	0.27	0.023	-	-	0.003	206	1	206	1.4056	1.4066	1	50
C	22	1/10/2012	14:23	38.38	0.27	0.023	-	-	0.003	212	1	212	1.4039	1.4048	0.9	45
C	23	1/10/2012	15:23	39.38	0.27	0.023	-	-	0.003	196	1	196	1.3977	1.3988	1.1	55
C	24	1/10/2012	16:23	40.38	0.27	0.022	-	-	0.003	198	1	198	1.3956	1.3973	1.7	85
D	1	1/9/2012	17:29	17.48	0.06	-	-	-	0.003	541	1	541	1.3961	1.4031	7	350
D	2	1/9/2012	18:27	18.45	0.12	-	-	-	0.003	487	1	487	1.3970	1.4013	4.3	215
D	3	1/9/2012	19:27	19.45	0.19	-	-	-	0.004	474	1	474	1.4053	1.4091	3.8	190
D	4	1/9/2012	20:27	20.45	0.19	-	-	-	0.004	546	1	546	1.3958	1.3999	4.1	205
D	5	1/9/2012	21:27	21.45	0.19	-	-	-	0.004	526	1	526	1.3966	1.4006	4	200
D	6	1/9/2012	22:27	22.45	0.21	-	-	-	0.005	524	1	524	1.4009	1.4053	4.4	220
D	7	1/9/2012	23:27	23.45	0.24	-	-	-	0.005	477	1	477	1.4059	1.4099	4	200
D	8	1/10/2012	0:27	24.45	0.25	-	-	-	0.005	438	1	438	1.3989	1.4029	4	200
D	9	1/10/2012	1:27	25.45	0.25	-	-	-	0.005	411	1	411	1.3973	1.4015	4.2	210
D	10	1/10/2012	2:27	26.45	0.25	-	-	-	0.004	403	1	403	1.3987	1.4022	3.5	175
D	11	1/10/2012	3:27	27.45	0.25	-	-	-	0.004	372	1	372	1.3935	1.3965	3	150
D	12	1/10/2012	4:27	28.45	0.26	-	-	-	0.004	365	1	365	1.3959	1.3991	3.2	160
D	13	1/10/2012	5:27	29.45	0.26	-	-	-	0.004	362	1	362	1.3999	1.4030	3.1	155
D	14	1/10/2012	6:27	30.45	0.26	-	-	-	0.004	339	1	339	1.3944	1.3972	2.8	140
D	15	1/10/2012	7:27	31.45	0.26	-	-	-	0.004	322	1	322	1.3903	1.3930	2.7	135
D	16	1/10/2012	8:27	32.45	0.26	-	-	-	0.004	306	1	306	1.3998	1.4026	2.8	140
D	17	1/10/2012	9:27	33.45	0.26	-	-	-	0.004	294	1	294	1.4004	1.4030	2.6	130
D	18	1/10/2012	10:27	34.45	0.26	-	-	-	0.004	289	1	289	1.3974	1.3999	2.5	125
D	19	1/10/2012	11:27	35.45	0.27	-	-	-	0.004	292	1	292	1.3928	1.3950	2.2	110
D	20	1/10/2012	12:27	36.45	0.27	-	-	-	0.004	280	1	280	1.4009	1.4035	2.6	130
D	21	1/10/2012	13:27	37.45	0.27	-	-	-	0.003	270	1	270	1.4002	1.4024	2.2	110
D	22	1/10/2012	14:27	38.45	0.27	-	-	-	0.003	299	1	299	1.3885	1.3904	1.9	95
D	23	1/10/2012	15:27	39.45	0.27	-	-	-	0.003	265	1	265	1.3917	1.3941	2.4	120
D	24	1/10/2012	16:27	40.45	0.27	-	-	-	0.003	260	1	260	1.4023	1.4043	2	100
E	1	1/9/2012	17:34	17.57	0.06	-	-	-	0.003	554	1	554	1.4015	1.4056	4.1	205
E	2	1/9/2012	18:32	18.53	0.12	-	-	-	0.003	479	1	479	1.4010	1.4051	4.1	205
E	3	1/9/2012	19:32	19.53	0.19	-	-	-	0.004	474	1	474	1.3944	1.3983	3.9	195
E	4	1/9/2012	20:32	20.53	0.19	-	-	-	0.004	466	1	466	1.4037	1.4087	5	250
E	5	1/9/2012	21:32	21.53	0.19	-	-	-	0.004	485	1	485	1.4006	1.4056	5	250
E	6	1/9/2012	22:32	22.53	0.21	-	-	-	0.005	501	1	501	1.4045	1.4095	5	250
E	7	1/9/2012	23:32	23.53	0.24	-	-	-	0.005	481	1	481	1.4043	1.4083	4	200
E	8	1/10/2012	0:32	24.53	0.25	-	-	-	0.005	458	1	458	1.4066	1.4098	3.2	160
E	9	1/10/2012	1:32	25.53	0.25	-	-	-	0.005	414	1	414	1.4022	1.4057	3.5	175
E	10	1/10/2012	2:32	26.53	0.25	-	-	-	0.004	413	1	413	1.4000	1.4033	3.3	165
E	11	1/10/2012	3:32	27.53	0.25	-	-	-	0.004	390	1	390	1.4053	1.4078	2.5	125
E	12	1/10/2012	4:32	28.53	0.26	-	-	-	0.004	373	1	373	1.4049	1.4080	3.1	155
E	13	1/10/2012	5:32	29.53	0.26	-	-	-	0.004	358	1	358	1.4009	1.4039	3	150
E	14	1/10/2012	6:32	30.53	0.26	-	-	-	0.004	337	1	337	1.4078	1.4107	2.9	145
E	15	1/10/2012	7:32	31.53	0.26	-	-	-	0.004	329	1	329	1.4236	1.4263	2.7	135
E	16	1/10/2012	8:32	32.53	0.26	-	-	-	0.004	317	1	317	1.4113	1.4134	2.1	105
E	17	1/10/2012	9:32	33.53	0.26	-	-	-	0.004	300	1	300	1.4020	1.4044	2.4	120
E	18	1/10/2012	10:32	34.53	0.26	-	-	-	0.004	292	1	292	1.4074	1.4100	2.6	130
E	19	1/10/2012	11:32	35.53	0.27	-	-	-	0.004	300	1	300	1.4068	1.4094	2.6	130
E	20	1/10/2012	12:32	36.53	0.27	-	-	-	0.004	279	1	279	1.4062	1.4086	2.4	120
E	21	1/10/2012	13:32	37.53	0.27	-	-	-	0.003	282	1	282	1.4016	1.4039	2.3	115
E	22	1/10/2012	14:32	38.53	0.27	-	-	-	0.003	270	1	270	1.4133	1.4166	3.3	165
E	23	1/10/2012	15:32	39.53	0.27	-	-	-	0.003	263	1	263	1.4162	1.4182	2	100
E	24	1/10/2012	16:32	40.53	0.27	-	-	-	0.003	260	1	260	1.4121	1.4146	2.5	125

APPENDIX D

Project: ALDOT 502
Site Name: Basin 4
Site Conditions: Weir Improperly Installed - No accurate Inflow #'s.
Analysis Performed By: Chris Logan
Date of Analysis: 1/16/2012
TSS Sample Vol. : 20 mL
Turbidity Sample Vol. : 15 mL

Sampler	Sample #	Date of Sample	Time of Sample	(TIME)	Rainfall (in)	Level (m)	Inflow Rate (cfs)	Inflow Volume (cf)	Outflow Rate (cfs)	Measured Tubidity (on turbidimeter)	Turbidity Ratio (1:x)	Actual Turbidity	Clean Dish/Filter Weight (g)	Dried Ladin Dish/Filter Weight (g)	TSS Weight of Sample (mg)	TSS (mg/L)
B	1	1/11/2012	2:22	2.37	0.86	0.000	0.000	114.393	0.008	614	4	2456	1.4059	1.4355	29.6	1480
B	2	1/11/2012	2:36	2.60	0.86	0.054	0.999	620.827	0.008	643	4	2572	1.4012	1.4391	37.9	1895
B	3	1/11/2012	2:44	2.73	0.86	0.040	0.638	1018.282	0.008	915	4	3660	1.4097	1.4500	40.3	2015
C	1	1/11/2012	14:19	14.32	1.04	0.036	-	-	0.008	430	1	430	1.4044	1.4066	2.2	110
C	2	1/11/2012	15:19	15.32	1.04	0.034	-	-	0.007	490	1	490	1.4033	1.4067	3.4	170
C	3	1/11/2012	16:19	16.32	1.04	0.033	-	-	0.007	549	1	549	1.4073	1.4116	4.3	215
C	4	1/11/2012	17:19	17.32	1.04	0.033	-	-	0.007	527	1	527	1.3987	1.4023	3.6	180
C	5	1/11/2012	18:19	18.32	1.04	0.032	-	-	0.006	539	1	539	1.4019	1.4057	3.8	190
C	6	1/11/2012	19:19	19.32	1.05	0.032	-	-	0.006	534	1	534	1.4037	1.4075	3.8	190
C	7	1/11/2012	20:19	20.32	1.05	0.033	-	-	0.007	503	1	503	1.4026	1.4061	3.5	175
C	8	1/11/2012	21:19	21.32	1.06	0.032	-	-	0.006	480	1	480	1.4189	1.4224	3.5	175
C	9	1/11/2012	22:19	22.32	1.07	0.032	-	-	0.006	506	1	506	1.4117	1.4151	3.4	170
C	10	1/11/2012	23:19	23.32	1.08	0.033	-	-	0.007	490	1	490	1.4012	1.4046	3.4	170
C	11	1/12/2012	0:19	24.32	1.08	0.033	-	-	0.007	467	1	467	1.4012	1.4046	3.4	170
C	12	1/12/2012	1:19	25.32	1.08	0.033	-	-	0.007	463	1	463	1.4010	1.4047	3.7	185
C	13	1/12/2012	2:19	26.32	1.09	0.032	-	-	0.006	450	1	450	1.4032	1.4063	3.1	155
C	14	1/12/2012	3:19	27.32	1.09	0.032	-	-	0.006	468	1	468	1.3954	1.3990	3.6	180
C	15	1/12/2012	4:19	28.32	1.09	0.032	-	-	0.006	449	1	449	1.4141	1.4175	3.4	170
C	16	1/12/2012	5:19	29.32	1.09	0.032	-	-	0.006	429	1	429	1.4098	1.4134	3.6	180
C	17	1/12/2012	6:19	30.32	1.09	0.032	-	-	0.006	433	1	433	1.4002	1.4032	3	150
C	18	1/12/2012	7:19	31.32	1.11	0.031	-	-	0.006	436	1	436	1.4151	1.4186	3.5	175
C	19	1/12/2012	8:19	32.32	1.14	0.031	-	-	0.006	437	1	437	1.3937	1.3967	3	150
C	20	1/12/2012	9:19	33.32	1.14	0.030	-	-	0.005	416	1	416	1.4090	1.4124	3.4	170
C	21	1/12/2012	10:19	34.32	1.14	0.031	-	-	0.006	426	1	426	1.3897	1.3930	3.3	165
C	22	1/12/2012	11:19	35.32	1.14	0.030	-	-	0.006	414	1	414	1.4008	1.4038	3	150
C	23	1/12/2012	12:19	36.32	1.14	0.029	-	-	0.005	404	1	404	1.4126	1.4159	3.3	165
C	24	1/12/2012	13:19	37.32	1.14	0.029	-	-	0.005	416	1	416	1.4001	1.4038	3.7	185
D	1	1/11/2012	14:25	14.42	1.04	-	-	-	0.008	720	1	720	1.4157	1.4220	6.3	315
D	2	1/11/2012	15:23	15.38	1.04	-	-	-	0.007	653	1	653	1.4069	1.4130	6.1	305
D	3	1/11/2012	16:23	16.38	1.04	-	-	-	0.007	646	1	646	1.4057	1.4112	5.5	275
D	4	1/11/2012	17:23	17.38	1.04	-	-	-	0.007	634	1	634	1.4212	1.4270	5.8	290
D	5	1/11/2012	18:23	18.38	1.04	-	-	-	0.006	619	1	619	1.3997	1.4050	5.3	265
D	6	1/11/2012	19:23	19.38	1.05	-	-	-	0.006	594	1	594	1.4081	1.4133	5.2	260
D	7	1/11/2012	20:23	20.38	1.05	-	-	-	0.006	606	1	606	1.4190	1.4242	5.2	260
D	8	1/11/2012	21:23	21.38	1.06	-	-	-	0.006	579	1	579	1.4178	1.4233	5.5	275
D	9	1/11/2012	22:23	22.38	1.07	-	-	-	0.007	584	1	584	1.4058	1.4113	5.5	275
D	10	1/11/2012	23:23	23.38	1.08	-	-	-	0.007	602	1	602	1.3977	1.4029	5.2	260
D	11	1/12/2012	0:23	24.38	1.08	-	-	-	0.007	572	1	572	1.4154	1.4205	5.1	255
D	12	1/12/2012	1:23	25.38	1.08	-	-	-	0.007	568	1	568	1.4021	1.4070	4.9	245
D	13	1/12/2012	2:23	26.38	1.09	-	-	-	0.007	551	1	551	1.4062	1.4111	4.9	245
D	14	1/12/2012	3:23	27.38	1.09	-	-	-	0.007	522	1	522	1.4048	1.4094	4.6	230
D	15	1/12/2012	4:23	28.38	1.09	-	-	-	0.006	503	1	503	1.4120	1.4160	4	200
D	16	1/12/2012	5:23	29.38	1.09	-	-	-	0.006	485	1	485	1.4042	1.4089	4.7	235
D	17	1/12/2012	6:23	30.38	1.09	-	-	-	0.006	469	1	469	1.4293	1.4335	4.2	210
D	18	1/12/2012	7:23	31.38	1.11	-	-	-	0.006	455	1	455	1.4062	1.4105	4.3	215
D	19	1/12/2012	8:23	32.38	1.14	-	-	-	0.006	465	1	465	1.3977	1.4018	4.1	205
D	20	1/12/2012	9:23	33.38	1.14	-	-	-	0.006	456	1	456	1.4037	1.4078	4.1	205
D	21	1/12/2012	10:23	34.38	1.14	-	-	-	0.006	452	1	452	1.4254	1.4297	4.3	215
D	22	1/12/2012	11:23	35.38	1.14	-	-	-	0.005	462	1	462	1.4003	1.4042	3.9	195
D	23	1/12/2012	12:23	36.38	1.14	-	-	-	0.006	454	1	454	1.4127	1.4166	3.9	195
D	24	1/12/2012	13:23	37.38	1.14	-	-	-	0.005	434	1	434	1.4054	1.4092	3.8	190
E	1	1/11/2012	14:31	14.52	1.04	-	-	-	0.007	841	1	841	1.4148	1.4220	7.2	360
E	2	1/11/2012	15:28	15.47	1.04	-	-	-	0.006	823	1	823	1.4038	1.4110	7.2	360
E	3	1/11/2012	16:28	16.47	1.04	-	-	-	0.007	840	1	840	1.4060	1.4131	7.1	355
E	4	1/11/2012	17:28	17.47	1.04	-	-	-	0.007	785	1	785	1.4092	1.4158	6.6	330
E	5	1/11/2012	18:28	18.47	1.04	-	-	-	0.006	772	1	772	1.4069	1.4133	6.4	320
E	6	1/11/2012	19:28	19.47	1.05	-	-	-	0.006	743	1	743	1.4113	1.4178	6.5	325
E	7	1/11/2012	20:28	20.47	1.05	-	-	-	0.006	734	1	734	1.3993	1.4057	6.4	320
E	8	1/11/2012	21:28	21.47	1.06	-	-	-	0.007	712	1	712	1.4031	1.4093	6.2	310
E	9	1/11/2012	22:28	22.47	1.07	-	-	-	0.007	662	1	662	1.4013	1.4074	6.1	305
E	10	1/11/2012	23:28	23.47	1.08	-	-	-	0.007	645	1	645	1.4022	1.4079	5.7	285
E	11	1/12/2012	0:28	24.47	1.08	-	-	-	0.007	611	1	611	1.4064	1.4117	5.3	265
E	12	1/12/2012	1:28	25.47	1.08	-	-	-	0.007	578	1	578	1.4046	1.4100	5.4	270
E	13	1/12/2012	2:28	26.47	1.09	-	-	-	0.007	556	1	556	1.3937	1.3983	4.6	230
E	14	1/12/2012	3:28	27.47	1.09	-	-	-	0.007	569	1	569	1.3956	1.4007	5.1	255
E	15	1/12/2012	4:28	28.47	1.09	-	-	-	0.006	568	1	568	1.4060	1.4108	4.8	240
E	16	1/12/2012	5:28	29.47	1.09	-	-	-	0.006	532	1	532	1.3981	1.4030	4.9	245
E	17	1/12/2012	6:28	30.47	1.09	-	-	-	0.006	534	1	534	1.3973	1.4019	4.6	230
E	18	1/12/2012	7:28	31.47	1.11	-	-	-	0.006	503	1	503	1.4137	1.4182	4.5	225
E	19	1/12/2012	8:28	32.47	1.14	-	-	-	0.006	483	1	483	1.3970	1.4010	4	200
E	20	1/12/2012	9:28	33.47	1.14	-	-	-	0.006	472	1	472	1.4014	1.4057	4.3	215
E	21	1/12/2012	10:28	34.47	1.14	-	-	-	0.006	478	1	478	1.3991	1.4032	4.1	205
E	22	1/12/2012	11:28	35.47	1.14	-	-	-	0.005	466	1	466	1.4027	1.4065	3.8	190
E	23	1/12/2012	12:28	36.47	1.14	-	-	-	0.005	448	1	448	1.4020	1.4060	4	200
E	24	1/12/2012	13:28	37.47	1.14	-	-	-	0.005	448	1	448	1.3995	1.4036	4.1	205

APPENDIX D

Project: ALDOT 502
Site Name: Basin 4
Site Conditions: Main weir not properly installed, rain caused inflow to overflow the main channel around the weir, therefore inflow #'s are low and inaccurate. Floc logs washed away - therefore are ineffective.
Analysis Performed By: Chris Logan
Date of Analysis: 1/20/2012
TSS Sample Vol. : 20 mL
Turbidity Sample Vol. : 15 mL

Sampler	Sample #	Date of Sample	Time of Sample	(TIME)	Rainfall (in)	Level (m)	Inflow Rate (cfs)	Inflow Volume (cf)	Outflow Rate (cfs)	Measured Tubidity (on turbidimeter)	Turbidity Ratio (1:x)	Actual Turbidity	Clean Dish/Filter Weight (g)	Dried Ladin Dish/Filter Weight (g)	TSS Weight of Sample (mg)	TSS (mg/L)
A	1	1/17/2012	15:26	15.43	0.59	0.011	0.070	107	0.007	436	8	3,488	1.3997	1.4570	57.3	2865
A	2	1/17/2012	15:36	15.60	1.08	0.071	1.110	488	0.012	978	8	7,824	1.4064	1.5395	133.1	6655
A	3	1/17/2012	15:41	15.68	1.19	0.057	0.802	763	0.012	787	8	6,296	1.4008	1.4557	54.9	2745
A	4	1/17/2012	15:54	15.90	1.22	0.020	0.170	1,027	0.014	505	8	4,040	1.4030	1.4574	54.4	2720
B	1	1/17/2012	15:54	15.90	1.22	0.126	2.662	314	0.014	789	16	12,624	1.4044	1.5920	187.6	9380
B	2	1/17/2012	15:57	15.95	1.22	0.105	2.026	698	0.015	705	16	11,280	1.4289	1.5814	152.5	7625
B	3	1/17/2012	16:00	16.00	1.22	0.107	2.084	1,061	0.015	630	16	10,080	1.4072	1.5473	140.1	7005
B	4	1/17/2012	16:03	16.05	1.22	0.107	2.084	1,434	0.015	490	16	7,840	1.4102	1.5238	113.6	5680
B	5	1/17/2012	16:06	16.10	1.23	0.113	2.261	1,823	0.015	481	16	7,696	1.4007	1.5094	108.7	5435
B	6	1/17/2012	16:09	16.15	1.23	0.112	2.231	2,236	0.015	457	16	7,312	1.3979	1.5049	107	5350
B	7	1/17/2012	16:12	16.20	1.23	0.108	2.113	2,622	0.015	940	8	7,520	1.4111	1.5063	95.2	4760
B	8	1/17/2012	16:15	16.25	1.24	0.102	1.940	2,981	0.015	828	8	6,624	1.4042	1.4962	92	4600
B	9	1/17/2012	16:18	16.30	1.24	0.095	1.744	3,310	0.014	850	8	6,800	1.4019	1.4898	87.9	4395
B	10	1/17/2012	16:21	16.35	1.24	0.092	1.662	3,612	0.015	802	8	6,416	1.3996	1.4824	82.8	4140
B	11	1/17/2012	16:24	16.40	1.24	0.090	1.608	3,912	0.015	744	8	5,952	1.3931	1.4698	76.7	3835
B	12	1/17/2012	16:27	16.45	1.24	0.117	2.382	4,272	0.015	767	8	6,136	1.3927	1.4796	86.9	4345
B	13	1/17/2012	16:29	16.48	1.24	0.182	4.617	4,750	0.015	926	16	14,816	1.4054	1.6047	199.3	9965
B	14	1/17/2012	16:32	16.53	1.24	0.314	10.456	6,282	0.015	886	32	28,352	1.4020	1.9285	526.5	26325
B	15	1/17/2012	16:35	16.58	1.24	0.300	9.765	8,214	0.015	867	32	27,744	1.4016	1.8429	441.3	22065
B	16	1/17/2012	16:38	16.63	1.24	0.268	8.246	9,743	0.015	623	32	19,936	1.4041	1.7210	316.9	15845
B	17	1/17/2012	16:41	16.68	1.24	0.245	7.208	11,124	0.015	904	16	14,464	1.4018	1.6481	246.3	12315
B	18	1/17/2012	16:43	16.72	1.24	0.216	5.968	11,873	0.014	706	16	11,296	1.4006	1.5861	185.5	9275
B	19	1/17/2012	16:46	16.77	1.24	0.189	4.886	12,788	0.014	592	16	9,472	1.3973	1.5428	145.5	7275
B	20	1/17/2012	16:49	16.82	1.24	0.159	3.771	13,517	0.015	483	16	7,728	1.4003	1.5283	128	6400
B	21	1/17/2012	16:52	16.87	1.24	0.140	3.116	14,108	0.014	929	8	7,432	1.3988	1.5021	103.3	5165
B	22	1/17/2012	16:55	16.92	1.24	0.121	2.505	14,595	0.014	836	8	6,688	1.4093	1.4972	87.9	4395
B	23	1/17/2012	16:58	16.97	1.24	0.106	2.055	14,990	0.014	753	8	6,024	1.4020	1.4809	78.9	3945
B	24	1/17/2012	17:00	17.00	1.24	0.097	1.799	15,213	0.014	672	8	5,376	1.4013	1.4738	72.5	3625
C	1	1/19/2012	15:46	63.77	1.24	0.031	0.000	18,618	0.006	710	2	1,420	1.4079	1.4185	10.6	530
C	2	1/19/2012	16:46	64.77	1.24	0.030	0.000	18,618	0.005	798	2	1,596	1.4239	1.4375	13.6	680
C	3	1/19/2012	17:46	65.77	1.24	0.029	0.000	18,618	0.005	929	2	1,858	1.3984	1.4133	14.9	745
C	4	1/19/2012	18:46	66.77	1.24	0.028	0.000	18,618	0.005	925	2	1,850	1.4202	1.4350	14.8	740
C	5	1/19/2012	19:46	67.77	1.24	0.027	0.000	18,618	0.005	900	2	1,800	1.4097	1.4244	14.7	735
C	6	1/19/2012	20:46	68.77	1.24	0.027	0.000	18,618	0.005	901	2	1,802	1.4029	1.4163	13.4	670
C	7	1/19/2012	21:46	69.77	1.24	0.026	0.000	18,618	0.004	886	2	1,772	1.4163	1.4308	14.5	725
C	8	1/19/2012	22:46	70.77	1.24	0.027	0.000	18,618	0.005	872	2	1,744	1.4029	1.4167	13.8	690
C	9	1/19/2012	23:46	71.77	1.24	0.026	0.000	18,618	0.004	847	2	1,694	1.4038	1.4176	13.8	690
C	10	1/20/2012	0:46	72.77	1.24	0.026	0.000	18,618	0.004	816	2	1,632	1.4046	1.4184	13.8	690
C	11	1/20/2012	1:46	73.77	1.24	0.025	0.000	18,618	0.004	832	2	1,664	1.4082	1.4218	13.6	680
C	12	1/20/2012	2:46	74.77	1.24	0.023	0.000	18,618	0.003	830	2	1,660	1.4195	1.4329	13.4	670
C	13	1/20/2012	3:46	75.77	1.24	0.023	0.000	18,618	0.003	810	2	1,620	1.4243	1.4374	13.1	655
C	14	1/20/2012	4:46	76.77	1.24	0.023	0.000	18,618	0.003	792	2	1,584	1.4165	1.4295	13	650
C	15	1/20/2012	5:46	77.77	1.24	0.023	0.000	18,618	0.003	756	2	1,512	1.4048	1.4178	13	650
C	16	1/20/2012	6:46	78.77	1.24	0.022	0.000	18,618	0.003	771	2	1,542	1.4173	1.4309	13.6	680
C	17	1/20/2012	7:46	79.77	1.24	0.022	0.000	18,618	0.003	759	2	1,518	1.4081	1.4206	12.5	625
C	18	1/20/2012	8:46	80.77	1.24	0.023	0.000	18,618	0.003	753	2	1,506	1.4066	1.4185	11.9	595
C	19	1/20/2012	9:46	81.77	1.24	0.022	0.000	18,618	0.003	746	2	1,492	1.4013	1.4132	11.9	595
C	20	1/20/2012	10:46	82.77	1.24	0.022	0.000	18,618	0.003	751	2	1,502	1.4076	1.4199	12.3	615
C	21	1/20/2012	11:46	83.77	1.24	0.023	0.000	18,618	0.003	723	2	1,446	1.4155	1.4274	11.9	595
C	22	1/20/2012	12:46	84.77	1.24	0.023	0.000	18,618	0.003	718	2	1,436	1.4022	1.4122	10	500
C	23	1/20/2012	13:46	85.77	1.24	0.023	0.000	18,618	0.003	697	2	1,394	1.4175	1.4276	10.1	505
C	24	1/20/2012	14:46	86.77	1.24	0.024	0.000	18,618	0.004	728	2	1,456	1.4085	1.4189	10.4	520
D	1	1/19/2012	15:52	63.87	1.24	-	0.000	18,618	0.006	449	4	1,796	1.4234	1.4393	15.9	795
D	2	1/19/2012	16:49	64.82	1.24	-	0.000	18,618	0.005	464	4	1,856	1.4032	1.4182	15	750
D	3	1/19/2012	17:49	65.82	1.24	-	0.000	18,618	0.005	450	4	1,800	1.4096	1.4242	14.6	730
D	4	1/19/2012	18:49	66.82	1.24	-	0.000	18,618	0.005	450	4	1,800	1.4276	1.4423	14.7	735
D	5	1/19/2012	19:49	67.82	1.24	-	0.000	18,618	0.005	431	4	1,724	1.4037	1.4186	14.9	745
D	6	1/19/2012	20:49	68.82	1.24	-	0.000	18,618	0.005	428	4	1,712	1.4180	1.4322	14.2	710
D	7	1/19/2012	21:49	69.82	1.24	-	0.000	18,618	0.005	963	2	1,926	1.4016	1.4158	14.2	710
D	8	1/19/2012	22:49	70.82	1.24	-	0.000	18,618	0.004	909	2	1,818	1.4221	1.4360	13.9	695
D	9	1/19/2012	23:49	71.82	1.24	-	0.000	18,618	0.004	935	2	1,870	1.4082	1.4216	13.4	670
D	10	1/20/2012	0:49	72.82	1.24	-	0.000	18,618	0.004	899	2	1,798	1.4063	1.4191	12.8	640
D	11	1/20/2012	1:49	73.82	1.24	-	0.000	18,618	0.004	911	2	1,822	1.4212	1.4338	12.6	630
D	12	1/20/2012	2:49	74.82	1.24	-	0.000	18,618	0.003	914	2	1,828	1.4221	1.4351	13	650
D	13	1/20/2012	3:49	75.82	1.24	-	0.000	18,618	0.003	943	2	1,886	1.4128	1.4258	13	650
D	14	1/20/2012	4:49	76.82	1.24	-	0.000	18,618	0.003	845	2	1,690	1.4018	1.4146	12.8	640
D	15	1/20/2012	5:49	77.82	1.24	-	0.000	18,618	0.003	853	2	1,706	1.4094	1.4225	13.1	655
D	16	1/20/2012	6:49	78.82	1.24	-	0.000	18,618	0.003	836	2	1,672	1.4290	1.4414	12.4	620
D	17	1/20/2012	7:49	79.82	1.24	-	0.000	18,618	0.003	808	2	1,616	1.4233	1.4362	12.9	645
D	18	1/20/2012	8:49	80.82	1.24	-	0.000	18,618	0.003	835	2	1,670	1.4190	1.4324	13.4	670
D	19	1/20/2012	9:49	81.82	1.24	-	0.000	18,618	0.003	825	2	1,650	1.4092	1.4222	13	650
D	20	1/20/2012	10:49	82.82	1.24	-	0.000	18,618	0.003	863	2	1,726	1.4205	1.4323	11.8	590
D	21	1/20/2012	11:49	83.82	1.24	-	0.000	18,618	0.003	785	2	1,570	1.4239	1.4357	11.8	590
D	22	1/20/2012	12:49	84.82	1.24	-	0.000	18,618	0.003	790	2	1,580	1.4257	1.4381	12.4	620
D	23	1/20/2012	13:49	85.82	1.24	-	0.000	18,618	0.004	783	2	1,566	1.4081	1.4204	12.3	615
D	24	1/20/2012	14:49	86.82	1.24	-	0.000	18,618	0.003	766	2	1,532	1.4137	1.4258	12.1	605
E	1	1/19/2012	15:58	63.97	1.24	-	0.000	18,618	0.005	476	4	1,904	1.4084	1.4245	16.1	805
E	2	1/19/2012	16:54	64.90	1.24	-	0.000	18,618	0.006	467	4	1,868	1.4062	1.4221	15.9	795
E	3	1/19/2012	17:54	65.90	1.24	-	0.000	18,618	0.005	989	2	1,978	1.4011	1.4168	15.7	785
E	4	1/19/2012	18:54	66.90	1.24	-	0.000	18,618	0.005	991	2	1,982	1.4037	1.4192	15.5	775
E	5	1/19/2012	19:54	67.90	1.24	-	0.000	18,618	0.005	951	2	1,902	1.4246	1.4399	15.3	765
E	6	1/19/2012	20:54	68.90	1.24	-	0.000	18,618	0.004	946	2	1,892	1.4023	1.4172	14.9	745
E	7	1/19/2012	21:54	69.90	1.24	-	0.000	18,618	0.004	938	2	1,876	1.4063	1.4215	15.2	760
E	8	1/19/2012	22:54	70.90	1.24	-	0.000	18,618	0.004	940	2	1,880	1.4272	1.4419	14.7	735
E	9	1/19/2012	23:54	71.90	1.24	-	0.000	18,618	0.004	915	2	1,830	1.4178	1.4325	14.7	735
E	10	1/20/2012	0:54	72.90	1.24	-	0.000	18,618	0.004	913	2	1,826	1.4096	1.4242	14.6	730
E	11	1/20/2012	1:54	73.90	1.24	-	0.000	18,618	0.004	900	2	1,800	1.3916	1.4053	13.7	685
E	12	1/20/2012	2:54	74.90	1.24	-	0.000	18,618	0.004	912	2	1,824	1.4114	1.4258	14.4	720
E	13	1/20/2012	3:54	75.90	1.24	-	0.000	18,618	0.003	856	2	1,712	1.4034	1.4170	13.6	680
E	14	1/20/2012	4:54	76.90	1.24	-	0.000	18,618	0.003	812	2	1,624	1.4076	1.4209	13.3	665
E	15	1/20/2012	5:54	77.90	1.24	-	0.000	18,618	0.003	831	2	1,662	1.4059	1.4191	13.2	660
E	16	1/20/2012	6:54	78.90	1.24	-	0.000	18,618	0.003	849	2	1,698	1.4092	1.4220	12.8	640
E	17	1/20/2012	7:54	79.90	1.24	-	0.000	18,618	0.003	829	2	1,658	1.4119	1.4247	12.8	640
E	18	1/20/2012	8:54	80.90	1.24	-	0.000	18,618	0.003	837	2	1,674	1.4141	1.4265	12.4	620
E	19	1/20/2012	9:54	81.90	1.24	-	0.000	18,618	0.003	823	2	1,646	1.4115	1.4237	12.2	610

APPENDIX D

Sampler	Sample #	Date of Sample	Time of Sample	(TIME)	Rainfall (in)	Level (m)	Inflow Rate (cfs)	Inflow Volume (cf)	Outflow Rate (cfs)	Measured Tubidity (on turbidimeter)	Turbidity Ratio (1:x)	Actual Turbidity	Clean Dish/Filter Weight (g)	Dried Ladin Dish/Filter Weight (g)	TSS Weight of Sample (mg)	TSS (mg/L)
E	20	1/20/2012	10:54	82.90	1.24	-	0.000	18,618	0.003	817	2	1,634	1.3947	1.4071	12.4	620
E	21	1/20/2012	11:54	83.90	1.24	-	0.000	18,618	0.003	781	2	1,562	1.4098	1.4215	11.7	585
E	22	1/20/2012	12:54	84.90	1.24	-	0.000	18,618	0.003	796	2	1,592	1.3982	1.4103	12.1	605
E	23	1/20/2012	13:54	85.90	1.24	-	0.000	18,618	0.004	781	2	1,562	1.4124	1.4245	12.1	605
E	24	1/20/2012	14:54	86.90	1.24	-	0.000	18,618	0.003	743	2	1,486	1.4097	1.4208	11.1	555

Project: ALDOT 502
Site Name: Basin 4
Site Conditions: Weir and channel compromised by inflow overflowing the inflow channel; therefore inflow #'s are lower than actual; weir not properly installed
Analysis Performed By: Chris Logan
Date of Analysis: 1/24/2012
TSS Sample Vol. : 20 mL
Turbidity Sample Vol. : 15 mL

Sampler	Sample #	Date of Sample	Time of Sample	(TIME)	Rainfall (in)	Level (m)	Inflow Rate (cfs)	Inflow Volume (cf)	Outflow Rate (cfs)	Measured Tubidity (on turbidimeter)	Turbidity Ratio (1:x)	Actual Turbidity	Clean Dish/Filter Weight (g)	Dried Ladin Dish/Filter Weight (g)	TSS Weight of Sample (mg)	TSS (mg/L)
C	1	1/21/2012	15:34	15.57	1.24	0.027	-	18,618	0.004	502	1	502	1.4137	1.4178	4.1	205
C	2	1/21/2012	16:33	16.55	1.24	0.026	-	18,618	0.004	585	2	1,170	1.4046	1.4154	10.8	540
C	3	1/21/2012	17:33	17.55	1.24	0.026	-	18,618	0.004	585	2	1,170	1.4007	1.4112	10.5	525
C	4	1/21/2012	18:33	18.55	1.24	0.024	-	18,618	0.004	568	2	1,136	1.3973	1.4079	10.6	530
C	5	1/21/2012	19:33	19.55	1.24	0.023	-	18,618	0.003	519	2	1,038	1.4092	1.4191	9.9	495
C	6	1/21/2012	20:33	20.55	1.24	0.023	-	18,618	0.003	450	2	900	1.4024	1.4114	9	450
C	7	1/21/2012	21:33	21.55	1.24	0.022	-	18,618	0.003	446	2	892	1.4061	1.4139	7.8	390
C	8	1/21/2012	22:33	22.55	1.24	0.021	-	18,618	0.003	837	1	837	1.4092	1.4172	8	400
C	9	1/21/2012	23:33	23.55	1.24	0.021	-	18,618	0.003	830	1	830	1.4036	1.4115	7.9	395
C	10	1/22/2012	0:33	24.55	1.24	0.020	-	18,618	0.002	756	1	756	1.4085	1.4162	7.7	385
C	11	1/22/2012	1:33	25.55	1.24	0.019	-	18,618	0.002	678	1	678	1.4136	1.4203	6.7	335
C	12	1/22/2012	2:33	26.55	1.24	0.019	-	18,618	0.002	678	1	678	1.4065	1.4131	6.6	330
C	13	1/22/2012	3:33	27.55	1.24	0.018	-	18,618	0.002	665	1	665	1.4061	1.4128	6.7	335
C	14	1/22/2012	4:33	28.55	1.24	0.018	-	18,618	0.002	653	1	653	1.4067	1.4127	6	300
C	15	1/22/2012	5:33	29.55	1.24	0.017	-	18,618	0.002	628	1	628	1.4145	1.4205	6	300
C	16	1/22/2012	6:33	30.55	1.24	0.017	-	18,618	0.002	603	1	603	1.4049	1.4107	5.8	290
C	17	1/22/2012	7:33	31.55	1.24	0.016	-	18,618	0.002	616	1	616	1.4109	1.4169	6	300
C	18	1/22/2012	8:33	32.55	1.24	0.015	-	18,618	0.001	592	1	592	1.4144	1.4209	6.5	325
C	19	1/22/2012	9:33	33.55	1.24	0.016	-	18,618	0.001	593	1	593	1.4162	1.4225	6.3	315
C	20	1/22/2012	10:33	34.55	1.24	0.016	-	18,618	0.002	564	1	564	1.4086	1.4141	5.5	275
C	21	1/22/2012	11:33	35.55	1.24	0.018	-	18,618	0.002	556	1	556	1.4141	1.4186	4.5	225
C	22	1/22/2012	12:33	36.55	1.24	0.019	-	18,618	0.002	541	1	541	1.4083	1.4128	4.5	225
C	23	1/22/2012	13:33	37.55	1.24	0.020	-	18,618	0.003	540	1	540	1.4086	1.4131	4.5	225
C	24	1/22/2012	14:33	38.55	1.24	0.019	-	18,618	0.002	516	1	516	1.4130	1.4173	4.3	215
D	1	1/21/2012	15:39	15.65	1.24	-	-	18,618	0.004	978	2	1,956	1.3964	1.4124	16	800
D	2	1/21/2012	16:37	16.62	1.24	-	-	18,618	0.004	873	2	1,746	1.4052	1.4188	13.6	680
D	3	1/21/2012	17:37	17.62	1.24	-	-	18,618	0.004	816	2	1,632	1.4129	1.4257	12.8	640
D	4	1/21/2012	18:37	18.62	1.24	-	-	18,618	0.004	758	2	1,516	1.4076	1.4191	11.5	575
D	5	1/21/2012	19:37	19.62	1.24	-	-	18,618	0.003	749	2	1,498	1.4010	1.4123	11.3	565
D	6	1/21/2012	20:37	20.62	1.24	-	-	18,618	0.003	677	2	1,354	1.4127	1.4236	10.9	545
D	7	1/21/2012	21:37	21.62	1.24	-	-	18,618	0.003	679	2	1,358	1.4029	1.4135	10.6	530
D	8	1/21/2012	22:37	22.62	1.24	-	-	18,618	0.003	624	2	1,248	1.4024	1.4125	10.1	505
D	9	1/21/2012	23:37	23.62	1.24	-	-	18,618	0.003	625	2	1,250	1.4071	1.4172	10.1	505
D	10	1/22/2012	0:37	24.62	1.24	-	-	18,618	0.002	622	2	1,244	1.4015	1.4115	10	500
D	11	1/22/2012	1:37	25.62	1.24	-	-	18,618	0.002	641	2	1,282	1.4064	1.4157	9.3	465
D	12	1/22/2012	2:37	26.62	1.24	-	-	18,618	0.002	580	2	1,160	1.4062	1.4157	9.5	475
D	13	1/22/2012	3:37	27.62	1.24	-	-	18,618	0.002	539	2	1,078	1.4088	1.4171	8.3	415
D	14	1/22/2012	4:37	28.62	1.24	-	-	18,618	0.002	485	2	970	1.4084	1.4160	7.6	380
D	15	1/22/2012	5:37	29.62	1.24	-	-	18,618	0.002	456	2	912	1.4107	1.4177	7	350
D	16	1/22/2012	6:37	30.62	1.24	-	-	18,618	0.002	434	2	868	1.3931	1.4002	7.1	355
D	17	1/22/2012	7:37	31.62	1.24	-	-	18,618	0.001	869	1	869	1.4013	1.4079	6.6	330
D	18	1/22/2012	8:37	32.62	1.24	-	-	18,618	0.001	858	1	858	1.4079	1.4148	6.9	345
D	19	1/22/2012	9:37	33.62	1.24	-	-	18,618	0.001	844	1	844	1.3974	1.4038	6.4	320
D	20	1/22/2012	10:37	34.62	1.24	-	-	18,618	0.002	810	1	810	1.4030	1.4090	6	300
D	21	1/22/2012	11:37	35.62	1.24	-	-	18,618	0.002	764	1	764	1.4014	1.4074	6	300
D	22	1/22/2012	12:37	36.62	1.24	-	-	18,618	0.002	769	1	769	1.4022	1.4084	6.2	310
D	23	1/22/2012	13:37	37.62	1.24	-	-	18,618	0.002	761	1	761	1.4017	1.4083	6.6	330
D	24	1/22/2012	14:37	38.62	1.24	-	-	18,618	0.002	738	1	738	1.4081	1.4135	5.4	270
E	1	1/21/2012	15:45	15.75	1.24	-	-	18,618	0.004	479	4	1,916	1.4060	1.4222	16.2	810
E	2	1/21/2012	16:42	16.70	1.24	-	-	18,618	0.004	860	2	1,720	1.4121	1.4262	14.1	705
E	3	1/21/2012	17:42	17.70	1.24	-	-	18,618	0.004	811	2	1,622	1.4047	1.4179	13.2	660
E	4	1/21/2012	18:42	18.70	1.24	-	-	18,618	0.004	752	2	1,504	1.4051	1.4173	12.2	610
E	5	1/21/2012	19:42	19.70	1.24	-	-	18,618	0.003	724	2	1,448	1.4049	1.4166	11.7	585
E	6	1/21/2012	20:42	20.70	1.24	-	-	18,618	0.003	706	2	1,412	1.4155	1.4264	10.9	545
E	7	1/21/2012	21:42	21.70	1.24	-	-	18,618	0.003	722	2	1,444	1.4060	1.4165	10.5	525
E	8	1/21/2012	22:42	22.70	1.24	-	-	18,618	0.003	628	2	1,256	1.4113	1.4216	10.3	515
E	9	1/21/2012	23:42	23.70	1.24	-	-	18,618	0.003	603	2	1,206	1.4072	1.4167	9.5	475
E	10	1/22/2012	0:42	24.70	1.24	-	-	18,618	0.002	622	2	1,244	1.4025	1.4121	9.6	480
E	11	1/22/2012	1:42	25.70	1.24	-	-	18,618	0.002	602	2	1,204	1.4092	1.4185	9.3	465
E	12	1/22/2012	2:42	26.70	1.24	-	-	18,618	0.002	600	2	1,200	1.4029	1.4128	9.9	495
E	13	1/22/2012	3:42	27.70	1.24	-	-	18,618	0.002	542	2	1,084	1.4111	1.4193	8.2	410
E	14	1/22/2012	4:42	28.70	1.24	-	-	18,618	0.002	561	2	1,122	1.4076	1.4169	9.3	465
E	15	1/22/2012	5:42	29.70	1.24	-	-	18,618	0.002	519	2	1,038	1.4069	1.4154	8.5	425
E	16	1/22/2012	6:42	30.70	1.24	-	-	18,618	0.002	511	2	1,022	1.4074	1.4154	8	400
E	17	1/22/2012	7:42	31.70	1.24	-	-	18,618	0.001	499	2	998	1.4088	1.4168	8	400
E	18	1/22/2012	8:42	32.70	1.24	-	-	18,618	0.001	482	2	964	1.4107	1.4187	8	400
E	19	1/22/2012	9:42	33.70	1.24	-	-	18,618	0.001	964	1	964	1.4083	1.4162	7.9	395
E	20	1/22/2012	10:42	34.70	1.24	-	-	18,618	0.002	925	1	925	1.4078	1.4153	7.5	375
E	21	1/22/2012	11:42	35.70	1.24	-	-	18,618	0.002	891	1	891	1.4046	1.4113	6.7	335
E	22	1/22/2012	12:42	36.70	1.24	-	-	18,618	0.002	819	1	819	1.4171	1.4237	6.6	330
E	23	1/22/2012	13:42	37.70	1.24	-	-	18,618	0.002	807	1	807	1.4088	1.4145	5.7	285
E	24	1/22/2012	14:42	38.70	1.24	-	-	18,618	0.002	847	1	847	1.4116	1.4180	6.4	320

APPENDIX D

Project: ALDOT 502
Site Name: Basin 4
Site Conditions: No accurate inflow #'s, No PAM, Sampler E Power Failure
Analysis Performed By: Chris Logan
Date of Analysis: 1/25/2012
TSS Sample Vol. : 20mL
Turbidity Sample Vol. : 15 mL

Sampler	Sample #	Date of Sample	Time of Sample	(TIME)	Rainfall (in)	Level (m)	Inflow Rate (cfs)	Inflow Volume (cf)	Outflow Rate (cfs)	Measured Tubidity (on turbidimeter)	Turbidity Ratio (1:x)	Actual Turbidity	Clean Dish/Filter Weight (g)	Dried Ladin Dish/Filter Weight (g)	TSS Weight of Sample (mg)	TSS (mg/L)
A	1	1/23/2012	0:28	0.47	0.46	0.013	0.090	224.447	0.009	875	4	3,500	1.4031	1.4421	39	1950
A	2	1/23/2012	1:28	1.47	0.73	0.008	0.044	489.857	0.012	703	4	2,812	1.3992	1.4318	32.6	1630
A	3	1/23/2012	1:58	1.97	0.92	0.010	0.061	728.355	0.016	604	4	2,416	1.4061	1.4332	27.1	1355
C	1	1/23/2012	11:54	11.90	0.96	0.047	-	751.328	0.014	786	2	1,572	1.3984	1.4108	12.4	620
C	2	1/23/2012	12:54	12.90	0.96	0.047	-	751.328	0.014	459	4	1,836	1.4002	1.4164	16.2	810
C	3	1/23/2012	13:54	13.90	0.96	0.048	-	751.328	0.014	509	4	2,036	1.3964	1.4142	17.8	890
C	4	1/23/2012	14:54	14.90	0.96	0.047	-	751.328	0.014	507	4	2,028	1.3982	1.4160	17.8	890
C	5	1/23/2012	15:54	15.90	0.96	0.046	-	751.328	0.013	471	4	1,884	1.3967	1.4132	16.5	825
C	6	1/23/2012	16:54	16.90	0.96	0.045	-	751.328	0.012	511	4	2,044	1.3995	1.4160	16.5	825
C	7	1/23/2012	17:54	17.90	0.96	0.038	-	751.328	0.009	485	4	1,940	1.4017	1.4179	16.2	810
C	8	1/23/2012	18:54	18.90	0.96	0.037	-	751.328	0.009	456	4	1,824	1.4040	1.4198	15.8	790
C	9	1/23/2012	19:54	19.90	0.96	0.036	-	751.328	0.008	458	4	1,832	1.4029	1.4181	15.2	760
C	10	1/23/2012	20:54	20.90	0.96	0.036	-	751.328	0.008	454	4	1,816	1.4105	1.4258	15.3	765
C	11	1/23/2012	21:54	21.90	0.96	0.036	-	751.328	0.008	470	4	1,880	1.4065	1.4223	15.8	790
C	12	1/23/2012	22:54	22.90	0.96	0.035	-	751.328	0.007	462	4	1,848	1.4036	1.4193	15.7	785
C	13	1/23/2012	23:54	23.90	0.96	0.034	-	751.328	0.007	439	4	1,756	1.4055	1.4207	15.2	760
C	14	1/24/2012	0:54	24.90	0.96	0.034	-	751.328	0.007	470	4	1,880	1.3976	1.4126	15	750
C	15	1/24/2012	1:54	25.90	0.96	0.034	-	751.328	0.007	441	4	1,764	1.4005	1.4158	15.3	765
C	16	1/24/2012	2:54	26.90	0.96	0.034	-	751.328	0.007	971	2	1,942	1.4004	1.4152	14.8	740
C	17	1/24/2012	3:54	27.90	0.96	0.033	-	751.328	0.007	950	2	1,900	1.4023	1.4169	14.6	730
C	18	1/24/2012	4:54	28.90	0.96	0.032	-	751.328	0.006	923	2	1,846	1.4008	1.4153	14.5	725
C	19	1/24/2012	5:54	29.90	0.96	0.032	-	751.328	0.006	959	2	1,918	1.4135	1.4279	14.4	720
C	20	1/24/2012	6:54	30.90	0.96	0.032	-	751.328	0.006	941	2	1,882	1.3985	1.4124	13.9	695
C	21	1/24/2012	7:54	31.90	0.96	0.032	-	751.328	0.006	923	2	1,846	1.4023	1.4163	14	700
C	22	1/24/2012	8:54	32.90	0.96	0.033	-	751.328	0.007	902	2	1,804	1.3991	1.4124	13.3	665
C	23	1/24/2012	9:54	33.90	0.96	0.034	-	751.328	0.007	897	2	1,794	1.4078	1.4212	13.4	670
C	24	1/24/2012	10:54	34.90	0.96	0.035	-	751.328	0.007	855	2	1,710	1.4083	1.4212	12.9	645
D	1	1/23/2012	11:59	11.98	0.96	-	-	751.328	0.013	748	4	2,992	1.4087	1.4365	27.8	1390
D	2	1/23/2012	12:57	12.95	0.96	-	-	751.328	0.015	697	4	2,788	1.4012	1.4266	25.4	1270
D	3	1/23/2012	13:57	13.95	0.96	-	-	751.328	0.014	741	4	2,964	1.4092	1.4334	24.2	1210
D	4	1/23/2012	14:57	14.95	0.96	-	-	751.328	0.014	673	4	2,692	1.4015	1.4249	23.4	1170
D	5	1/23/2012	15:57	15.95	0.96	-	-	751.328	0.013	641	4	2,564	1.4011	1.4239	22.8	1140
D	6	1/23/2012	16:57	16.95	0.96	-	-	751.328	0.009	620	4	2,480	1.4168	1.4391	22.3	1115
D	7	1/23/2012	17:57	17.95	0.96	-	-	751.328	0.009	610	4	2,440	1.3984	1.4203	21.9	1095
D	8	1/23/2012	18:57	18.95	0.96	-	-	751.328	0.009	612	4	2,448	1.4111	1.4320	20.9	1045
D	9	1/23/2012	19:57	19.95	0.96	-	-	751.328	0.008	580	4	2,320	1.4119	1.4327	20.8	1040
D	10	1/23/2012	20:57	20.95	0.96	-	-	751.328	0.008	577	4	2,308	1.3997	1.4204	20.7	1035
D	11	1/23/2012	21:57	21.95	0.96	-	-	751.328	0.008	569	4	2,276	1.4113	1.4317	20.4	1020
D	12	1/23/2012	22:57	22.95	0.96	-	-	751.328	0.008	536	4	2,144	1.3985	1.4183	19.8	990
D	13	1/23/2012	23:57	23.95	0.96	-	-	751.328	0.007	521	4	2,084	1.4045	1.4230	18.5	925
D	14	1/24/2012	0:58	24.97	0.96	-	-	751.328	0.007	504	4	2,016	1.4017	1.4229	21.2	1060
D	15	1/24/2012	1:58	25.97	0.96	-	-	751.328	0.007	463	4	1,852	1.4058	1.4221	16.3	815
D	16	1/24/2012	2:58	26.97	0.96	-	-	751.328	0.007	451	4	1,804	1.4049	1.4202	15.3	765
D	17	1/24/2012	3:58	27.97	0.96	-	-	751.328	0.007	432	4	1,728	1.4027	1.4182	15.5	775
D	18	1/24/2012	4:58	28.97	0.96	-	-	751.328	0.007	952	2	1,904	1.4055	1.4210	15.5	775
D	19	1/24/2012	5:58	29.97	0.96	-	-	751.328	0.006	946	2	1,892	1.4117	1.4272	15.5	775
D	20	1/24/2012	6:58	30.97	0.96	-	-	751.328	0.007	957	2	1,914	1.4133	1.4282	14.9	745
D	21	1/24/2012	7:58	31.97	0.96	-	-	751.328	0.007	931	2	1,862	1.3952	1.4096	14.4	720
D	22	1/24/2012	8:58	32.97	0.96	-	-	751.328	0.007	910	2	1,820	1.4071	1.4216	14.5	725
D	23	1/24/2012	9:57	33.95	0.96	-	-	751.328	0.007	900	2	1,800	1.4073	1.4212	13.9	695
D	24	1/24/2012	10:57	34.95	0.96	-	-	751.328	0.008	892	2	1,784	1.3996	1.4138	14.2	710
E	1	1/23/2012	12:05	12.08	0.96	-	-	751.328	0.013	759	4	3,036	1.3982	1.4247	26.5	1325
E	2	1/23/2012	13:02	13.03	0.96	-	-	751.328	0.014	711	4	2,844	1.4004	1.4247	24.3	1215
E	3	1/23/2012	14:02	14.03	0.96	-	-	751.328	0.014	694	4	2,776	1.4111	1.4354	24.3	1215
E	4	1/23/2012	15:02	15.03	0.96	-	-	751.328	0.014	679	4	2,716	1.4104	1.4334	23	1150
E	5	1/23/2012	16:02	16.03	0.96	-	-	751.328	0.013	636	4	2,544	1.4011	1.4241	23	1150
E	6	1/23/2012	17:02	17.03	0.96	-	-	751.328	0.009	659	4	2,636	1.4145	1.4362	21.7	1085
E	7	1/23/2012	18:02	18.03	0.96	-	-	751.328	0.009	621	4	2,484	1.3989	1.4208	21.9	1095
E	8	1/23/2012	19:02	19.03	0.96	-	-	751.328	0.008	610	4	2,440	1.4050	1.4259	20.9	1045
E	9	1/23/2012	20:02	20.03	0.96	-	-	751.328	0.008	562	4	2,248	1.4105	1.4317	21.2	1060
E	10	1/23/2012	21:02	21.03	0.96	-	-	751.328	0.008	606	4	2,424	1.4153	1.4363	21	1050
E	11	1/23/2012	22:03	22.05	0.96	-	-	751.328	0.007	566	4	2,264	1.4031	1.4230	19.9	995
E	12	1/23/2012	23:03	23.05	0.96	-	-	751.328	0.007	550	4	2,200	1.4062	1.4246	18.4	920
E	13	1/24/2012	0:03	24.05	0.96	-	-	751.328	0.007	512	4	2,048	1.4164	1.4339	17.5	875
E	14	1/24/2012	1:03	25.05	0.96	-	-	751.328	0.007	462	4	1,848	1.4052	1.4220	16.8	840

APPENDIX D

Project: ALDOT 502
Site Name: Basin 4
Site Conditions: No Inflow #'s, No PAM
Analysis Performed By: Chris Logan
Date of Analysis: 1/26/2011
TSS Sample Vol. : 20 mL
Turbidity Sample Vol. : 15 mL

Sampler	Sample #	Date of Sample	Time of Sample	(TIME)	Rainfall (in)	Level (m)	Inflow Rate (cfs)	Inflow Volume (cf)	Outflow Rate (cfs)	Measured Tubidity (on turbidimeter)	Turbidity Ratio (1:x)	Actual Turbidity	Clean Dish/Filter Weight (g)	Dried Ladin Dish/Filter Weight (g)	TSS Weight of Sample (mg)	TSS (mg/L)
C	1	1/24/2012	12:37	12.62	0.96	0.037	-	-	0.008	822	2	1,644	1.4273	1.4388	11.5	575
C	2	1/24/2012	13:37	13.62	0.96	0.039	-	-	0.009	780	2	1,560	1.4230	1.4340	11	550
C	3	1/24/2012	14:37	14.62	0.96	0.038	-	-	0.009	790	2	1,580	1.4284	1.4391	10.7	535
C	4	1/24/2012	15:37	15.62	0.96	0.037	-	-	0.008	774	2	1,548	1.4209	1.4317	10.8	540
C	5	1/24/2012	16:37	16.62	0.96	0.036	-	-	0.008	738	2	1,476	1.4245	1.4347	10.2	510
C	6	1/24/2012	17:37	17.62	0.96	0.035	-	-	0.008	757	2	1,514	1.4205	1.4305	10	500
C	7	1/24/2012	18:37	18.62	0.96	0.033	-	-	0.007	718	2	1,436	1.4197	1.4292	9.5	475
C	8	1/24/2012	19:37	19.62	0.96	0.033	-	-	0.007	733	2	1,466	1.4248	1.4345	9.7	485
C	9	1/24/2012	20:37	20.62	0.96	0.033	-	-	0.007	670	2	1,340	1.4136	1.4231	9.5	475
C	10	1/24/2012	21:37	21.62	0.96	0.033	-	-	0.007	666	2	1,332	1.4231	1.4326	9.5	475
C	11	1/24/2012	22:37	22.62	0.96	0.032	-	-	0.006	672	2	1,344	1.4245	1.4338	9.3	465
C	12	1/24/2012	23:37	23.62	0.96	0.032	-	-	0.006	653	2	1,306	1.4289	1.4380	9.1	455
C	13	1/25/2012	0:37	24.62	0.96	0.032	-	-	0.006	660	2	1,320	1.4268	1.4362	9.4	470
C	14	1/25/2012	1:37	25.62	0.96	0.032	-	-	0.006	655	2	1,310	1.4222	1.4319	9.7	485
C	15	1/25/2012	2:37	26.62	0.96	0.031	-	-	0.006	635	2	1,270	1.4142	1.4234	9.2	460
C	16	1/25/2012	3:37	27.62	0.96	0.030	-	-	0.006	640	2	1,280	1.4324	1.4413	8.9	445
C	17	1/25/2012	4:37	28.62	0.96	0.031	-	-	0.006	621	2	1,242	1.4294	1.4386	9.2	460
C	18	1/25/2012	5:37	29.62	0.96	0.031	-	-	0.006	575	2	1,150	1.4337	1.4426	8.9	445
C	19	1/25/2012	6:37	30.62	0.96	0.030	-	-	0.006	608	2	1,216	1.4339	1.4424	8.5	425
C	20	1/25/2012	7:37	31.62	0.96	0.030	-	-	0.006	580	2	1,160	1.4285	1.4367	8.2	410
C	21	1/25/2012	8:37	32.62	0.96	0.030	-	-	0.006	587	2	1,174	1.4048	1.4128	8	400
C	22	1/25/2012	9:37	33.62	0.96	0.031	-	-	0.006	565	2	1,130	1.4076	1.4155	7.9	395
C	23	1/25/2012	10:37	34.62	0.96	0.031	-	-	0.006	559	2	1,118	1.4183	1.4263	8	400
C	24	1/25/2012	11:37	35.62	0.96	0.032	-	-	0.006	558	2	1,116	1.4190	1.4369	17.9	895
D	1	1/24/2012	12:42	12.70	0.96	-	-	-	0.008	884	2	1,768	1.4152	1.4276	12.4	620
D	2	1/24/2012	13:41	13.68	0.96	-	-	-	0.009	881	2	1,762	1.4136	1.4264	12.8	640
D	3	1/24/2012	14:41	14.68	0.96	-	-	-	0.009	862	2	1,724	1.4291	1.4420	12.9	645
D	4	1/24/2012	15:41	15.68	0.96	-	-	-	0.008	852	2	1,704	1.4275	1.4404	12.9	645
D	5	1/24/2012	16:41	16.68	0.96	-	-	-	0.008	838	2	1,676	1.4329	1.4457	12.8	640
D	6	1/24/2012	17:41	17.68	0.96	-	-	-	0.007	815	2	1,630	1.4253	1.4381	12.8	640
D	7	1/24/2012	18:41	18.68	0.96	-	-	-	0.007	835	2	1,670	1.4240	1.4365	12.5	625
D	8	1/24/2012	19:41	19.68	0.96	-	-	-	0.007	799	2	1,598	1.4270	1.4394	12.4	620
D	9	1/24/2012	20:41	20.68	0.96	-	-	-	0.007	809	2	1,618	1.4294	1.4415	12.1	605
D	10	1/24/2012	21:41	21.68	0.96	-	-	-	0.007	757	2	1,514	1.4221	1.4339	11.8	590
D	11	1/24/2012	22:41	22.68	0.96	-	-	-	0.006	694	2	1,388	1.4259	1.4363	10.4	520
D	12	1/24/2012	23:41	23.68	0.96	-	-	-	0.006	694	2	1,388	1.4289	1.4397	10.8	540
D	13	1/25/2012	0:41	24.68	0.96	-	-	-	0.006	638	2	1,276	1.4300	1.4407	10.7	535
D	14	1/25/2012	1:41	25.68	0.96	-	-	-	0.006	642	2	1,284	1.4241	1.4343	10.2	510
D	15	1/25/2012	2:41	26.68	0.96	-	-	-	0.006	677	2	1,354	1.4360	1.4459	9.9	495
D	16	1/25/2012	3:41	27.68	0.96	-	-	-	0.006	666	2	1,332	1.4182	1.4277	9.5	475
D	17	1/25/2012	4:41	28.68	0.96	-	-	-	0.006	670	2	1,340	1.4233	1.4331	9.8	490
D	18	1/25/2012	5:41	29.68	0.96	-	-	-	0.006	632	2	1,264	1.4249	1.4392	14.3	715
D	19	1/25/2012	6:41	30.68	0.96	-	-	-	0.006	609	2	1,218	1.4294	1.4339	4.5	225
D	20	1/25/2012	7:41	31.68	0.96	-	-	-	0.005	603	2	1,206	1.4109	1.4201	9.2	460
D	21	1/25/2012	8:41	32.68	0.96	-	-	-	0.006	599	2	1,198	1.4232	1.4323	9.1	455
D	22	1/25/2012	9:41	33.68	0.96	-	-	-	0.005	650	2	1,300	1.4279	1.4371	9.2	460
D	23	1/25/2012	10:41	34.68	0.96	-	-	-	0.006	608	2	1,216	1.4221	1.4313	9.2	460
D	24	1/25/2012	11:41	35.68	0.96	-	-	-	0.006	593	2	1,186	1.4324	1.4415	9.1	455
E	1	1/24/2012	12:48	12.80	0.96	-	-	-	0.008	496	4	1,984	1.4346	1.4502	15.6	780
E	2	1/24/2012	13:46	13.77	0.96	-	-	-	0.009	429	4	1,716	1.4109	1.4244	13.5	675
E	3	1/24/2012	14:46	14.77	0.96	-	-	-	0.008	875	2	1,750	1.4244	1.4378	13.4	670
E	4	1/24/2012	15:46	15.77	0.96	-	-	-	0.008	868	2	1,736	1.4190	1.4320	13	650
E	5	1/24/2012	16:46	16.77	0.96	-	-	-	0.008	842	2	1,684	1.4252	1.4375	12.3	615
E	6	1/24/2012	17:46	17.77	0.96	-	-	-	0.007	817	2	1,634	1.4154	1.4278	12.4	620
E	7	1/24/2012	18:46	18.77	0.96	-	-	-	0.007	788	2	1,576	1.4281	1.4404	12.3	615
E	8	1/24/2012	19:46	19.77	0.96	-	-	-	0.007	804	2	1,608	1.4111	1.4224	11.3	565
E	9	1/24/2012	20:46	20.77	0.96	-	-	-	0.006	793	2	1,586	1.4218	1.4335	11.7	585
E	10	1/24/2012	21:46	21.77	0.96	-	-	-	0.006	780	2	1,560	1.4208	1.4323	11.5	575
E	11	1/24/2012	22:46	22.77	0.96	-	-	-	0.006	704	2	1,408	1.4260	1.4367	10.7	535
E	12	1/24/2012	23:46	23.77	0.96	-	-	-	0.006	701	2	1,402	1.4252	1.4357	10.5	525
E	13	1/25/2012	0:46	24.77	0.96	-	-	-	0.006	685	2	1,370	1.4202	1.4306	10.4	520
E	15	1/25/2012	2:46	26.77	0.96	-	-	-	0.006	672	2	1,344	1.4265	1.4366	10.1	505
E	16	1/25/2012	3:46	27.77	0.96	-	-	-	0.006	676	2	1,352	1.4296	1.4394	9.8	490
E	17	1/25/2012	4:46	28.77	0.96	-	-	-	0.006	618	2	1,236	1.4195	1.4290	9.5	475
E	18	1/25/2012	5:46	29.77	0.96	-	-	-	0.006	629	2	1,258	1.4032	1.4133	10.1	505
E	19	1/25/2012	6:46	30.77	0.96	-	-	-	0.006	596	2	1,192	1.4185	1.4282	9.7	485
E	20	1/25/2012	7:46	31.77	0.96	-	-	-	0.005	598	2	1,196	1.4155	1.4252	9.7	485
E	21	1/25/2012	8:46	32.77	0.96	-	-	-	0.005	623	2	1,246	1.4055	1.4155	10	500
E	22	1/25/2012	9:46	33.77	0.96	-	-	-	0.006	605	2	1,210	1.4149	1.4245	9.6	480
E	23	1/25/2012	10:46	34.77	0.96	-	-	-	0.006	583	2	1,166	1.4121	1.4213	9.2	460
E	24	1/25/2012	11:46	35.77	0.96	-	-	-	0.007	582	2	1,164	1.4104	1.4199	9.5	475

APPENDIX D

Site Name: Basin 4
Site Conditions: Inaccurate Flow #'s Due to Rock Against Bubbler Tube
Analysis Performed By: Chris Logan
Date of Analysis: 1/29/2012
TSS Sample Vol. : 20 mL
Turbidity Sample Vol. : 15 mL

Sampler	Sample #	Date of Sample	Time of Sample	(TIME)	Rainfall (in)	Level (m)	Inflow Rate (cfs)	Inflow Volume (cf)	Outflow Rate (cfs)	Measured Tubidity (on turbidimeter)	Turbidity Ratio (1:x)	Actual Turbidity	Clean Dish/Filter Weight (g)	Dried Ladin Dish/Filter Weight (g)	TSS Weight of Sample (mg)	TSS (mg/L)
B	1	1/26/2012	6:51	6.85	0.21	0.034	0.501	4,983	0.005	191	1	191	1.4095	1.4114	1.9	95
B	2	1/26/2012	7:02	7.03	0.22	0.033	0.479	5,298	0.005	344	1	344	1.4106	1.4144	3.8	190
B	3	1/26/2012	7:11	7.18	0.22	0.037	0.568	5,581	0.005	645	1	645	1.4095	1.4159	6.4	320
B	4	1/26/2012	7:20	7.33	0.22	0.040	0.638	5,916	0.005	648	1	648	1.4071	1.4135	6.4	320
B	5	1/26/2012	7:27	7.45	0.22	0.040	0.638	6,185	0.005	676	1	676	1.4231	1.4304	7.3	365
B	6	1/26/2012	7:35	7.58	0.22	0.040	0.638	6,492	0.005	684	1	684	1.4036	1.4105	6.9	345
B	7	1/26/2012	7:43	7.72	0.23	0.041	0.662	6,801	0.005	609	1	609	1.4080	1.4143	6.3	315
B	8	1/26/2012	7:51	7.85	0.23	0.041	0.662	7,117	0.005	565	1	565	1.4150	1.4218	6.8	340
B	9	1/26/2012	7:58	7.97	0.23	0.043	0.711	7,402	0.005	592	1	592	1.4147	1.4220	7.3	365
B	10	1/26/2012	8:05	8.08	0.24	0.041	0.662	7,686	0.005	613	1	613	1.4242	1.4305	6.3	315
B	11	1/26/2012	8:13	8.22	0.24	0.041	0.662	8,004	0.005	644	1	644	1.4279	1.4342	6.3	315
B	12	1/26/2012	8:20	8.33	0.25	0.043	0.711	8,306	0.005	622	1	622	1.4202	1.4262	6	300
B	13	1/26/2012	8:27	8.45	0.27	0.043	0.711	8,607	0.005	541	1	541	1.4261	1.4320	5.9	295
B	14	1/26/2012	8:33	8.55	0.28	0.045	0.761	8,870	0.005	508	1	508	1.4304	1.4357	5.3	265
B	15	1/26/2012	8:40	8.67	0.29	0.043	0.711	9,181	0.006	456	1	456	1.4207	1.4258	5.1	255
B	16	1/26/2012	8:47	8.78	0.32	0.044	0.736	9,482	0.005	434	1	434	1.4162	1.4213	5.1	255
B	17	1/26/2012	8:54	8.90	0.33	0.042	0.686	9,785	0.006	403	1	403	1.4223	1.4268	4.5	225
B	18	1/26/2012	9:01	9.02	0.33	0.042	0.686	10,074	0.006	394	1	394	1.4124	1.4169	4.5	225
B	19	1/26/2012	9:09	9.15	0.34	0.042	0.686	10,403	0.006	365	1	365	1.4177	1.4219	4.2	210
B	20	1/26/2012	9:16	9.27	0.35	0.042	0.686	10,688	0.006	337	1	337	1.4176	1.4216	4	200
B	21	1/26/2012	9:23	9.38	0.36	0.042	0.686	10,978	0.006	331	1	331	1.4250	1.4293	4.3	215
B	22	1/26/2012	9:30	9.50	0.38	0.043	0.711	11,268	0.006	355	1	355	1.4280	1.4325	4.5	225
B	23	1/26/2012	9:37	9.62	0.39	0.045	0.761	11,580	0.006	401	1	401	1.4188	1.4228	4	200
B	24	1/26/2012	9:44	9.73	0.41	0.047	0.812	11,916	0.007	785	1	785	1.4281	1.4368	8.7	435
C	1	1/26/2012	6:18	6.30	0.20	0.028	0.262	4,286	0.005	849	1	849	1.4266	1.4342	7.6	380
C	2	1/26/2012	7:18	7.30	0.22	0.029	0.662	5,839	0.005	905	1	905	1.4239	1.4316	7.7	385
C	3	1/26/2012	8:18	8.30	0.25	0.030	0.736	8,220	0.005	884	1	884	1.4233	1.4305	7.2	360
C	4	1/26/2012	9:18	9.30	0.35	0.032	0.686	10,772	0.006	746	1	746	1.4106	1.4169	6.3	315
C	5	1/26/2012	10:18	10.30	0.50	0.035	1.258	14,252	0.007	741	1	741	1.4309	1.4375	6.6	330
C	6	1/26/2012	11:18	11.30	0.57	0.039	1.934	19,515	0.009	760	1	760	1.4222	1.4297	7.5	375
C	7	1/26/2012	12:18	12.30	0.58	0.037	1.348	25,876	0.009	744	1	744	1.4306	1.4380	7.4	370
C	8	1/26/2012	13:18	13.30	0.58	0.038	0.864	29,662	0.009	726	1	726	1.4138	1.4210	7.2	360
C	9	1/26/2012	14:18	14.30	0.58	0.039	0.736	32,533	0.009	707	1	707	1.4286	1.4354	6.8	340
C	10	1/26/2012	15:18	15.30	0.58	0.040	0.568	34,912	0.010	670	1	670	1.4160	1.4224	6.4	320
C	11	1/26/2012	16:18	16.30	0.58	0.039	0.479	36,765	0.009	642	1	642	1.4235	1.4300	6.5	325
C	12	1/26/2012	17:18	17.30	0.64	0.040	0.501	38,471	0.010	569	1	569	1.4313	1.4368	5.5	275
C	13	1/26/2012	18:18	18.30	0.65	0.040	0.812	40,928	0.010	537	1	537	1.4241	1.4292	5.1	255
C	14	1/26/2012	19:18	19.30	0.73	0.038	0.736	43,823	0.009	524	1	524	1.4241	1.4293	5.2	260
C	15	1/26/2012	20:18	20.30	0.73	0.039	1.140	47,520	0.009	533	1	533	1.4177	1.4231	5.4	270
C	16	1/26/2012	21:18	21.30	0.73	0.038	0.761	50,812	0.009	526	1	526	1.4068	1.4118	5	250
C	17	1/26/2012	22:18	22.30	0.73	0.038	0.614	53,316	0.009	539	1	539	1.4334	1.4388	5.4	270
C	18	1/26/2012	23:18	23.30	0.73	0.036	0.501	55,311	0.008	541	1	541	1.4161	1.4205	4.4	220
C	19	1/27/2012	0:18	24.30	0.74	0.036	0.479	57,102	0.008	527	1	527	1.4314	1.4371	5.7	285
C	20	1/27/2012	1:18	25.30	0.74	0.036	0.523	58,903	0.008	520	1	520	1.4206	1.4252	4.6	230
C	21	1/27/2012	2:18	26.30	0.74	0.036	0.436	60,647	0.008	499	1	499	1.4245	1.4296	5.1	255
C	22	1/27/2012	3:18	27.30	0.74	0.035	0.436	62,241	0.007	493	1	493	1.4097	1.4143	4.6	230
C	23	1/27/2012	4:18	28.30	0.74	0.035	0.375	63,644	0.007	480	1	480	1.4074	1.4119	4.5	225
C	24	1/27/2012	5:18	29.30	0.74	0.034	0.317	64,874	0.007	495	1	495	1.4058	1.4104	4.6	230
D	1	1/26/2012	6:24	6.40	0.20	-	0.262	4,381	0.005	502	2	1,004	1.4035	1.4119	8.4	420
D	2	1/26/2012	7:22	7.37	0.22	-	0.638	5,993	0.005	479	2	958	1.4222	1.4306	8.4	420
D	3	1/26/2012	8:22	8.37	0.25	-	0.736	8,392	0.005	460	2	920	1.4043	1.4126	8.3	415
D	4	1/26/2012	9:22	9.37	0.35	-	0.686	10,937	0.006	459	2	918	1.4259	1.4341	8.2	410
D	5	1/26/2012	10:22	10.37	0.50	-	1.258	14,554	0.007	521	2	1,042	1.4230	1.4322	9.2	460
D	6	1/26/2012	11:22	11.37	0.57	-	1.934	19,977	0.009	498	2	996	1.4274	1.4369	9.5	475
D	7	1/26/2012	12:22	12.37	0.58	-	1.288	26,189	0.009	503	2	1,006	1.4033	1.4135	10.2	510
D	8	1/26/2012	13:22	13.37	0.58	-	0.812	29,862	0.009	493	2	986	1.4198	1.4294	9.6	480
D	9	1/26/2012	14:22	14.37	0.58	-	0.711	32,706	0.009	463	2	926	1.4256	1.4356	10	500
D	10	1/26/2012	15:22	15.37	0.58	-	0.545	35,042	0.010	441	2	882	1.4233	1.4316	8.3	415
D	11	1/26/2012	16:22	16.37	0.58	-	0.479	36,878	0.010	905	1	905	1.4169	1.4252	8.3	415
D	12	1/26/2012	17:22	17.37	0.64	-	0.457	38,587	0.010	934	1	934	1.4210	1.4300	9	450
D	13	1/26/2012	18:22	18.37	0.65	-	0.864	41,133	0.010	888	1	888	1.4253	1.4332	7.9	395
D	14	1/26/2012	19:22	19.37	0.73	-	0.736	44,000	0.009	829	1	829	1.4259	1.4329	7	350
D	15	1/26/2012	20:22	20.37	0.73	-	1.111	47,786	0.009	736	1	736	1.4163	1.4227	6.4	320
D	16	1/26/2012	21:22	21.37	0.73	-	0.736	50,990	0.009	697	1	697	1.4085	1.4149	6.4	320
D	17	1/26/2012	22:22	22.37	0.73	-	0.614	53,464	0.008	634	1	634	1.4130	1.4191	6.1	305
D	18	1/26/2012	23:22	23.37	0.73	-	0.501	55,427	0.008	598	1	598	1.4140	1.4197	5.7	285
D	19	1/27/2012	0:22	24.37	0.74	-	0.479	57,218	0.008	577	1	577	1.4303	1.4369	6.6	330
D	20	1/27/2012	1:22	25.37	0.74	-	0.523	59,023	0.008	567	1	567	1.4297	1.4351	5.4	270
D	21	1/27/2012	2:22	26.37	0.74	-	0.479	60,754	0.008	548	1	548	1.4196	1.4244	4.8	240
D	22	1/27/2012	3:22	27.37	0.74	-	0.457	62,347	0.007	543	1	543	1.4198	1.4248	5	250
D	23	1/27/2012	4:22	28.37	0.74	-	0.395	63,738	0.007	519	1	519	1.4288	1.4337	4.9	245
D	24	1/27/2012	5:22	29.37	0.74	-	0.336	64,951	0.007	523	1	523	1.4253	1.4298	4.5	225
E	1	1/26/2012	6:29	6.48	0.20	-	0.280	4,463	0.005	504	2	1,008	1.4072	1.4170	9.8	490
E	2	1/26/2012	7:27	7.45	0.22	-	0.638	6,185	0.005	476	2	952	1.3993	1.4079	8.6	430
E	3	1/26/2012	8:27	8.45	0.27	-	0.711	8,607	0.005	463	2	926	1.3969	1.4065	9.6	480
E	4	1/26/2012	9:27	9.45	0.38	-	0.686	11,143	0.006	488	2	976	1.4013	1.4100	8.7	435
E	5	1/26/2012	10:27	10.45	0.52	-	1.228	14,928	0.008	490	2	980	1.4070	1.4186	11.6	580
E	6	1/26/2012	11:27	11.45	0.57	-	1.865	20,547	0.009	498	2	996	1.4008	1.4121	11.3	565
E	7	1/26/2012	12:27	12.45	0.58	-	1.198	26,565	0.009	470	2	940	1.3965	1.4066	10.1	505
E	8	1/26/2012	13:27	13.45	0.58	-	0.812	30,107	0.009	444	2	888	1.3930	1.4019	8.9	445
E	9	1/26/2012	14:27	14.45	0.58	-	0.686	32,918	0.010	445	2	890	1.3994	1.4084	9	450
E	10	1/26/2012	15:27	15.45	0.58	-	0.523	35,202	0.010	433	2	866	1.4058	1.4143	8.5	425
E	11	1/26/2012	16:27	16.45	0.58	-	0.479	37,024	0.010	412	2	824	1.3997	1.4086	8.9	445
E	12	1/26/2012	17:27	17.45	0.64	-	0.479	38,735	0.010	839	1	839	1.4137	1.4214	7.7	385
E	13	1/26/2012	18:27	18.45	0.69	-	0.812	41,381	0.010	821	1	821	1.4119	1.4200	8.1	405
E	14	1/26/2012	19:27	19.45	0.73	-	0.736	44,220	0.010	763	1	763	1.4030	1.4100	7	350
E	15	1/26/2012	20:27	20.45	0.73	-	1.027	48,103	0.009	751	1	751	1.4034	1.4103	6.9	345
E	16	1/26/2012	21:27	21.45	0.73	-	0.761	51,213	0.010	707	1	707	1.3976	1.4047	7.1	355
E	17	1/26/2012	22:27	22.45	0.73	-	0.614	53,646	0.008	647	1	647	1.4091	1.4158	6.7	335
E	18	1/26/2012	23:27	23.45	0.74	-	0.501	55,577	0.008	627	1	627	1.3951	1.4009	5.8	290
E	19	1/27/2012	0:27	24.45	0.74	-	0.479	57,363	0.008	582	1	582	1.3963	1.4022	5.9	295
E	20	1/27/2012	1:27	25.45	0.74	-	0.501	59,176	0.008	554	1	554	1.4047	1.4096	4.9	245
E	21	1/27/2012	2:27	26.45	0.74	-	0.436	60,886	0.008	537	1	537	1.4010	1.4062	5.2	260
E	22	1/27/2012	3:27	27.45	0.74	-	0.436	62,475	0.007	531	1	531	1.4033	1.4095	6.2	310
E	23	1/27/2012	4:27	28.45	0.74	-	0.355	63,849	0.007	528	1	528	1.4030	1.4094	6.4	320
E	24	1/27/2012	5:27	29.45	0.74	-	0.336	65,052	0.007	517	1	517	1.4017	1.4071	5.4	270

APPENDIX D

Project: ALDOT 502
Site Name: Basin 4
Site Conditions: Inaccurate inflow #'s due to rock leaning against bubbler tube
Analysis Performed By: Chris Logan
Date of Analysis: 1/29/2012
TSS Sample Vol. : 20 mL
Turbidity Sample Vol. : 15 mL

Sampler	Sample #	Date of Sample	Time of Sample	(TIME)	Rainfall (in)	Level (m)	Inflow Rate (cfs)	Inflow Volume (cf)	Outflow Rate (cfs)	Measured Tubidity (on turbidimeter)	Turbidity Ratio (1:x)	Actual Turbidity	Clean Dish/Filter Weight (g)	Dried Ladin Dish/Filter Weight (g)	TSS Weight of Sample (mg)	TSS (mg/L)
C	1	1/27/2012	15:06	15.10	0.74	0.039	0.227	74,561	0.010	379	1	379	1.4132	1.4165	3.3	165
C	2	1/27/2012	16:06	16.10	0.74	0.038	0.000	74,727	0.009	405	1	405	1.4084	1.4120	3.6	180
C	3	1/27/2012	17:06	17.10	0.74	0.037	0.000	74,733	0.009	409	1	409	1.4205	1.4232	2.7	135
C	4	1/27/2012	18:06	18.10	0.74	0.036	0.000	74,743	0.008	397	1	397	1.4160	1.4193	3.3	165
C	5	1/27/2012	19:06	19.10	0.74	0.035	0.000	74,753	0.007	402	1	402	1.4227	1.4257	3	150
C	6	1/27/2012	20:06	20.10	0.74	0.033	0.000	74,755	0.007	403	1	403	1.4112	1.4144	3.2	160
C	7	1/27/2012	21:06	21.10	0.74	0.032	0.000	74,755	0.006	389	1	389	1.4237	1.4265	2.8	140
C	8	1/27/2012	22:06	22.10	0.74	0.032	0.000	74,755	0.006	378	1	378	1.4209	1.4243	3.4	170
C	9	1/27/2012	23:06	23.10	0.74	0.031	0.000	74,755	0.006	374	1	374	1.4148	1.4177	2.9	145
C	10	1/28/2012	0:06	24.10	0.74	0.030	0.000	74,755	0.006	365	1	365	1.4226	1.4257	3.1	155
C	11	1/28/2012	1:06	25.10	0.74	0.030	0.000	74,755	0.005	361	1	361	1.4078	1.4108	3	150
C	12	1/28/2012	2:06	26.10	0.74	0.029	0.000	74,755	0.005	351	1	351	1.4060	1.4086	2.6	130
C	13	1/28/2012	3:06	27.10	0.74	0.028	0.000	74,755	0.005	354	1	354	1.4060	1.4094	3.4	170
C	14	1/28/2012	4:06	28.10	0.74	0.028	0.000	74,755	0.005	356	1	356	1.4262	1.4292	3	150
C	15	1/28/2012	5:06	29.10	0.74	0.027	0.000	74,755	0.005	342	1	342	1.4266	1.4300	3.4	170
C	16	1/28/2012	6:06	30.10	0.74	0.027	0.000	74,755	0.004	335	1	335	1.4102	1.4130	2.8	140
C	17	1/28/2012	7:06	31.10	0.74	0.026	0.000	74,755	0.004	338	1	338	1.4118	1.4151	3.3	165
C	18	1/28/2012	8:06	32.10	0.75	0.026	0.000	74,755	0.004	337	1	337	1.4110	1.4149	3.9	195
C	19	1/28/2012	9:06	33.10	0.75	0.025	0.000	74,755	0.004	339	1	339	1.4053	1.4083	3	150
C	20	1/28/2012	10:06	34.10	0.75	0.027	0.000	74,755	0.005	324	1	324	1.4035	1.4064	2.9	145
C	21	1/28/2012	11:06	35.10	0.75	0.028	0.000	74,755	0.005	315	1	315	1.4075	1.4113	3.8	190
C	22	1/28/2012	12:06	36.10	0.75	0.029	0.000	74,755	0.005	308	1	308	1.4066	1.4096	3	150
C	23	1/28/2012	13:06	37.10	0.75	0.030	0.000	74,755	0.006	320	1	320	1.4164	1.4194	3	150
C	24	1/28/2012	14:06	38.10	0.75	0.032	0.000	74,755	0.006	320	1	320	1.4122	1.4145	2.3	115
D	1	1/27/2012	15:11	15.18	0.74	-	0.244	74,633	0.010	459	1	459	1.4035	1.4082	4.7	235
D	2	1/27/2012	16:10	16.17	0.74	-	0.000	74,727	0.009	459	1	459	1.4180	1.4222	4.2	210
D	3	1/27/2012	17:10	17.17	0.74	-	0.000	74,733	0.009	455	1	455	1.4128	1.4171	4.3	215
D	4	1/27/2012	18:10	18.17	0.74	-	0.000	74,743	0.008	440	1	440	1.4197	1.4237	4	200
D	5	1/27/2012	19:10	19.17	0.74	-	0.000	74,753	0.007	432	1	432	1.4169	1.4209	4	200
D	6	1/27/2012	20:10	20.17	0.74	-	0.000	74,755	0.007	438	1	438	1.4043	1.4086	4.3	215
D	7	1/27/2012	21:10	21.17	0.74	-	0.000	74,755	0.006	407	1	407	1.4045	1.4078	3.3	165
D	8	1/27/2012	22:10	22.17	0.74	-	0.000	74,755	0.006	385	1	385	1.4164	1.4200	3.6	180
D	9	1/27/2012	23:10	23.17	0.74	-	0.000	74,755	0.006	388	1	388	1.4059	1.4095	3.6	180
D	10	1/28/2012	0:10	24.17	0.74	-	0.000	74,755	0.006	385	1	385	1.4159	1.4199	4	200
D	11	1/28/2012	1:10	25.17	0.74	-	0.000	74,755	0.005	378	1	378	1.4084	1.4122	3.8	190
D	12	1/28/2012	2:10	26.17	0.74	-	0.000	74,755	0.005	380	1	380	1.4081	1.4118	3.7	185
D	13	1/28/2012	3:10	27.17	0.74	-	0.000	74,755	0.005	366	1	366	1.4063	1.4095	3.2	160
D	14	1/28/2012	4:10	28.17	0.74	-	0.000	74,755	0.005	368	1	368	1.4094	1.4127	3.3	165
D	15	1/28/2012	5:10	29.17	0.74	-	0.000	74,755	0.005	369	1	369	1.4073	1.4106	3.3	165
D	16	1/28/2012	6:10	30.17	0.74	-	0.000	74,755	0.004	364	1	364	1.4135	1.4168	3.3	165
D	17	1/28/2012	7:10	31.17	0.74	-	0.000	74,755	0.004	351	1	351	1.4023	1.4053	3	150
D	18	1/28/2012	8:10	32.17	0.75	-	0.000	74,755	0.004	354	1	354	1.4107	1.4138	3.1	155
D	19	1/28/2012	9:10	33.17	0.75	-	0.000	74,755	0.004	383	1	383	1.4048	1.4086	3.8	190
D	20	1/28/2012	10:10	34.17	0.75	-	0.000	74,755	0.005	350	1	350	1.4066	1.4093	2.7	135
D	21	1/28/2012	11:10	35.17	0.75	-	0.000	74,755	0.005	348	1	348	1.3974	1.4003	2.9	145
D	22	1/28/2012	12:10	36.17	0.75	-	0.000	74,755	0.005	337	1	337	1.3947	1.3980	3.3	165
D	23	1/28/2012	13:10	37.17	0.75	-	0.000	74,755	0.006	334	1	334	1.4091	1.4120	2.9	145
D	24	1/28/2012	14:10	38.17	0.75	-	0.000	74,755	0.006	332	1	332	1.4041	1.4071	3	150
E	1	1/27/2012	15:17	15.28	0.74	-	0.244	74,719	0.010	465	1	465	1.4171	1.4215	4.4	220
E	2	1/27/2012	16:15	16.25	0.74	-	0.000	74,727	0.009	467	1	467	1.4144	1.4183	3.9	195
E	3	1/27/2012	17:15	17.25	0.74	-	0.003	74,733	0.009	453	1	453	1.4052	1.4086	3.4	170
E	4	1/27/2012	18:15	18.25	0.74	-	0.000	74,743	0.008	447	1	447	1.4155	1.4208	5.3	265
E	5	1/27/2012	19:15	19.25	0.74	-	0.000	74,753	0.007	437	1	437	1.4183	1.4232	4.9	245
E	6	1/27/2012	20:15	20.25	0.74	-	0.000	74,755	0.007	436	1	436	1.4171	1.4220	4.9	245
E	7	1/27/2012	21:15	21.25	0.74	-	0.000	74,755	0.006	421	1	421	1.4141	1.4189	4.8	240
E	8	1/27/2012	22:15	22.25	0.74	-	0.000	74,755	0.006	404	1	404	1.4144	1.4186	4.2	210
E	9	1/27/2012	23:15	23.25	0.74	-	0.000	74,755	0.006	387	1	387	1.4169	1.4200	3.1	155
E	10	1/28/2012	0:15	24.25	0.74	-	0.000	74,755	0.006	381	1	381	1.4086	1.4119	3.3	165
E	11	1/28/2012	1:15	25.25	0.74	-	0.000	74,755	0.005	380	1	380	1.4109	1.4149	4	200
E	12	1/28/2012	2:15	26.25	0.74	-	0.000	74,755	0.005	379	1	379	1.4051	1.4079	2.8	140
E	13	1/28/2012	3:15	27.25	0.74	-	0.000	74,755	0.005	372	1	372	1.4073	1.4096	2.3	115
E	14	1/28/2012	4:15	28.25	0.74	-	0.000	74,755	0.005	353	1	353	1.4070	1.4095	2.5	125
E	15	1/28/2012	5:15	29.25	0.74	-	0.000	74,755	0.005	354	1	354	1.4083	1.4108	2.5	125
E	16	1/28/2012	6:15	30.25	0.74	-	0.000	74,755	0.004	355	1	355	1.4120	1.4145	2.5	125
E	17	1/28/2012	7:15	31.25	0.75	-	0.000	74,755	0.004	353	1	353	1.4116	1.4148	3.2	160
E	18	1/28/2012	8:15	32.25	0.75	-	0.000	74,755	0.004	342	1	342	1.4094	1.4117	2.3	115
E	19	1/28/2012	9:15	33.25	0.75	-	0.000	74,755	0.004	341	1	341	1.4110	1.4149	3.9	195
E	20	1/28/2012	10:15	34.25	0.75	-	0.000	74,755	0.005	338	1	338	1.4131	1.4165	3.4	170
E	21	1/28/2012	11:15	35.25	0.75	-	0.000	74,755	0.005	332	1	332	1.4124	1.4159	3.5	175
E	22	1/28/2012	12:15	36.25	0.75	-	0.000	74,755	0.005	328	1	328	1.4090	1.4123	3.3	165
E	23	1/28/2012	13:15	37.25	0.75	-	0.000	74,755	0.006	327	1	327	1.4090	1.4120	3	150
E	24	1/28/2012	14:15	38.25	0.75	-	0.000	74,755	0.006	326	1	326	1.4199	1.4227	2.8	140

APPENDIX D

Project: ALDOT 502
Site Name: Basin 4
Site Conditions: Inaccurate inflow #'s due to rock leaning against bubbler tube during intial inflow, Freezing conditions caused C to miss samples
Analysis Performed By: Chris Logan
Date of Analysis: 1/31/2012
TSS Sample Vol. : 20 mL
Turbidity Sample Vol. : 15 mL

Sampler	Sample #	Date of Sample	Time of Sample	(TIME)	Rainfall (in)	Level (m)	Inflow Rate (cfs)	Inflow Volume (cf)	Outflow Rate (cfs)	Measured Tubidity (on turbidimeter)	Turbidity Ratio (1:x)	Actual Turbidity	Clean Dish/Filter Weight (g)	Dried Ladin Dish/Filter Weight (g)	TSS Weight of Sample (mg)	TSS (mg/L)
C	1	1/28/2012	17:39	17.65	0.74	0.026	0.000	74,755	0.004	295	1	295	1.4122	1.4135	1.3	65
C	2	1/28/2012	18:39	18.65	0.74	0.023	0.000	74,755	0.003	300	1	300	1.4114	1.4124	1	50
C	3	1/28/2012	19:39	19.65	0.75	0.021	0.000	74,755	0.003	377	1	377	1.4038	1.4063	2.5	125
C	4	1/28/2012	20:39	20.65	0.75	0.020	0.000	74,755	0.002	407	1	407	1.4005	1.4035	3	150
C	5	1/28/2012	21:39	21.65	0.75	0.018	0.000	74,755	0.002	329	1	329	1.4017	1.4032	1.5	75
C	6	1/28/2012	22:39	22.65	0.75	0.017	0.000	74,755	0.002	320	1	320	1.4076	1.4087	1.1	55
C	7	1/28/2012	23:39	23.65	0.75	0.016	0.000	74,755	0.001	304	1	304	1.4067	1.4075	0.8	40
C	17	1/29/2012	9:39	33.65	0.75	0.008	0.000	74,755	0.000	507	1	507	1.4022	1.4066	4.4	220
C	18	1/29/2012	10:39	34.65	0.75	0.011	0.000	74,755	0.001	251	1	251	1.4056	1.4083	2.7	135
C	19	1/29/2012	11:39	35.65	0.75	0.013	0.000	74,755	0.001	247	1	247	1.4034	1.4037	0.3	15
C	20	1/29/2012	12:39	36.65	0.75	0.015	0.000	74,755	0.001	250	1	250	1.4028	1.4047	1.9	95
C	21	1/29/2012	13:39	37.65	0.75	0.016	0.000	74,755	0.001	250	1	250	1.4044	1.4059	1.5	75
C	22	1/29/2012	14:39	38.65	0.75	0.016	0.000	74,755	0.002	252	1	252	1.4115	1.4149	3.4	170
C	23	1/29/2012	15:39	39.65	0.75	0.014	0.000	74,755	0.001	250	1	250	1.4131	1.4150	1.9	95
C	24	1/29/2012	16:39	40.65	0.75	0.013	0.000	74,755	0.001	243	1	243	1.4057	1.4073	1.6	80
D	1	1/28/2012	17:45	17.75	0.74	-	0.000	74,755	0.004	325	1	325	1.4048	1.4078	3	150
D	2	1/28/2012	18:43	18.72	0.74	-	0.000	74,755	0.003	326	1	326	1.4006	1.4032	2.6	130
D	3	1/28/2012	19:43	19.72	0.75	-	0.000	74,755	0.003	305	1	305	1.4077	1.4102	2.5	125
D	4	1/28/2012	20:43	20.72	0.75	-	0.000	74,755	0.002	295	1	295	1.4220	1.4248	2.8	140
D	5	1/28/2012	21:43	21.72	0.75	-	0.000	74,755	0.002	287	1	287	1.4137	1.4150	1.3	65
D	6	1/28/2012	22:44	22.73	0.75	-	0.000	74,755	0.002	295	1	295	1.4155	1.4170	1.5	75
D	7	1/28/2012	23:43	23.72	0.75	-	0.000	74,755	0.001	287	1	287	1.4164	1.4190	2.6	130
D	8	1/29/2012	0:55	24.92	0.75	-	0.000	74,755	0.001	286	1	286	1.4125	1.4146	2.1	105
D	9	1/29/2012	1:57	25.95	0.75	-	0.000	74,755	0.001	275	1	275	1.4098	1.4121	2.3	115
D	10	1/29/2012	2:57	26.95	0.75	-	0.000	74,755	0.001	285	1	285	1.4201	1.4226	2.5	125
D	11	1/29/2012	3:57	27.95	0.75	-	0.000	74,755	0.001	269	1	269	1.4030	1.4057	2.7	135
D	12	1/29/2012	4:57	28.95	0.75	-	0.000	74,755	0.001	273	1	273	1.4212	1.4234	2.2	110
D	13	1/29/2012	5:57	29.95	0.75	-	0.000	74,755	0.000	269	1	269	1.4123	1.4148	2.5	125
D	14	1/29/2012	6:57	30.95	0.75	-	0.000	74,755	0.000	267	1	267	1.4091	1.4118	2.7	135
D	15	1/29/2012	7:56	31.93	0.75	-	0.000	74,755	0.000	262	1	262	1.4153	1.4166	1.3	65
D	16	1/29/2012	8:54	32.90	0.75	-	0.000	74,755	0.000	261	1	261	1.4087	1.4103	1.6	80
D	17	1/29/2012	9:47	33.78	0.75	-	0.000	74,755	0.000	258	1	258	1.4082	1.4095	1.3	65
D	18	1/29/2012	10:43	34.72	0.75	-	0.000	74,755	0.001	256	1	256	1.4227	1.4243	1.6	80
D	19	1/29/2012	11:43	35.72	0.75	-	0.000	74,755	0.001	259	1	259	1.4142	1.4164	2.2	110
D	20	1/29/2012	12:43	36.72	0.75	-	0.000	74,755	0.001	257	1	257	1.4115	1.4139	2.4	120
D	21	1/29/2012	13:43	37.72	0.75	-	0.000	74,755	0.002	257	1	257	1.4162	1.4184	2.2	110
D	22	1/29/2012	14:43	38.72	0.75	-	0.000	74,755	0.002	265	1	265	1.4181	1.4206	2.5	125
D	23	1/29/2012	15:43	39.72	0.75	-	0.000	74,755	0.001	258	1	258	1.4172	1.4192	2	100
D	24	1/29/2012	16:43	40.72	0.75	-	0.000	74,755	0.001	262	1	262	1.4131	1.4158	2.7	135
E	1	1/28/2012	17:50	17.83	0.74	-	0.000	74,755	0.004	318	1	318	1.4210	1.4239	2.9	145
E	2	1/28/2012	18:48	18.80	0.74	-	0.000	74,755	0.003	322	1	322	1.4215	1.4247	3.2	160
E	3	1/28/2012	19:48	19.80	0.75	-	0.000	74,755	0.003	295	1	295	1.4191	1.4213	2.2	110
E	4	1/28/2012	20:48	20.80	0.75	-	0.000	74,755	0.002	291	1	291	1.4132	1.4155	2.3	115
E	5	1/28/2012	21:48	21.80	0.75	-	0.000	74,755	0.002	295	1	295	1.4063	1.4089	2.6	130
E	6	1/28/2012	22:49	22.82	0.75	-	0.000	74,755	0.002	294	1	294	1.4127	1.4150	2.3	115
E	7	1/28/2012	23:48	23.80	0.75	-	0.000	74,755	0.001	285	1	285	1.4160	1.4180	2	100
E	8	1/29/2012	1:00	25.00	0.75	-	0.000	74,755	0.001	280	1	280	1.4154	1.4169	1.5	75
E	9	1/29/2012	2:02	26.03	0.75	-	0.000	74,755	0.001	275	1	275	1.4159	1.4173	1.4	70
E	10	1/29/2012	3:02	27.03	0.75	-	0.000	74,755	0.001	272	1	272	1.4227	1.4247	2	100
E	11	1/29/2012	4:02	28.03	0.75	-	0.000	74,755	0.001	268	1	268	1.4194	1.4221	2.7	135
E	12	1/29/2012	5:02	29.03	0.75	-	0.000	74,755	0.001	263	1	263	1.4113	1.4136	2.3	115
E	13	1/29/2012	6:02	30.03	0.75	-	0.000	74,755	0.000	269	1	269	1.4256	1.4283	2.7	135
E	14	1/29/2012	7:02	31.03	0.75	-	0.000	74,755	0.000	262	1	262	1.4176	1.4189	1.3	65
E	15	1/29/2012	8:02	32.03	0.75	-	0.000	74,755	0.000	254	1	254	1.4082	1.4109	2.7	135
E	16	1/29/2012	8:59	32.98	0.75	-	0.000	74,755	0.000	250	1	250	1.4141	1.4162	2.1	105
E	17	1/29/2012	9:52	33.87	0.75	-	0.000	74,755	0.000	250	1	250	1.4074	1.4099	2.5	125
E	18	1/29/2012	10:48	34.80	0.75	-	0.000	74,755	0.001	252	1	252	1.4253	1.4277	2.4	120
E	19	1/29/2012	11:48	35.80	0.75	-	0.000	74,755	0.001	255	1	255	1.4139	1.4162	2.3	115
E	20	1/29/2012	12:48	36.80	0.75	-	0.000	74,755	0.001	249	1	249	1.4195	1.4213	1.8	90
E	21	1/29/2012	13:48	37.80	0.75	-	0.000	74,755	0.002	252	1	252	1.4177	1.4198	2.1	105
E	22	1/29/2012	14:48	38.80	0.75	-	0.000	74,755	0.002	241	1	241	1.4190	1.4207	1.7	85
E	23	1/29/2012	15:48	39.80	0.75	-	0.000	74,755	0.001	248	1	248	1.4198	1.4213	1.5	75
E	24	1/29/2012	16:48	40.80	0.75	-	0.000	74,755	0.001	250	1	250	1.4239	1.4254	1.5	75

APPENDIX D

Site Name: Basin 4
Site Conditions:
Analysis Performed By: Chris Logan
Date of Analysis: 2/4/2012
TSS Sample Vol. : 20 mL
Turbidity Sample Vol. : 15 mL

Sampler	Sample #	Date of Sample	Time of Sample	(TIME)	Rainfall (in)	Level (m)	Inflow Rate (cfs)	Inflow Volume (cf)	Outflow Rate (cfs)	Measured Tubidity (on turbidimeter)	Turbidity Ratio (1:x)	Actual Turbidity	Clean Dish/Filter Weight (g)	Dried Ladin Dish/Filter Weight (g)	TSS Weight of Sample (mg)	TSS (mg/L)
A	1	2/1/2012	20:14	20.23	0.71	0.009	0.052	68	0.009	944	2	1,888	1.4293	1.4467	17.4	870
B	1	2/1/2012	7:42	7.70	0.28	0.022	0.258	270	0.003	561	4	2,244	1.4232	1.4446	21.4	1070
B	2	2/1/2012	8:02	8.03	0.29	0.028	0.371	650	0.003	361	4	1,444	1.4221	1.4388	16.7	835
B	3	2/1/2012	8:19	8.32	0.33	0.030	0.411	1,068	0.003	682	2	1,364	1.4214	1.4353	13.9	695
B	4	2/1/2012	8:35	8.58	0.42	0.030	0.411	1,468	0.004	676	2	1,352	1.4202	1.4335	13.3	665
B	5	2/1/2012	8:52	8.87	0.43	0.028	0.371	1,862	0.005	582	2	1,164	1.4160	1.4275	11.5	575
B	6	2/1/2012	9:10	9.17	0.45	0.027	0.351	2,254	0.006	512	2	1,024	1.4210	1.4312	10.2	510
B	7	2/1/2012	9:26	9.43	0.45	0.045	0.756	2,655	0.006	878	4	3,512	1.4148	1.4526	37.8	1890
B	8	2/1/2012	9:34	9.57	0.46	0.055	1.021	3,076	0.006	445	8	3,560	1.4165	1.4616	45.1	2255
B	9	2/1/2012	9:39	9.65	0.47	0.069	1.435	3,466	0.006	444	8	3,552	1.4254	1.4746	49.2	2460
B	10	2/1/2012	9:44	9.73	0.47	0.065	1.312	3,874	0.005	461	8	3,688	1.4212	1.4741	52.9	2645
B	11	2/1/2012	9:50	9.83	0.47	0.056	1.049	4,293	0.005	433	8	3,464	1.4166	1.4631	46.5	2325
B	12	2/1/2012	9:57	9.95	0.47	0.052	0.939	4,704	0.006	363	8	2,904	1.4236	1.4587	35.1	1755
B	13	2/1/2012	10:04	10.07	0.47	0.051	0.912	5,087	0.005	697	4	2,788	1.4218	1.4529	31.1	1555
B	14	2/1/2012	10:12	10.20	0.47	0.049	0.859	5,505	0.006	583	4	2,332	1.4124	1.4385	26.1	1305
B	15	2/1/2012	10:20	10.33	0.47	0.045	0.756	5,893	0.006	495	4	1,980	1.4211	1.4424	21.3	1065
B	16	2/1/2012	10:29	10.48	0.47	0.042	0.681	6,280	0.006	419	4	1,676	1.4107	1.4302	19.5	975
B	17	2/1/2012	10:39	10.65	0.47	0.040	0.633	6,677	0.006	388	4	1,552	1.4030	1.4209	17.9	895
B	18	2/1/2012	10:50	10.83	0.47	0.038	0.586	7,075	0.006	721	2	1,442	1.4191	1.4335	14.4	720
B	19	2/1/2012	11:01	11.02	0.47	0.036	0.541	7,442	0.006	592	2	1,184	1.4243	1.4363	12	600
B	20	2/1/2012	11:15	11.25	0.47	0.033	0.475	7,869	0.006	482	2	964	1.4229	1.4321	9.2	460
B	21	2/1/2012	11:29	11.48	0.47	0.032	0.453	8,249	0.006	402	2	804	1.4185	1.4265	8	400
B	22	2/1/2012	11:47	11.78	0.47	0.029	0.391	8,657	0.007	321	2	642	1.4208	1.4275	6.7	335
B	23	2/1/2012	12:05	12.08	0.47	0.026	0.332	9,049	0.007	287	2	574	1.4176	1.4232	5.6	280
B	24	2/1/2012	12:26	12.43	0.47	0.024	0.294	9,443	0.007	508	1	508	1.4204	1.4254	5	250
C	1	2/1/2012	7:12	7.20	0.27	0.018	0.000	0	0.002	183	1	183	1.4240	1.4256	1.6	80
C	2	2/1/2012	8:12	8.20	0.29	0.023	0.411	890	0.003	193	1	193	1.4193	1.4223	3	150
C	3	2/1/2012	9:12	9.20	0.45	0.030	0.351	2,296	0.006	194	1	194	1.4264	1.4287	2.3	115
C	4	2/1/2012	10:12	10.20	0.47	0.030	0.859	5,505	0.006	323	1	323	1.4230	1.4269	3.9	195
C	5	2/1/2012	11:12	11.20	0.47	0.032	0.475	7,784	0.006	625	1	625	1.4251	1.4312	6.1	305
C	6	2/1/2012	12:12	12.20	0.47	0.033	0.332	9,191	0.007	663	1	663	1.4272	1.4336	6.4	320
C	7	2/1/2012	13:12	13.20	0.47	0.034	0.224	10,179	0.007	740	1	740	1.4283	1.4351	6.8	340
C	8	2/1/2012	14:12	14.20	0.47	0.036	0.145	10,833	0.008	674	1	674	1.4168	1.4236	6.8	340
C	9	2/1/2012	15:12	15.20	0.47	0.037	0.104	11,297	0.008	651	1	651	1.4199	1.4258	5.9	295
C	10	2/1/2012	16:12	16.20	0.47	0.037	0.104	11,662	0.009	658	1	658	1.4103	1.4161	5.8	290
C	11	2/1/2012	17:12	17.20	0.47	0.037	0.046	11,906	0.008	661	1	661	1.4128	1.4185	5.7	285
C	12	2/1/2012	18:12	18.20	0.47	0.036	0.028	12,046	0.008	641	1	641	1.4164	1.4222	5.8	290
C	13	2/1/2012	19:12	19.20	0.47	0.036	0.020	12,145	0.008	629	1	629	1.4107	1.4168	6.1	305
C	14	2/1/2012	20:12	20.20	0.71	0.037	0.083	12,284	0.009	552	1	552	1.4099	1.4148	4.9	245
C	15	2/1/2012	21:12	21.20	0.72	0.036	1.593	14,463	0.008	911	1	911	1.4111	1.4191	8	400
C	16	2/1/2012	22:12	22.20	0.72	0.037	0.496	17,471	0.008	665	2	1,330	1.4169	1.4286	11.7	585
C	17	2/1/2012	23:12	23.20	0.72	0.037	0.294	18,852	0.008	629	2	1,258	1.4122	1.4237	11.5	575
C	18	2/2/2012	0:12	24.20	0.72	0.036	0.207	19,766	0.008	621	2	1,242	1.4177	1.4282	10.5	525
C	19	2/2/2012	1:12	25.20	0.72	0.036	0.131	20,384	0.008	625	2	1,250	1.4148	1.4248	10	500
C	20	2/2/2012	2:12	26.20	0.72	0.035	0.131	20,862	0.008	601	2	1,202	1.4220	1.4319	9.9	495
C	21	2/2/2012	3:12	27.20	0.72	0.035	0.104	21,292	0.008	568	2	1,136	1.4114	1.4214	10	500
C	22	2/2/2012	4:12	28.20	0.72	0.035	0.046	21,557	0.008	587	2	1,174	1.4172	1.4270	9.8	490
C	23	2/2/2012	5:12	29.20	0.72	0.035	0.028	21,709	0.008	556	2	1,112	1.4225	1.4319	9.4	470
C	24	2/2/2012	6:12	30.20	0.72	0.035	0.020	21,803	0.007	536	2	1,072	1.4166	1.4259	9.3	465
D	1	2/1/2012	7:17	7.28	0.27	-	0.000	0	0.002	194	1	194	1.4234	1.4248	1.4	70
D	2	2/1/2012	8:16	8.27	0.29	-	0.432	990	0.004	186	1	186	1.4224	1.4234	1	50
D	3	2/1/2012	9:16	9.27	0.45	-	0.351	2,379	0.006	547	2	1,094	1.4066	1.4184	11.8	590
D	4	2/1/2012	10:16	10.27	0.47	-	0.807	5,705	0.005	663	2	1,326	1.4174	1.4306	13.2	660
D	5	2/1/2012	11:16	11.27	0.47	-	0.475	7,898	0.006	603	2	1,206	1.4197	1.4313	11.6	580
D	6	2/1/2012	12:16	12.27	0.47	-	0.294	9,268	0.007	553	2	1,106	1.4206	1.4308	10.2	510
D	7	2/1/2012	13:16	13.27	0.47	-	0.224	10,233	0.007	542	2	1,084	1.4207	1.4300	9.3	465
D	8	2/1/2012	14:16	14.27	0.47	-	0.160	10,867	0.008	501	2	1,002	1.4248	1.4338	9	450
D	9	2/1/2012	15:16	15.27	0.47	-	0.117	11,321	0.008	450	2	900	1.4276	1.4363	8.7	435
D	10	2/1/2012	16:16	16.27	0.47	-	0.079	11,684	0.008	432	2	864	1.4149	1.4232	8.3	415
D	11	2/1/2012	17:16	17.27	0.47	-	0.057	11,918	0.008	423	2	846	1.4208	1.4283	7.5	375
D	12	2/1/2012	18:16	18.27	0.47	-	0.028	12,053	0.008	864	1	864	1.4278	1.4352	7.4	370
D	13	2/1/2012	19:16	19.27	0.47	-	0.028	12,151	0.008	844	1	844	1.4181	1.4253	7.2	360
D	14	2/1/2012	20:16	20.27	0.71	-	0.064	12,226	0.009	988	2	1,976	1.4153	1.4364	21.1	1055
D	15	2/1/2012	21:16	21.27	0.72	-	1.404	14,808	0.008	618	4	2,472	1.4139	1.4390	25.1	1255
D	16	2/1/2012	22:16	22.27	0.72	-	0.475	17,579	0.008	562	4	2,248	1.4208	1.4433	22.5	1125
D	17	2/1/2012	23:16	23.27	0.72	-	0.276	18,919	0.008	497	4	1,988	1.4030	1.4230	20	1000
D	18	2/2/2012	0:16	24.27	0.72	-	0.224	19,812	0.008	464	4	1,856	1.4034	1.4216	18.2	910
D	19	2/2/2012	1:16	25.27	0.72	-	0.160	20,409	0.008	974	2	1,948	1.4172	1.4342	17	850
D	20	2/2/2012	2:16	26.27	0.72	-	0.131	20,885	0.008	897	2	1,794	1.4233	1.4399	16.6	830
D	21	2/2/2012	3:16	27.27	0.72	-	0.104	21,308	0.008	860	2	1,720	1.4097	1.4255	15.8	790
D	22	2/2/2012	4:16	28.27	0.72	-	0.037	21,562	0.008	804	2	1,608	1.4113	1.4271	15.8	790
D	23	2/2/2012	5:16	29.27	0.72	-	0.028	21,711	0.007	801	2	1,602	1.4176	1.4308	13.2	660
D	24	2/2/2012	6:16	30.27	0.72	-	0.020	21,802	0.007	772	2	1,544	1.4108	1.4242	13.4	670
E	1	2/1/2012	7:23	7.38	0.28	-	0.000	0	0.002	190	1	190	1.4155	1.4175	2	100
E	2	2/1/2012	8:21	8.35	0.33	-	0.411	1,117	0.004	270	1	270	1.4129	1.4156	2.7	135
E	3	2/1/2012	9:21	9.35	0.45	-	0.371	2,485	0.006	822	1	822	1.4169	1.4346	17.7	885
E	4	2/1/2012	10:21	10.35	0.47	-	0.756	5,938	0.006	776	2	1,552	1.4201	1.4351	15	750
E	5	2/1/2012	11:21	11.35	0.47	-	0.453	8,036	0.006	627	2	1,254	1.4203	1.4330	12.7	635
E	6	2/1/2012	12:21	12.35	0.47	-	0.294	9,357	0.007	616	2	1,232	1.4117	1.4230	11.3	565
E	7	2/1/2012	13:21	13.35	0.47	-	0.207	10,297	0.007	547	2	1,094	1.4124	1.4234	11	550
E	8	2/1/2012	14:21	14.35	0.47	-	0.160	10,915	0.008	488	2	976	1.4061	1.4161	10	500
E	9	2/1/2012	15:21	15.35	0.47	-	0.104	11,354	0.008	467	2	934	1.4135	1.4229	9.4	470
E	10	2/1/2012	16:21	16.35	0.47	-	0.091	11,710	0.008	937	1	937	1.4123	1.4206	8.3	415
E	11	2/1/2012	17:21	17.35	0.47	-	0.046	11,933	0.008	910	1	910	1.4164	1.4253	8.9	445
E	12	2/1/2012	18:21	18.35	0.47	-	0.028	12,061	0.008	840	1	840	1.4071	1.4152	8.1	405
E	13	2/1/2012	19:21	19.35	0.47	-	0.020	12,158	0.008	811	1	811	1.4084	1.4163	7.9	395
E	14	2/1/2012	20:21	20.35	0.71	-	0.024	12,231	0.009	749	4	2,996	1.4108	1.4464	35.6	1780
E	15	2/1/2012	21:21	21.35	0.72	-	1.222	15,277	0.008	661	4	2,644	1.4153	1.4446	29.3	1465
E	16	2/1/2012	22:21	22.35	0.72	-	0.453	17,722	0.008	556	4	2,224	1.4209	1.4448	23.9	1195
E	17	2/1/2012	23:21	23.35	0.72	-	0.276	19,006	0.008	526	4	2,104	1.4215	1.4428	21.3	1065
E	18	2/2/2012	0:21	24.35	0.72	-	0.207	19,880	0.008	477	4	1,908	1.4178	1.4375	19.7	985
E	19	2/2/2012	1:21	25.35	0.72	-	0.145	20,460	0.008	958	2	1,916	1.4192	1.4367	17.5	875
E	20	2/2/2012	2:21	26.35	0.72	-	0.145	20,932	0.008	894	2	1,788	1.4176	1.4340	16.4	820
E	21	2/2/2012	3:21	27.35	0.72	-	0.104	21,344	0.008	878	2	1,756	1.4224	1.4377	15.3	765
E	22	2/2/2012	4:21	28.35	0.72	-	0.046	21,580	0.008	840	2	1,680	1.4164	1.4315	15.1	755
E	23	2/2/2012	5:21	29.35	0.72	-	0.028	21,725	0.007	812	2	1,624	1.4184	1.4326	14.2	710
E	24	2/2/2012	6:21	30.35	0.72	-	0.028	21,815	0.007	756	2	1,512	1.4177	1.4312	13.5	675

APPENDIX D

Project: ALDOT 502
Site Name: Basin 4
Site Conditions:
Analysis Performed By: Chris Logan
Date of Analysis: 2/4/2012
TSS Sample Vol. : 20mL
Turbidity Sample Vol. : 15 mL

Sampler	Sample #	Date of Sample	Time of Sample	(TIME)	Rainfall (in)	Level (m)	Inflow Rate (cfs)	Inflow Volume (cf)	Outflow Rate (cfs)	Measured Tubidity (on turbidimeter)	Turbidity Ratio (1:x)	Actual Turbidity	Clean Dish/Filter Weight (g)	Dried Ladin Dish/Filter Weight (g)	TSS Weight of Sample (mg)	TSS (mg/L)
C	1	2/2/2012	14:24	14.40	0.72	0.038	0.000	21,921	0.009	418	2	836	1.4223	1.4301	7.8	390
C	2	2/2/2012	15:24	15.40	0.72	0.038	0.000	21,921	0.009	474	2	948	1.4236	1.4314	7.8	390
C	3	2/2/2012	16:24	16.40	0.72	0.037	0.000	21,921	0.009	454	2	908	1.4273	1.4354	8.1	405
C	4	2/2/2012	17:24	17.40	0.72	0.036	0.000	21,921	0.008	439	2	878	1.4140	1.4230	9	450
C	5	2/2/2012	18:24	18.40	0.72	0.035	0.000	21,921	0.008	420	2	840	1.4214	1.4297	8.3	415
C	6	2/2/2012	19:24	19.40	0.72	0.033	0.000	21,921	0.007	416	2	832	1.4227	1.4310	8.3	415
C	7	2/2/2012	20:24	20.40	0.72	0.032	0.000	21,921	0.006	417	2	834	1.4189	1.4266	7.7	385
C	8	2/2/2012	21:24	21.40	0.72	0.030	0.000	21,921	0.006	413	2	826	1.4117	1.4199	8.2	410
C	9	2/2/2012	22:24	22.40	0.72	0.029	0.000	21,921	0.005	887	1	887	1.4225	1.4297	7.2	360
C	10	2/2/2012	23:24	23.40	0.72	0.029	0.000	21,921	0.005	868	1	868	1.4196	1.4266	7	350
C	11	2/3/2012	0:24	24.40	0.72	0.028	0.000	21,921	0.005	816	1	816	1.4160	1.4227	6.7	335
C	12	2/3/2012	1:24	25.40	0.72	0.027	0.000	21,921	0.004	770	1	770	1.4329	1.4403	7.4	370
C	13	2/3/2012	2:24	26.40	0.72	0.026	0.000	21,921	0.004	690	1	690	1.4193	1.4261	6.8	340
C	14	2/3/2012	3:24	27.40	0.72	0.025	0.000	21,921	0.004	643	1	643	1.4268	1.4334	6.6	330
C	15	2/3/2012	4:24	28.40	0.72	0.023	0.000	21,921	0.003	641	1	641	1.4179	1.4240	6.1	305
C	16	2/3/2012	5:24	29.40	0.72	0.023	0.000	21,921	0.003	660	1	660	1.4201	1.4265	6.4	320
C	17	2/3/2012	6:24	30.40	0.72	0.022	0.000	21,921	0.003	660	1	660	1.4273	1.4335	6.2	310
C	18	2/3/2012	7:24	31.40	0.72	0.021	0.000	21,921	0.003	670	1	670	1.4239	1.4298	5.9	295
C	19	2/3/2012	8:24	32.40	0.72	0.022	0.000	21,921	0.003	681	1	681	1.4218	1.4285	6.7	335
C	20	2/3/2012	9:24	33.40	0.72	0.022	0.000	21,921	0.003	732	1	732	1.4202	1.4266	6.4	320
C	21	2/3/2012	10:24	34.40	0.72	0.022	0.000	21,921	0.003	680	1	680	1.4249	1.4312	6.3	315
C	22	2/3/2012	11:24	35.40	0.72	0.023	0.000	21,921	0.003	666	1	666	1.4214	1.4279	6.5	325
C	23	2/3/2012	12:24	36.40	0.72	0.023	0.000	21,921	0.003	677	1	677	1.4227	1.4293	6.6	330
C	24	2/3/2012	13:24	37.40	0.72	0.025	0.000	21,921	0.004	671	1	671	1.4280	1.4345	6.5	325
D	1	2/2/2012	14:30	14.50	0.72	-	0.000	21,921	0.009	598	2	1,196	1.4202	1.4319	11.7	585
D	2	2/2/2012	15:28	15.47	0.72	-	0.000	21,921	0.009	571	2	1,142	1.4226	1.4340	11.4	570
D	3	2/2/2012	16:28	16.47	0.72	-	0.000	21,921	0.008	529	2	1,058	1.4199	1.4306	10.7	535
D	4	2/2/2012	17:28	17.47	0.72	-	0.000	21,921	0.008	531	2	1,062	1.4326	1.4409	8.3	415
D	5	2/2/2012	18:28	18.47	0.72	-	0.000	21,921	0.007	515	2	1,030	1.4176	1.4270	9.4	470
D	6	2/2/2012	19:28	19.47	0.72	-	0.000	21,921	0.007	486	2	972	1.4212	1.4308	9.6	480
D	7	2/2/2012	20:28	20.47	0.72	-	0.000	21,921	0.006	506	2	1,012	1.4250	1.4347	9.7	485
D	8	2/2/2012	21:28	21.47	0.72	-	0.000	21,921	0.006	490	2	980	1.4234	1.4329	9.5	475
D	9	2/2/2012	22:28	22.47	0.72	-	0.000	21,921	0.005	508	2	1,016	1.4235	1.4333	9.8	490
D	10	2/2/2012	23:28	23.47	0.72	-	0.000	21,921	0.005	461	2	922	1.4231	1.4328	9.7	485
D	11	2/3/2012	0:28	24.47	0.72	-	0.000	21,921	0.005	470	2	940	1.4270	1.4361	9.1	455
D	12	2/3/2012	1:28	25.47	0.72	-	0.000	21,921	0.004	397	2	794	1.4245	1.4321	7.6	380
D	13	2/3/2012	2:28	26.47	0.72	-	0.000	21,921	0.004	814	1	814	1.4051	1.4128	7.7	385
D	14	2/3/2012	3:28	27.47	0.72	-	0.000	21,921	0.004	783	1	783	1.4020	1.4094	7.4	370
D	15	2/3/2012	4:28	28.47	0.72	-	0.000	21,921	0.003	779	1	779	1.4025	1.4104	7.9	395
D	16	2/3/2012	5:28	29.47	0.72	-	0.000	21,921	0.003	765	1	765	1.4156	1.4228	7.2	360
D	17	2/3/2012	6:28	30.47	0.72	-	0.000	21,921	0.003	767	1	767	1.4103	1.4182	7.9	395
D	18	2/3/2012	7:28	31.47	0.72	-	0.000	21,921	0.003	827	1	827	1.4042	1.4117	7.5	375
D	19	2/3/2012	8:28	32.47	0.72	-	0.000	21,921	0.003	763	1	763	1.3962	1.4036	7.4	370
D	20	2/3/2012	9:28	33.47	0.72	-	0.000	21,921	0.003	730	1	730	1.4088	1.4163	7.5	375
D	21	2/3/2012	10:28	34.47	0.72	-	0.000	21,921	0.003	730	1	730	1.4059	1.4130	7.1	355
D	22	2/3/2012	11:28	35.47	0.72	-	0.000	21,921	0.003	739	1	739	1.4054	1.4129	7.5	375
D	23	2/3/2012	12:28	36.47	0.72	-	0.000	21,921	0.003	722	1	722	1.3999	1.4071	7.2	360
D	24	2/3/2012	13:28	37.47	0.72	-	0.000	21,921	0.004	732	1	732	1.4066	1.4139	7.3	365
E	1	2/2/2012	14:35	14.58	0.72	-	0.000	21,921	0.009	613	2	1,226	1.4073	1.4187	11.4	570
E	2	2/2/2012	15:33	15.55	0.72	-	0.000	21,921	0.009	585	2	1,170	1.3962	1.4072	11	550
E	3	2/2/2012	16:33	16.55	0.72	-	0.000	21,921	0.008	568	2	1,136	1.3982	1.4093	11.1	555
E	4	2/2/2012	17:33	17.55	0.72	-	0.000	21,921	0.008	551	2	1,102	1.3979	1.4082	10.3	515
E	5	2/2/2012	18:33	18.55	0.72	-	0.000	21,921	0.007	531	2	1,062	1.4016	1.4124	10.8	540
E	6	2/2/2012	19:33	19.55	0.72	-	0.000	21,921	0.007	558	2	1,116	1.4106	1.4209	10.3	515
E	7	2/2/2012	20:33	20.55	0.72	-	0.000	21,921	0.006	523	2	1,046	1.4084	1.4187	10.3	515
E	8	2/2/2012	21:33	21.55	0.72	-	0.000	21,921	0.006	550	2	1,100	1.4060	1.4165	10.5	525
E	9	2/2/2012	22:33	22.55	0.72	-	0.000	21,921	0.005	525	2	1,050	1.3982	1.4074	9.2	460
E	10	2/2/2012	23:33	23.55	0.72	-	0.000	21,921	0.005	452	2	904	1.4065	1.4146	8.1	405
E	11	2/3/2012	0:33	24.55	0.72	-	0.000	21,921	0.005	427	2	854	1.4096	1.4178	8.2	410
E	12	2/3/2012	1:33	25.55	0.72	-	0.000	21,921	0.004	413	2	826	1.4027	1.4103	7.6	380
E	13	2/3/2012	2:33	26.55	0.72	-	0.000	21,921	0.004	792	1	792	1.3948	1.4021	7.3	365
E	14	2/3/2012	3:33	27.55	0.72	-	0.000	21,921	0.004	804	1	804	1.3952	1.4023	7.1	355
E	15	2/3/2012	4:33	28.55	0.72	-	0.000	21,921	0.003	828	1	828	1.3922	1.3992	7	350
E	16	2/3/2012	5:34	29.57	0.72	-	0.000	21,921	0.003	766	1	766	1.3977	1.4050	7.3	365
E	17	2/3/2012	6:34	30.57	0.72	-	0.000	21,921	0.003	773	1	773	1.3942	1.4015	7.3	365
E	18	2/3/2012	7:34	31.57	0.72	-	0.000	21,921	0.003	762	1	762	1.4011	1.4081	7	350
E	19	2/3/2012	8:33	32.55	0.72	-	0.000	21,921	0.003	758	1	758	1.3968	1.4035	6.7	335
E	20	2/3/2012	9:33	33.55	0.72	-	0.000	21,921	0.003	753	1	753	1.3939	1.4008	6.9	345
E	21	2/3/2012	10:33	34.55	0.72	-	0.000	21,921	0.003	756	1	756	1.3926	1.3994	6.8	340
E	22	2/3/2012	11:33	35.55	0.72	-	0.000	21,921	0.003	760	1	760	1.3988	1.4056	6.8	340
E	23	2/3/2012	12:33	36.55	0.72	-	0.000	21,921	0.004	752	1	752	1.3891	1.3956	6.5	325
E	24	2/3/2012	13:33	37.55	0.72	-	0.000	21,921	0.004	747	1	747	1.3882	1.3945	6.3	315

APPENDIX D

Project: ALDOT 502
Site Name: Basin 4
Site Conditions: Normal, All systems working properly
Analysis Performed By: Chris Logan
Date of Analysis: 2/10/2012
TSS Sample Vol. : 20 mL
Turbidity Sample Vol. : 15 mL

Sampler	Sample #	Date of Sample	Time of Sample	(TIME)	Rainfall (in)	Level (m)	Inflow Rate (cfs)	Inflow Volume (cf)	Outflow Rate (cfs)	Measured Tubidity (on turbidimeter)	Turbidity Ratio (1:x)	Actual Turbidity	Clean Dish/Filter Weight (g)	Dried Ladin Dish/Filter Weight (g)	TSS Weight of Sample (mg)	TSS (mg/L)
A	1	2/4/2012	12:14	36.23	0.38	0.013	0.090	44	0.005	868	1	868	1.3930	1.4027	9.7	485
A	2	2/4/2012	12:23	36.38	0.40	0.008	0.044	82	0.006	819	1	819	1.3950	1.4034	8.4	420
A	3	2/4/2012	13:23	37.38	0.57	0.008	0.044	121	0.008	616	1	616	1.3963	1.4014	5.1	255
B	1	2/4/2012	12:24	36.40	0.40	0.023	0.276	372	0.006	743	2	1,486	1.3965	1.4111	14.6	730
B	2	2/4/2012	12:50	36.83	0.45	0.039	0.610	977	0.007	737	2	1,474	1.3945	1.4100	15.5	775
B	3	2/4/2012	13:02	37.03	0.48	0.062	1.222	1,612	0.007	579	4	2,316	1.3988	1.4248	26	1300
B	4	2/4/2012	13:08	37.13	0.52	0.085	1.962	2,213	0.007	848	4	3,392	1.3961	1.4360	39.9	1995
B	5	2/4/2012	13:13	37.22	0.54	0.088	2.066	2,839	0.007	923	4	3,692	1.3966	1.4418	45.2	2260
B	6	2/4/2012	13:18	37.30	0.56	0.081	1.825	3,423	0.008	973	4	3,892	1.3903	1.4366	46.3	2315
B	7	2/4/2012	13:24	37.40	0.57	0.072	1.529	4,015	0.008	844	4	3,376	1.3969	1.4373	40.4	2020
B	8	2/4/2012	13:31	37.52	0.58	0.068	1.404	4,629	0.008	719	4	2,876	1.3983	1.4314	33.1	1655
B	9	2/4/2012	13:39	37.65	0.59	0.062	1.222	5,257	0.008	566	4	2,264	1.3905	1.4175	27	1350
B	10	2/4/2012	13:47	37.78	0.59	0.058	1.106	5,808	0.009	485	4	1,940	1.3965	1.4191	22.6	1130
B	11	2/4/2012	13:56	37.93	0.61	0.058	1.106	6,400	0.009	925	2	1,850	1.4032	1.4229	19.7	985
B	12	2/4/2012	14:05	38.08	0.63	0.062	1.222	7,025	0.009	967	2	1,934	1.3974	1.4151	17.7	885
B	13	2/4/2012	14:12	38.20	0.64	0.068	1.404	7,580	0.009	926	2	1,852	1.3996	1.4191	19.5	975
B	14	2/4/2012	14:19	38.32	0.65	0.075	1.626	8,234	0.009	471	4	1,884	1.4083	1.4300	21.7	1085
B	15	2/4/2012	14:25	38.42	0.66	0.076	1.658	8,835	0.009	482	4	1,928	1.4107	1.4340	23.3	1165
B	16	2/4/2012	14:31	38.52	0.67	0.073	1.561	9,422	0.009	488	4	1,952	1.4007	1.4246	23.9	1195
B	17	2/4/2012	14:38	38.63	0.68	0.067	1.373	10,036	0.009	458	4	1,832	1.3936	1.4157	22.1	1105
B	18	2/4/2012	14:46	38.77	0.69	0.060	1.163	10,641	0.010	408	4	1,632	1.4044	1.4241	19.7	985
B	19	2/4/2012	14:55	38.92	0.70	0.054	0.993	11,221	0.010	764	4	3,056	1.4041	1.4208	16.7	835
B	20	2/4/2012	15:05	39.08	0.71	0.052	0.939	11,804	0.010	712	2	1,424	1.4102	1.4247	14.5	725
B	21	2/4/2012	15:16	39.27	0.73	0.053	0.966	12,426	0.010	613	2	1,226	1.3937	1.4063	12.6	630
B	22	2/4/2012	15:26	39.43	0.74	0.052	0.939	12,993	0.010	534	2	1,068	1.3976	1.4091	11.5	575
B	23	2/4/2012	15:37	39.62	0.76	0.052	0.939	13,622	0.010	491	2	982	1.3988	1.4092	10.4	520
B	24	2/4/2012	15:47	39.78	0.77	0.050	0.885	14,174	0.010	434	2	868	1.3919	1.4014	9.5	475
C	1	2/3/2012	15:56	15.93	0.00	0.023	0.000	0	0.003	323	2	646	1.3915	1.3976	6.1	305
C	2	2/3/2012	17:56	17.93	0.02	0.022	0.000	0	0.003	601	1	601	1.4050	1.4109	5.9	295
C	3	2/3/2012	19:56	19.93	0.02	0.020	0.000	0	0.003	601	1	601	1.4052	1.4111	5.9	295
C	4	2/3/2012	21:56	21.93	0.03	0.019	0.000	0	0.002	582	1	582	1.3977	1.4033	5.6	280
C	5	2/3/2012	23:56	23.93	0.03	0.017	0.000	0	0.002	547	1	547	1.4039	1.4095	5.6	280
C	6	2/4/2012	1:56	25.93	0.03	0.016	0.000	0	0.002	513	1	513	1.4016	1.4072	5.6	280
C	7	2/4/2012	3:56	27.93	0.03	0.014	0.000	0	0.001	507	1	507	1.3935	1.3984	4.9	245
C	8	2/4/2012	5:56	29.93	0.03	0.014	0.000	0	0.001	491	1	491	1.3977	1.4028	5.1	255
C	9	2/4/2012	7:56	31.93	0.03	0.014	0.000	0	0.001	467	1	467	1.3972	1.4027	5.5	275
C	10	2/4/2012	9:56	33.93	0.03	0.014	0.000	0	0.001	435	1	435	1.3961	1.4008	4.7	235
C	11	2/4/2012	11:56	35.93	0.28	0.023	0.000	0	0.003	486	1	486	1.4242	1.4295	5.3	265
C	12	2/4/2012	13:56	37.93	0.61	0.037	1.106	222	0.009	573	2	1,146	1.4049	1.4168	11.9	595
C	13	2/4/2012	15:56	39.93	0.79	0.039	0.832	205	0.010	564	2	1,128	1.4021	1.4140	11.9	595
C	14	2/4/2012	17:56	41.93	0.87	0.039	0.807	204	0.009	462	2	924	1.3959	1.4053	9.4	470
C	15	2/4/2012	19:56	43.93	0.87	0.039	0.276	172	0.009	394	2	788	1.4008	1.4090	8.2	410
C	16	2/4/2012	21:56	45.93	0.87	0.038	0.145	164	0.009	771	1	771	1.3958	1.4033	7.5	375
C	17	2/4/2012	23:56	47.93	0.87	0.039	0.104	161	0.009	714	1	714	1.4012	1.4080	6.8	340
C	18	2/5/2012	1:56	49.93	0.88	0.038	0.068	159	0.009	667	1	667	1.3956	1.4020	6.4	320
C	19	2/5/2012	3:56	51.93	0.88	0.038	0.046	158	0.009	622	1	622	1.3994	1.4053	5.9	295
C	20	2/5/2012	5:56	53.93	0.88	0.038	0.028	157	0.009	622	1	622	1.4103	1.4161	5.8	290
C	21	2/5/2012	7:56	55.93	0.88	0.037	0.028	157	0.009	612	1	612	1.4036	1.4095	5.9	295
C	22	2/5/2012	9:56	57.93	0.88	0.038	0.007	156	0.009	604	1	604	1.4030	1.4091	6.1	305
C	23	2/5/2012	11:56	59.93	0.88	0.041	0.000	155	0.010	583	1	583	1.4055	1.4111	5.6	280
C	24	2/5/2012	13:56	61.93	0.88	0.041	0.000	155	0.010	555	1	555	1.4056	1.4107	5.1	255
D	1	2/3/2012	16:00	16.00	0.00	-	0.000	0	0.003	687	1	687	1.4106	1.4176	7	350
D	2	2/3/2012	17:58	17.97	0.02	-	0.000	0	0.003	650	1	650	1.4054	1.4121	6.7	335
D	3	2/3/2012	19:58	19.97	0.02	-	0.000	0	0.003	657	1	657	1.4084	1.4148	6.4	320
D	4	2/3/2012	21:58	21.97	0.03	-	0.000	0	0.002	649	1	649	1.4082	1.4142	6	300
D	5	2/3/2012	23:58	23.97	0.03	-	0.000	0	0.002	643	1	643	1.4131	1.4193	6.2	310
D	6	2/4/2012	1:58	25.97	0.03	-	0.000	0	0.002	620	1	620	1.4163	1.4222	5.9	295
D	7	2/4/2012	3:58	27.97	0.03	-	0.000	0	0.001	605	1	605	1.4203	1.4263	6	300
D	8	2/4/2012	5:58	29.97	0.03	-	0.000	0	0.001	600	1	600	1.4193	1.4258	6.5	325
D	9	2/4/2012	7:58	31.97	0.03	-	0.000	0	0.001	580	1	580	1.4042	1.4104	6.2	310
D	10	2/4/2012	9:58	33.97	0.03	-	0.000	0	0.001	557	1	557	1.4135	1.4196	6.1	305
D	11	2/4/2012	11:58	35.97	0.28	-	0.068	0	0.003	551	1	551	1.4101	1.4158	5.7	285
D	12	2/4/2012	13:58	37.97	0.61	-	1.106	222	0.009	957	2	1,914	1.4161	1.4349	18.8	940
D	13	2/4/2012	15:58	39.97	0.79	-	0.859	207	0.010	850	2	1,700	1.4144	1.4312	16.8	840
D	14	2/4/2012	17:58	41.97	0.87	-	0.807	204	0.009	664	2	1,328	1.4046	1.4172	12.6	630
D	15	2/4/2012	19:58	43.97	0.87	-	0.276	172	0.009	614	2	1,228	1.4130	1.4248	11.8	590
D	16	2/4/2012	21:58	45.97	0.87	-	0.145	164	0.009	538	2	1,076	1.4128	1.4238	11	550
D	17	2/4/2012	23:58	47.97	0.87	-	0.104	161	0.009	512	2	1,024	1.4127	1.4228	10.1	505
D	18	2/5/2012	1:58	49.97	0.88	-	0.068	159	0.009	494	2	988	1.4145	1.4244	9.9	495
D	19	2/5/2012	3:58	51.97	0.88	-	0.046	158	0.009	475	2	950	1.4198	1.4290	9.2	460
D	20	2/5/2012	5:58	53.97	0.88	-	0.028	157	0.009	446	2	892	1.4167	1.4256	8.9	445
D	21	2/5/2012	7:58	55.97	0.88	-	0.028	156	0.009	952	1	952	1.4007	1.4089	8.2	410
D	22	2/5/2012	9:58	57.97	0.88	-	0.007	156	0.009	917	1	917	1.4137	1.4217	8	400
D	23	2/5/2012	11:58	59.97	0.88	-	0.000	155	0.010	859	1	859	1.4098	1.4176	7.8	390
D	24	2/5/2012	13:58	61.97	0.88	-	0.000	155	0.010	862	1	862	1.4147	1.4222	7.5	375
E	1	2/3/2012	16:06	16.10	0.00	-	0.000	0	0.003	360	2	720	1.4118	1.4183	6.5	325
E	2	2/3/2012	18:03	18.05	0.02	-	0.000	0	0.003	693	1	693	1.4192	1.4255	6.3	315
E	3	2/3/2012	20:03	20.05	0.02	-	0.000	0	0.003	664	1	664	1.4105	1.4168	6.3	315
E	4	2/3/2012	22:03	22.05	0.03	-	0.000	0	0.002	669	1	669	1.4148	1.4205	5.7	285
E	5	2/4/2012	0:03	24.05	0.03	-	0.000	0	0.002	636	1	636	1.4074	1.4134	6	300
E	6	2/4/2012	2:03	26.05	0.03	-	0.000	0	0.002	620	1	620	1.4150	1.4205	5.5	275
E	7	2/4/2012	4:03	28.05	0.03	-	0.000	0	0.001	614	1	614	1.4115	1.4174	5.9	295
E	8	2/4/2012	6:03	30.05	0.03	-	0.000	0	0.001	590	1	590	1.4173	1.4229	5.6	280
E	9	2/4/2012	8:03	32.05	0.03	-	0.000	0	0.001	591	1	591	1.4125	1.4179	5.4	270
E	10	2/4/2012	10:03	34.05	0.03	-	0.000	0	0.001	579	1	579	1.3994	1.4051	5.7	285
E	11	2/4/2012	12:03	36.05	0.28	-	0.224	13	0.003	581	1	581	1.4193	1.4248	5.5	275
E	12	2/4/2012	14:03	38.05	0.61	-	1.193	227	0.009	994	2	1,988	1.4122	1.4308	18.6	930
E	13	2/4/2012	16:03	40.05	0.79	-	0.885	208	0.010	758	2	1,516	1.4116	1.4265	14.9	745
E	14	2/4/2012	18:03	42.05	0.87	-	0.731	199	0.009	678	2	1,356	1.4185	1.4317	13.2	660
E	15	2/4/2012	20:03	44.05	0.87	-	0.276	172	0.009	632	2	1,264	1.4230	1.4343	11.3	565
E	16	2/4/2012	22:03	46.05	0.87	-	0.131	163	0.009	591	2	1,182	1.4181	1.4282	10.1	505
E	17	2/5/2012	0:03	48.05	0.87	-	0.104	161	0.009	546	2	1,092	1.4203	1.4305	10.2	510
E	18	2/5/2012	2:03	50.05	0.88	-	0.068	159	0.009	481	2	962	1.4119	1.4213	9.4	470
E	19	2/5/2012	4:03	52.05	0.88	-	0.046	158	0.009	476	2	952	1.4102	1.4191	8.9	445
E	20	2/5/2012	6:03	54.05	0.88	-	0.037	157	0.009	445	2	890	1.4161	1.4245	8.4	420
E	21	2/5/2012	8:03	56.05	0.88	-	0.013	156	0.009	440	2	880	1.4153	1.4232	7.9	395
E	22	2/5/2012	10:03	58.05	0.88	-	0.007	156	0.009	422	2	844	1.4193	1.4269	7.6	380

APPENDIX D

Sampler	Sample #	Date of Sample	Time of Sample	(TIME)	Rainfall (in)	Level (m)	Inflow Rate (cfs)	Inflow Volume (cf)	Outflow Rate (cfs)	Measured Tubidity (on turbidimeter)	Turbidity Ratio (1:x)	Actual Turbidity	Clean Dish/Filter Weight (g)	Dried Ladin Dish/Filter Weight (g)	TSS Weight of Sample (mg)	TSS (mg/L)
E	23	2/5/2012	12:03	60.05	0.88	-	0.003	155	0.010	865	1	865	1.4152	1.4226	7.4	370
E	24	2/5/2012	14:03	62.05	0.88	-	0.000	155	0.010	902	1	902	1.4185	1.4261	7.6	380

APPENDIX E: DATA COLLECTION LOG

1. Data Collection on 11/15–11/16/2011

Additional sand bag reinforcements were added to seal any gaps around the edges of the weir on 11/15 (prior to rainfall event). Rainfall event took place on 11/16 and proper function of the weir was confirmed by ALDOT Q.C.I., Seth Hale (as shown in Figure B.4). Samples and data logs were collected from the ISCO samplers on 11/18. It was noted that the ISCO rain gauge, installed on the inflow sampler, was not logging rainfall data. This was corrected for future rainfall events by installing the rain gauge on the outflow sampler.

Much of the small #4 stone that was on the check dam washed away and into the weir during the inflow. This did not cause any damage to the data collection equipment; however, it posed a potential danger to the weir. The contractor was notified of the issue and agreed to remove the stone that had washed into the weir.

It was also noted that the placement of the floc logs on top of the inflow channel, (downstream of the weir) was ineffective in addition to the fact that the floc logs were entirely coated with dirt and mulch from when the hillside had been seeded and mulched. The floc logs were then moved away from the weir about 2-3 feet and roughened up so that they would be more effective.

There was little outflow at the time of sample collection and the sampler programming was reset awaiting the next rainfall event.

2. Data Collection on 11/26–27/2011

It was noted that the floc logs placed on top of the channel, downstream of the weir had been buried underneath the #4 stone (as shown in Figure B.6). Upon investigation, the contractor has taken the stone that had washed into the weir and shoveled it onto the downstream side of the weir, thus burying the floc logs. ALDOT personnel Adam Sandlin was notified that the floc logs had been buried and rendered ineffective. Mr. Sandlin stated that he would be in touch with the contractor to have new floc logs in place prior to the next rainfall event.

It was also noted that there was sediment build-up occurring in the diversion ditch where the filter fabric liner had given way to mud from where the ditch had been cut. This was noted as a possible source of turbidity and suspended solids within the inflow.

3. Data Collection on 12/5–7/2011

Samples were collected on 12/9. It was noted that the floc logs had been replaced on top of the inflow channel, just downstream of the weir. Suspicion was raised due to the fact that the new logs that were in place were white and not blue, like the original floc logs (as shown in Figure B.8). Applied Polymer Systems (APS, floc log manufacturer) was contacted by Auburn to find out what log was prescribed for the area, according to their soil analysis records. Nancy, with APS, explained that she was the one who did the soil analysis for the jobsite and stated that, according to their records, a 706b floc log was what had been prescribed for the soil on the 502 job. This matched the photo record produced by Auburn researchers of the label on the box from which the original floc logs came out of. In addition, Nancy stated that the 706b floc log had never been white in color. Once the samples had been processed, the outflow turbidity and TSS showed very little to no decrease over a 24 hour time period. All of this information was presented to Adam Sandlin, and it was recommended that the correct floc logs be placed on the inflow channel.

4. Data Collection on 12/16/2011

Samples were collected from the site on 12/17. Sediment build-up had continued in the diversion ditch that fed the inflow channel. Two large sump areas had been dug out prior to the diversion ditch, retaining a large amount of water in each. This was noted to be a probable reason for lack of inflow through the weir and into the basin. It was also noted that the white (incorrect) floc logs were still in place, and this would be a major contribution to the lack of efficiency of the sediment basin.

5. Data Collection on 12/21 – 22/2011

Samples were collected on 12/23. Initially it was noted that the correct floc logs had been placed across the top of the inflow channel, just downstream of the weir. A large advancement of cut had been made to the roadbed and a large dam had been built to back up the water in the ditch alongside the roadbed. It was noted that the water was unable to get into the diversion ditch to go through the inflow channel and into the basin and was going around the dam (to the North) and flowing alongside the berm that had been built along the south edge of the roadbed (as shown in Figure B.15-16). Therefore, all water contributed to the basin during the rainfall event came from the hillside (to the west of the basin) or from the amount of rainfall itself. There was still a large amount of outflow taking place at the time of sample collection and when the basin sampler programs had been reset, they immediately began pulling samples again (which would be the next data collection set).

6. Data Collection on 12/24 – 26/2011

Samples were ready on 12/24, however were not collected until 12/26 due to the Christmas Holiday. As previously mentioned, this set of samples was a continuation of the previous rainfall event's outflow in the basin. All site conditions remained the same as the previous collection date.

7. Data Collection on 12/28 – 29/2011

Samples were collected on 12/30. It was noted that site conditions remained the same, however the area that water had been bypassing the dam (to the north) had experienced a great deal of scour and was still carrying water. A photo log of this area was collected by Auburn researchers for future reference. A large amount of water was ponded behind the dam and could not flow into the diversion ditch to carry it into the inflow channel (it would have to flow uphill 2-3 feet in order to just get into the diversion ditch).

8. Data Collection on 1/7/2012 – 1/8/2012

Samples were collected on 1/9/2012. A new inflow channel has been added to the northwest corner of the basin on 1/6/2012. Inflow channel and weir had already been installed prior to Auburn researchers arriving onsite on 1/6 to install additional ISCO 6710 sampler to monitor new primary inflow channel. There is now a 30 inch concrete pipe connecting the roadbed ditch to the inflow channel of the basin. The road bed is now at finish grade, awaiting limestone base material. It has been noted that the weir was not properly installed, according to the original weir. Conversation with the contractor revealed that the weir was not trenched in at all (proper installation is trenching 6 inches) and there was no filter fabric underneath or along the edges of the weir. The contractor claimed that there were (25) 50lb sand bags packed in along the upstream side of the weir. It is apparent that these sandbags did not waterproof the weir and that water was being allowed to flow under and around the weir freely. Due to this issue, no inflow samples were collected because there was no water passing through the weir. In addition to the sampler not being able to retrieve inflow samples, this issue also means that none of the inflow is coming into contact with the floc logs that were placed on top of the channel, just downstream of the weir. ALDOT personnel, Adam Sandlin, was notified immediately of this issue along with the importance that this problem be corrected as soon as possible so that data collected in the future would be usable.

There was a large volume of water remaining in the basin when samples were collected, and when the sampler programming was reset, the basin samplers began pulling a second set of samples.

9. Data Collection on 1/9/2012 – 1/10/2012

Samples were collected on 1/11/2012. There were only basin samples collected due to the fact that the samplers were triggered by the continuous outflow produced by the rainfall event on 1/7/2012 – 1/8/2012 during the previous data collection process. All site conditions remained the same as the previous collection period.

10. Data Collection on 1/12/2012 – 1/13/2012

Samples were collected on 1/13/2012. It was noted that there was a large enough flow rate through the inflow channel to force some water through the opening in the weir, despite the amount of water going around and under it. Only 900 ft^3 of water was recorded to have passed through the weir; however, the water level in the basin was at an all-time high, (estimated 15 to 20 thousand ft^3 volume). The volume that passed through the weir allowed for (3) 1L samples to be taken from the inflow. It should be noted that this is an inadequate representation of the inflow and may prove to be useless when trying to prove basin performance, but at least there is somewhat of a baseline to go by. Outflow was still occurring at the time of sample collection and sampler programming reset; however, the samplers were not reset due to the below freezing temperatures, which renders the samplers incapable of pulling samples. Auburn researchers returned to the site on the afternoon of 1/14/2012 to reset the sampler programming, once temperatures were above freezing. There was no outflow at the time of programming reset.

11. Data Collection on 1/17/2012 – 1/19/2012

Samples from large rain event on 1/17/2012 were collected on 1/19/2012. It was noted that there was a tremendous amount of scour around the channel and at the base of the driveway that crosses the roadbed ditch (via 30” concrete pipe). Initial inspection of the weir showed that the contractor had gone back in and placed filter fabric along the upstream side of the weir and had enlarged the weir opening to 3’ wide by 1.5’ deep. In addition to the large amount of scour, it was also noted that the 4 706b floc logs that were in place downstream of the weir had been washed away from their original positioning. The two floc logs attached to posts on the north half of the weir had been pushed to the north side of the channel (high side), while the two floc logs attached to posts on the south side of the weir had apparently been washed to the south side of the channel (low side) – one being shredded in the riprap and the other was completely missing. Overall, the floc logs that were in place had be rendered ineffective for future rain events. According to ALDOT personnel, Seth Hale, there was such a large amount of rainfall in a short period of time that the volume of runoff was too great for the concrete pipe and channel to accommodate. Upon review of the rainfall data collected by ISCO 6712 sampler and rain gauge, approximately 1.12 inches of rain fell over a time period of 1 hour and 5 minutes, at a maximum intensity of 3.48 in/hr. It has been taken into consideration that, according to ALDOT personnel, Adam Sandlin, there were high winds involved throughout the duration of the rainfall, so the rainfall measurement taken might be lower than what actually fell (because rain gauges can not detect horizontally blowing rain).

It is apparent that the channel size was underdesigned for this particular type of rainfall, as there was evidence of water flowing 4 – 6 feet outside the channel. Auburn researcher, Chris Logan, met with ALDOT personnel, Seth Hale, to discuss what could be done to repair the inflow channel and weir, so that valuable inflow data and samples could be collected for future rain events. Mr. Hale stated that cost was becoming an issue with the inflow channel and basin, and he would like to see some information showing whether or not the basin would perform accordingly once a limestone base material is in place over the road bed. It was agreed upon by both parties, that Auburn contact Applied Polymer Systems, Inc. to find out if the 706b floc logs would still work once limestone base material is down on the roadbed.

Samples that were collected from within the basin were not from the large rainfall event, as there was a very small rainfall event that triggered the samplers and the sampling program had finished before the large rainfall event occurred. Samples from small rainfall event were collected and samplers were reset immediately. There was still a large amount of water still in the basin creating outflow through the skimmer, therefore the samplers began drawing samples immediately once the program had been reset.

ALDOT personnel, Adam Sandlin, met with Auburn researcher, Chris Logan, on site to discuss the needs of the site to get the inflow channel back into a usable condition, for both research and overall purposes. It was agreed upon that the inflow channel needed to be widened and deeper, to accommodate a high flow situation, should one ever occur in the future. It was also agreed upon that the location of the check dam and the weir should be moved downstream, providing storage volume for the check dam to work properly and also to allow for the weir to be placed in such a way that if the flow became more than the weir opening could handle, the water would overtop the weir and not go around it (keeping the water in the channel). W.S. Newell personnel met on site to receive instruction on what to do for repairing the inflow channel. A time was mutually agreed upon by all three parties that reconstruction of the inflow channel would occur on

Monday (1/23/2012) and that Mr. Logan would travel from Auburn to be on site by 9:00 A.M. to oversee the reconstruction efforts of the channel – so that all aspects related to the research equipment (including the weir) would be installed properly allowing no further work to be necessary on the inflow channel (as far as the needs of Auburn researchers will go).

Following the meeting of the contractor, ALDOT, and Auburn, the sampler equipment being used on the inflow channel was removed from the site and stored in the contractor's office trailer (as the main inflow channel was no longer in a usable condition for gathering research data). The contractor also took the remains of the floc logs that were in the main inflow channel and placed them in the 30" concrete pipe – to encourage settling in the forthcoming rain event during the weekend. This would not affect any research data, as there were not any inflow samples being taken from the main inflow channel until the main inflow channel is repaired.

12. Data Collection on 1/19/2012 – 1/20/2012

As was previously stated, the samples collected were from the large rainfall event on 1/17/2012, and were picked up on 1/20/2012. Site conditions remained the same, as it had been too wet for the contractor to perform any work in the area. It had been noted that the outflow from the basin appeared very turbid, and this is probably due to the upset condition of the rainfall event from 1/17 that damaged the floc logs, resulting in an improper dosing of the inflow. Despite the turbid appearance of the outflow, there appeared to be a large amount of sediment deposited in the sediment basin. Water remaining in the basin was still very turbid, and the basin had still not completely dewatered to the point of no outflow through the skimmer. This could be due to the rainfall event of 0.31" that occurred on the morning of 1/20/2012. Samplers were reset and, citing continual outflow, immediately began pulling samples again. This was allowed due to the plan for Auburn researchers to be on site on Monday (1/23) for the reconstruction of the main inflow channel, and it would not hurt to gather more basin samples for the continued outflow. Though there was not any inflow data to be had for this outflow, there were inflow samples taken during the rain event of 1/17/2012, due to the large amount of inflow and despite the ineffectiveness of the weir and channel. These samples would provide some idea of the turbidity and TSS of the large amount of inflow on 1/17.

13. Data Collection for 1/20/2012 – 1/21/2012

Samples were collected on Monday (1/23) from the continuation of outflow from the rain event on 1/17/2012. It was noted that the floc logs that were placed in the concrete pipe has been washed out and were found on at the check dam of the inflow channel, downstream of the pipe. This was noted as an ineffective location for the floc logs and, in combination with not knowing how long the floc logs lasted in the pipe, it was assumed that most of the inflow to the basin did not come into contact with the floc logs. There was still outflow from the skimmer on the basin, therefore, the sampler program was reset and samplers immediately began drawing samples from basin once their programs were started. This would give Auburn researchers a data set of continuous in-basin data to determine the settling capabilities of the basin without the use of floc logs.

It had been previously agreed upon that the contractor would begin reconstruction of the main inflow channel on the day of this data collection (1/23); however upon arriving on site at 9:00 am on 1/23, Auburn researcher, Chris Logan, could not find any activity by the contractor on site. There had been a rainfall event that morning (approximately 0.96”, according to ISCO rain gauge) between the hours of 12:45 A.M. and 3:00 A.M.; however, Mr. Logan was not contacted in regards to the contractor not performing any work on the day of 1/23. For this reason, Mr. Logan met with the contractor in their field office and was told that work would begin on the following morning, Tuesday (1/24/2012). Mr. Logan returned to Auburn with samples and prepared for returning to sediment basin on 1/24.

14. Data Collection for 1/23/2012 – 1/24/2012

Samples were collected on 1/24/2012. There was still a continuous outflow condition of basin (as there basin was still at 75% capacity) and once samplers were reset, they began pulling another set of samples. It is important to note that the samplers are set to a 24 hour program, pulling one sample per hour for 24 hours once outflow is detected. This explains the recurrence of daily sample collection and sampler reset. It is also important to note that there are only 3 sets of sample bottles per sampler. This amount of sample bottle sets was determined according to sediment basin specification stating that the basin should be able to dewater itself in 3 days (or 3 program durations). The catch with having 3 bottle sets is that bottles must be transported back to Auburn on a daily basis to be processed. This situation is better explained in this way:

> If there is a dry period before the outflow condition, 2 sets of bottles can be taken when samples are collected. If outflow condition continues when the first set of samples are collected, the researcher may spend the night and collect the second set of samples the following day before returning to Auburn to process the samples. However, if there is still continuous outflow upon collection of the second set of samples, then the 2 sets of samples must be processed immediately upon returning to Auburn in order to have a clean set of sample bottles so that the third set of samples may be collected on the following day. In a situation where there are several rain events back to back, trips to and from the sediment basin must be made daily – collecting a set of samples while an assistant is processing another set of samples so that, when the researcher returns with full bottles, there will be clean bottles to take back to the basin on the following day.

Auburn researcher, Chris Logan, returned from Auburn to the site on the morning of 1/24/2012 at 9:00 A.M. for the reconstruction effort of the main inflow channel to the sediment basin. W.S. Newell personnel met Mr. Logan on site with equipment and material needed to repair the main inflow channel. The riprap initially in the channel was removed and the channel was enlarged to a width of 16 feet and a depth of 5 feet. Filter fabric was then placed across the channel so that the bottom and the sides of the channel were completely protected. The fabric was overlapped according to the direction of flow so that the downstream edge of one piece was placed overtop the upstream edge of the next. The entire area of the newly cut inflow channel was covered in filter fabric. HDPE sheeting was then placed on the channel where the location of the weir was to be set. The upstream edge of the HDPE was overlapped by filter fabric to be pinned to the bottom following the installation of the weir. The weir was then installed under the close supervision of Mr. Logan, ensuring that the weir would be properly installed and would function as designed. The opening of the weir was enlarged to 4’ wide by 1.5’ deep (allowing for a larger area in the weir opening than the 30” concrete pipe). Once the weir was installed the HDPE was extended along the bottom and sides of the channel (about 10 feet) and then run up the face of the weir, essentially sealing the channel and weir so that all flow must pass through the weir. A small amount of limestone base material was added on top of the HDPE at the upstream edge of the weir and manually compacted. This was to provide a tight fit of the plastic at the bottom edge of the weir. In addition to the limestone base material, sandbags (provided by Auburn researchers) were added to ensure a tight fit of the HDPE at all upstream edges of the weir (bottom and sides of the channel. Filter fabric was then placed over the HDPE sheeting to protect the plastic for when the riprap would be added to the channel, keeping the weir area of the channel water tight. #2 stone was then placed immediately after the weir, allowing for a location where the floc logs may be placed and flow may continue into the remaining original portion of the inflow channel. It is important to note that the bottom of the weir opening was very near the bottom of the channel downstream of the weir. This will allow for water to not pour over the weir, but simply flow through the weir opening and down the remainder of the inflow channel. The weir was placed approximately 40 ft downstream of the opening in the 30” concrete pipe. Once weir was in place and all filter fabric laid into channel, the channel was lined with riprap (approximately 1.5’ deep), and riprap was hand placed around the weir, so as to not damage it while the rock was being placed. A larger check dam was placed in the channel, approximately 20’ downstream of the opening in the 30” concrete pipe. At the completion of the channel, Mr. Logan confirmed that the channel met the needs of Auburn researchers, and proceeded to re-install sampler equipment on the north side of the channel, to monitor inflow to the basin.

15. Data Collection on 1/24/2012 – 1/25/2012

Samples were collected on Wednesday (1/25). There basin was still in an outflow condition; however, in anticipation of the upcoming rainfall event to arrive in the early morning of Thursday (1/26), the samplers were not reset. Auburn researcher, Chris Logan, collected the samples from 1/24 and readied the samplers for the incoming rain event. Mr. Logan decided to wait on the rain event before going back to Auburn, so that the next data set would be a complete data set, with inflow samples and outflow/in-basin samples with respect to the inflow. The first wave of rain arrived at 1:45 A.M., but did not produce a level of inflow that would have an impact on the basin, so Mr. Logan waited on site for the main band of rain to arrive before starting the program on the samplers. The main band of rain arrived at 6:00 A.M., and the samplers were started at 6:15 A.M. Once the programs were reset on the samplers, Mr. Logan traveled back to Auburn to process the samples. It is important to note that waiting for the rainfall and inflow to the basin to begin allowed confirmation that the inflow channel, weir, and all samplers were performing properly and should any changes or modifications have been necessary, they could have been made immediately so that the data set would not have been missed.

16. Data Collection on 1/26/2012 – 1/27/2012

Samples were collected on 1/27/2012. The basin was at 50% capacity when the samples were collected and Auburn researcher, Chris Logan, reset the samplers, which immediately began drawing more samples. The next sample set that had begun on the reset of the samplers would be additional data for the previous rainfall event on 1/26. Overall conditions at the basin were good, though the ground remained very wet. Since Mr. Logan had 2 sets of bottles with him during the sample collection, he stayed the night to collect the next set of samples on the following day. It was noted that the trickling inflow that was still coming into the basin (and through the weir opening) was very clear and free of suspended particles. It was also noted that there was evidence of the floc log at work, as there was a trail of deposited sediment along the filter fabric where the inflow channel met the sediment basin.

17. Data Collection on 1/27/2012 – 1/28/2012

Samples were collected on 1/28/2012. The basin was at 20% capacity during the time at which the samples were collected (still in an outflow condition). To continue the data set of basin performance for the rainfall on 1/26, the samplers were reset, yet again, and allowed to begin taking another set of data. Site conditions remained unchanged from the previous day, however everything was beginning to dry. The 2 sets of samples that had been collected on Friday (1/26) and Saturday (1/27) were then taken back to the lab in

Auburn for processing. It was noted that inflow to the basin had ceased, and water was pooled up behind the weir, showing the water tightness of the weir.

18. Data Collection on 1/28/2012 – 1/29/2012

Samples were collected on 1/30/2012. The basin was no longer in an outflow state. It was noted that there was a large amount of deposited sediment visible on the side slopes of the basin. Site conditions had dried out and the baffles within the basin were visible. It was also noted that the first baffle was pushed over slightly along the top (directly downstream of the inflow channel). This could be attributed to occasional high flow conditions in the inflow channel. Samplers were reset awaiting the next rainfall event and samples were transported back to the lab in Auburn to be processed.

19. Data Collection on 2/1/2012 – 2/2/2012

Samples were collected on 2/2/2012. The basin was at 60% capacity and continuing to produce outflow. Sampler programming was reset by Auburn researcher, Chris Logan, and samplers continued to pull samples. Since Mr. Logan had 2 sets of bottles with him during the sample collection, he stayed the night to collect the next set of samples on the following day. No notable changes in site conditions were observed.

20. Data Collection on 2/2/2012 – 2/3/2012

Samples were collected on 2/3/2012. The basin was at about 30% capacity and still producing an outflow condition. The programming of the samplers was changed, however, to pull a sample every two hours, instead of every hour. The programming of the inflow samplers was also changed. The sampler on the primary inflow channel was programmed to pull composite samples (4 to each bottle) over a representative flow volume of 600 cubic feet, instead of 400 cubic feet. The sampler on the secondary inflow channel was programmed to pull a full bottle sample for every 40 cubic feet of inflow volume. This would allow for all samples to be of a better representative sample for inflow and outflow and catch multiple inflow events, should they occur. This programming change also allows for fewer trips to be made to collect samples and replace sampler bottles. Sampler programming was then enabled and samplers began to pull samples from basin and outflow. No notable site condition changes were observed.

21. Data Collection on 2/3/2012 – 2/5/2012

Samples were collected on 2/6/2012. Basin was still at 30% capacity and producing an outflow condition. Samplers were placed in stand-by mode, to collect inflow, outflow, and rain data. No notable site condition changes were observed.

APPENDIX F: STATISTICAL DATA SUMMARY

Table F.1: Statistical summary of rainfall and turbidity (NTU) and TSS (mg/L) data collected at inflow channels of sediment basin #4.

Conditions of PAM	Rainfall Data								Inflow Data												
	Start Date	Start Time	Finish Date	Finish Time	Duration (Hr:Min)	Amount (in)	Average Intensity	Maximum Intensity	Start Date	Start Time	Finish Date	Finish Time	# of Samples	Max TSS	Min TSS	Average TSS	Std. Dev. TSS	Max NTU	Min NTU	Average NTU	Std. Dev. NTU
With PAM	11/16/2011	0:00	11/16/2011	10:10	10:10	1.35	0.127	2.22	11/16/2011	8:48	11/16/2011	10:22	**23**	**10,545**	**790**	**5,430**	**2,689**	**10,656**	**1,030**	**5,855**	**2,582**
Wrong PAM	11/27/2011	0:10	11/27/2011	6:50	6:40	0.58	0.085	0.60	11/27/2011	3:52	11/27/2011	3:52	1	340	--	--	--	547	--	--	--
	11/27/2011	15:50	11/28/2011	9:00	17:10	0.60	0.035	0.12	11/27/2011	23:50	11/28/2011	1:24	4	130	80	109	21	296	188	257	48
	11/28/2011	13:30	11/29/2011	4:20	14:50	0.41	0.028	0.12	11/28/2011	0.676	11/28/2011	16:51	2	80	60	70	14	229	171	200	41
	12/5/2011	13:50	12/5/2011	17:05	3:15	1.09	0.335	1.08	12/5/2011	15:30	12/5/2011	17:45	**21**	**1,950**	**465**	**1,305**	**380**	**2,724**	**878**	**1,989**	**446**
	12/5/2011	18:35	12/6/2011	0:40	6:05	0.23	0.040	0.24	--	--	--	--	0	--	--	--	--	--	--	--	--
No PAM	12/22/2011	7:15	12/22/2011	14:15	7:00	1.65	0.236	1.92	12/22/2011	10:03	12/22/2011	11:36	3	770	630	712	73	1,548	1,294	1,425	73
	12/26/2011	14:45	12/27/2011	1:40	10:55	1.55	0.142	1.32	12/26/2011	20:23	12/26/2011	21:45	2	660	380	520	198	1,220	955	1,088	187
	1/7/2012	10:55	1/7/2012	12:15	1:20	0.27	0.200	0.84	--	--	--	--	0	--	--	--	--	--	--	--	--
	1/7/2012	16:35	1/7/2012	16:55	0:20	0.21	0.630	1.08													
	1/8/2012	8:15	1/8/2012	9:10	0:55	0.28	0.310	0.36													
Limited or No PAM	1/11/2012	0:05	1/11/2012	1:45	1:40	0.30	0.180	0.36	1/11/2012	2:22	1/11/2012	2:44	3	2,015	1,480	1,797	281	3,660	2,456	2,896	664
	1/11/2012	4:55	1/11/2012	6:20	1:25	0.17	0.120	0.48	--	--	--	--	0	--	--	--	--	--	--	--	--
	1/11/2012	18:50	1/12/2012	8:20	13:30	0.10	0.007	0.12	--	--	--	--	0	--	--	--	--	--	--	--	--
	1/17/2012	14:15	1/17/2012	16:15	2:00	1.22	0.610	3.48	1/17/2012	15:26	1/17/2012	17:00	**28**	**26,325**	**2,720**	**7,433**	**5,632**	**28,352**	**3,488**	**9,902**	**6,234**
									--	--	--	--	0	--	--	--	--	--	--	--	--
	1/22/2012	23:15	1/23/2012	3:50	4:35	0.96	0.209	2.64	1/23/2012	0:28	1/23/2012	1:58	3	1,950	1,355	1,645	298	3,500	2,416	2,909	549
									--	--	--	--	0	--	--	--	--	--	--	--	--
With PAM	1/26/2012	0:10	1/26/2012	1:00	0:50	0.11	0.132	0.24	1/26/2012	6:51	1/26/2012	9:44	**24**	435	95	275	75	785	191	506	149
	1/26/2012	5:20	1/26/2012	10:50	5:30	0.47	0.085	0.24													
	1/26/2012	16:35	1/26/2012	19:05	2:30	0.16	0.064	0.36													
	2/1/2012	4:25	2/1/2012	9:40	5:15	0.46	0.090	0.96	2/1/2012	7:42	2/1/2012	12:26	**24**	**2,645**	**250**	**1,105**	**745**	**3,688**	**508**	**1,905**	**1,067**
	2/1/2012	19:40	2/1/2012	20:05	0:25	0.25	0.610	1.44	2/1/2012	20:14	2/1/2012	20:14	1	870	870	870	--	1,888	1,888	1,888	--
									--	--	--	--	0	--	--	--	--	--	--	--	--
	2/4/2012	9:45	2/4/2012	16:40	6:55	0.88	0.130	0.60	2/4/2012	12:14	2/4/2012	15:47	**27**	**2,315**	**255**	**1,068**	**561**	**3,892**	**616**	**1,944**	**914**

Note: Rainfall data on 11/16/2011 were from RainWave.

APPENDIX F

Table F.2: Statistical summary of rainfall and turbidity (NTU) and TSS (mg/L) data collected at Bay 2 of sediment basin #4.

Phase		Rainfall Data								Bay 2 Data																
	PAM	Start Date	Start Time	Finish Date	Finish Time	Duration	Amount (in)	Average Intensity	Maximum Intensity	Start Date	Start Time	Finish Date	Finish Time	# of Samples	Max TSS	Min TSS	Average TSS	Std. Dev. TSS	% Peak TSS Reduction	% Avg. Inflow TSS Reduction	Max NTU	Min NTU	Average NTU	Std. Dev. NTU	% Peak NTU Reduction	% Avg Inflow NTU Reduction
PH1	With PAM	11/16/2011	0:00	11/16/2011	10:10	10:10	1.35	0.127	2.22	11/16/2011	9:21	11/17/2011	8:18	24	4,940	125	439	2,689	97%	98%	5,592	235	688	1,064	96%	96%
	Wrong PAM	11/27/2011	0:10	11/27/2011	6:50	6:40	0.58	0.085	0.60	--	--	--	--	0	--	--	--	--	--	--	--	--	--	--	--	--
		11/27/2011	15:50	11/28/2011	9:00	17:10	0.60	0.035	0.12	--	--	--	--	0	--	--	--	--	--	--	--	--	--	--	--	--
		11/28/2011	13:30	11/29/2011	4:20	14:50	0.41	0.028	0.12	--	--	--	--	0	--	--	--	--	--	--	--	--	--	--	--	--
		12/5/2011	13:50	12/5/2011	17:05	3:15	1.09	0.335	1.08	12/5/2011	15:49	12/6/2011	14:47	24	885	175	361	217	80%	87%	1,642	590	929	374	64%	70%
		12/5/2011	18:35	12/6/2011	0:40	6:05	0.23	0.040	0.24																	
		12/22/2011	7:15	12/22/2011	14:15	7:00	1.65	0.236	1.92	12/23/2011	13:36	12/24/2011	12:34	24	235	130	174	28	45%	82%	483	298	376	44	38%	79%
		12/26/2011	14:45	12/27/2011	1:40	10:55	1.55	0.142	1.32	12/26/2011	20:11	12/27/2011	19:08	24	170	75	114	32	56%	86%	420	318	352	34	24%	71%
PH2	Limited or No PAM	1/7/2012	10:55	1/7/2012	12:15	1:20	0.27	0.200	0.84	1/7/2012	13:30	1/7/2012	16:27	4	200	105	171	39	0%	--	556	327	495	96	0%	--
		1/7/2012	16:35	1/7/2012	16:55	0:20	0.21	0.630	1.08	1/7/2012	17:27	1/8/2012	7:28	15	1,315	515	727	266	61%	--	2,636	1,338	1,689	480	49%	--
		1/8/2012	8:15	1/8/2012	9:10	0:55	0.28	0.310	0.36	1/8/2012	8:28	1/8/2012	12:27	5	840	490	654	150	42%	--	1,790	1,236	1,525	242	31%	--
										1/9/2012	17:34	1/10/2012	16:32	24	250	100	161	46	60%	--	554	260	378	91	53%	--
		1/11/2012	0:05	1/11/2012	1:45	1:40	0.30	0.180	0.36	1/11/2012	14:31	1/12/2012	3:28	14	360	230	306	41	36%	87%	841	556	705	102	34%	81%
		1/11/2012	4:55	1/11/2012	6:20	1:25	0.17	0.120	0.48	1/12/2012	4:28	1/12/2012	8:28	5	245	200	228	18	18%	89%	568	483	524	32	15%	83%
		1/11/2012	18:50	1/12/2012	8:20	13:30	0.10	0.007	0.12	1/12/2012	9:28	1/12/2012	13:28	5	215	190	203	9	12%	89%	478	448	462	14	6%	85%
		1/17/2012	14:15	1/17/2012	16:15	2:00	1.22	0.610	3.48	1/19/2012	15:58	1/20/2012	14:54	24	805	555	688	74	31%	93%	1,982	1,486	1,753	143	25%	85%
										1/21/2012	15:45	1/22/2012	14:42	24	810	285	475	129	65%	96%	1,916	807	1,194	298	58%	92%
		1/22/2012	23:15	1/23/2012	3:50	4:35	0.96	0.209	2.64	1/23/2012	12:05	1/24/2012	1:03	14	1,325	840	1,073	136	37%	49%	3,036	1,848	2,465	326	39%	36%
										1/24/2012	12:48	1/25/2012	11:46	23	780	460	556	83	41%	72%	1,984	1,164	1,451	233	41%	60%
	With PAM	1/26/2012	0:10	1/26/2012	1:00	0:50	0.11	0.132	0.24	1/26/2012	6:29	1/27/2012	5:27	24	580	245	392	94	58%	11%	1,008	517	777	172	49%	-2%
		1/26/2012	5:20	1/26/2012	10:50	5:30	0.47	0.085	0.24																	
		1/26/2012	16:35	1/26/2012	19:05	2:30	0.16	0.064	0.36	1/28/2012	17:50	1/29/2012	16:48	24	160	65	108	25	59%	76%	322	241	270	23	25%	52%
		2/1/2012	4:25	2/1/2012	9:40	5:15	0.46	0.090	0.96	2/1/2012	7:23	2/1/2012	19:21	13	885	395	481	215	55%	64%	1,552	811	909	368	48%	57%
		2/1/2012	19:40	2/1/2012	20:05	0:25	0.25	0.610	1.44	2/1/2012	20:21	2/2/2012	6:21	11	1,780	675	1,008	349	62%	22%	2,996	1,512	2,014	455	50%	20%
										2/2/2012	14:35	2/3/2012	13:33	24	570	315	420	89	45%	64%	1,226	747	910	167	39%	60%
										2/3/2012	16:06	2/4/2012	12:03	11	325	270	293	19	17%	69%	720	579	632	48	20%	69%
		2/4/2012	9:45	2/4/2012	16:40	6:55	0.88	0.130	0.60	2/4/2012	14:03	2/5/2012	14:03	13	930	370	521	167	60%	65%	994	844	1,130	334	15%	57%

Table F.3: Statistical summary of rainfall and turbidity (NTU) and TSS (mg/L) data collected at Bay 3 of sediment basin #4.

Phase		Rainfall Data								Bay 3 Data																
	PAM	Start Date	Start Time	Finish Date	Finish Time	Duration	Amount (in)	Average Intensity	Maximum Intensity	Start Date	Start Time	Finish Date	Finish Time	# of Samples	Max TSS	Min TSS	Average TSS	Std. Dev. TSS	% Peak TSS Reduction	% Avg. Inflow TSS Reduction	Max NTU	Min NTU	Average NTU	Std. Dev. NTU	% Peak NTU Reduction	% Avg Inflow NTU Reduction
PH1	With PAM	11/16/2011	0:00	11/16/2011	10:10	10:10	1.35	0.127	2.22	11/16/2011	9:14	11/17/2011	8:11	24	2,145	110	356	415	95%	98%	3,856	247	708	729	94%	96%
	Wrong PAM	11/27/2011	0:10	11/27/2011	6:50	6:40	0.58	0.085	0.60	--	--	--	--	0	--	--	--	--	--	--	--	--	--	--	--	--
		11/27/2011	15:50	11/28/2011	9:00	17:10	0.60	0.035	0.12	--	--	--	--	0	--	--	--	--	--	--	--	--	--	--	--	--
		1/17/2012	13:30	11/29/2011	4:20	14:50	0.41	0.028	0.12	--	--	--	--	0	--	--	--	--	--	--	--	--	--	--	--	--
		12/5/2011	13:50	12/5/2011	17:05	3:15	1.09	0.335	1.08	12/5/2011	15:42	12/6/2011	14:41	24	800	225	311	125	72%	83%	1,552	615	914	345	60%	69%
		12/5/2011	18:35	12/6/2011	0:40	6:05	0.23	0.040	0.24																	
		12/22/2011	7:15	12/22/2011	14:15	7:00	1.65	0.236	1.92	12/23/2011	13:08	12/24/2011	12:06	24	205	135	165	19	34%	81%	482	352	390	33	27%	75%
		12/26/2011	14:45	12/27/2011	1:40	10:55	1.55	0.142	1.32	12/26/2011	19:43	12/27/2011	18:41	24	160	70	101	26	56%	87%	446	266	363	52	40%	76%
PH2	Limited or No PAM	1/7/2012	10:55	1/7/2012	12:15	1:20	0.27	0.200	0.84	1/7/2012	13:01	1/7/2012	16:00	4	185	30	117	70	0%	--	508	153	358	157	0%	--
		1/7/2012	16:35	1/7/2012	16:55	0:20	0.21	0.630	1.08	1/7/2012	17:00	1/8/2012	7:00	15	1,125	460	692	252	59%	--	2,232	1,236	1,614	445	45%	--
		1/8/2012	8:15	1/8/2012	9:10	0:55	0.28	0.310	0.36	1/8/2012	8:00	1/8/2012	12:00	5	755	470	606	135	38%	--	1,704	1,518	1,446	270	11%	--
										1/9/2012	17:29	1/10/2012	16:27	24	350	95	161	46	73%	--	546	260	381	98	52%	--
		1/11/2012	0:05	1/11/2012	1:45	1:40	0.30	0.180	0.36	1/11/2012	14:25	1/12/2012	3:23	14	315	230	268	23	27%	87%	720	522	604	49	28%	82%
		1/11/2012	4:55	1/11/2012	6:20	1:25	0.17	0.120	0.48	1/12/2012	4:23	1/12/2012	8:23	5	235	200	213	14	15%	89%	503	455	475	19	10%	84%
		1/11/2012	18:50	1/12/2012	8:20	13:30	0.10	0.007	0.12	1/12/2012	9:23	1/12/2012	13:23	5	215	190	200	10	12%	89%	462	434	452	11	6%	85%
		1/17/2012	14:15	1/17/2012	16:15	2:00	1.22	0.610	3.48	1/19/2012	15:52	1/20/2012	14:49	24	795	590	667	55	26%	92%	1,926	1,532	1,734	111	20%	85%
										1/21/2012	15:39	1/22/2012	14:37	24	800	270	450	139	66%	96%	1,956	738	1,145	348	62%	93%
		1/22/2012	23:15	1/23/2012	3:50	4:35	0.96	0.209	2.64	1/23/2012	11:59	1/24/2012	10:57	24	1,390	695	959	203	50%	58%	2,992	1,728	2,203	394	42%	41%
										1/24/2012	12:42	1/25/2012	11:41	24	715	225	544	105	69%	86%	1,768	1,186	1,442	207	33%	59%
	With PAM	1/26/2012	0:10	1/26/2012	1:00	0:50	0.11	0.132	0.24	1/26/2012	6:24	1/27/2012	5:22	24	510	225	371	89	56%	18%	1,042	519	797	187	50%	-3%
		1/26/2012	5:20	1/26/2012	10:50	5:30	0.47	0.085	0.24																	
		1/26/2012	16:35	1/26/2012	19:05	2:30	0.16	0.064	0.36	1/28/2012	17:45	1/29/2012	16:43	24	150	65	111	26	57%	76%	326	256	277	21	21%	49%
		2/1/2012	4:25	2/1/2012	9:40	5:15	0.46	0.090	0.96	2/1/2012	7:17	2/1/2012	19:16	13	660	50	410	180	92%	95%	1,326	844	886	343	36%	56%
		2/1/2012	19:40	2/1/2012	20:05	0:25	0.25	0.610	1.44	2/1/2012	20:16	2/2/2012	6:16	11	1,255	660	903	188	47%	24%	2,472	1,544	1,887	284	38%	18%
										2/2/2012	14:30	2/3/2012	13:28	24	585	355	429	70	39%	59%	1,196	722	886	147	40%	62%
										2/3/2012	16:00	2/4/2012	11:58	11	350	285	312	19	19%	67%	687	551	618	44	20%	71%
		2/4/2012	9:45	2/4/2012	16:40	6:55	0.88	0.130	0.60	2/4/2012	13:58	2/5/2012	13:58	13	940	375	541	175	60%	65%	1,914	859	1,130	333	55%	56%

Table F.4: Statistical summary of rainfall and turbidity (NTU) and TSS (mg/L) data collected at outflow of sediment basin #4.

Phase	PAM	Rainfall Data								Outflow Data																
		Start Date	Start Time	Finish Date	Finish Time	Duration	Amount (in)	Average Intensity	Maximum Intensity	Start Date	Start Time	Finish Date	Finish Time	# of Samples	Max TSS	Min TSS	Average TSS	Std. Dev. TSS	% Peak TSS Reduction	% Avg. Inflow TSS Reduction	Max NTU	Min NTU	Average NTU	Std. Dev. NTU	% Peak NTU Reduction	% Avg Inflow NTU Reduction
PH1	With PAM	11/16/2011	0:00	11/16/2011	10:10	10:10	1.35	0.127	2.22	11/16/2011	9:07	11/17/2011	8:07	24	895	120	234	162	87%	98%	1,646	239	498	298	85%	96%
	Wrong PAM	11/27/2011	0:10	11/27/2011	6:50	6:40	0.58	0.085	0.60	--	--	--	--	0	--	--	--	--	--	--	--	--	--	--	--	--
		11/27/2011	15:50	11/28/2011	9:00	17:10	0.60	0.035	0.12	--	--	--	--	0	--	--	--	--	--	--	--	--	--	--	--	--
		1/26/2012	13:30	11/29/2011	4:20	14:50	0.41	0.028	0.12	--	--	--	--	0	--	--	--	--	--	--	--	--	--	--	--	--
		12/5/2011	13:50	12/5/2011	17:05	3:15	1.09	0.335	1.08	12/5/2011	15:37	12/6/2011	14:37	24	520	95	311	125	82%	93%	1,112	236	774	245	79%	88%
		12/5/2011	18:35	12/6/2011	0:40	6:05	0.23	0.040	0.24																	
		12/22/2011	7:15	12/22/2011	14:15	7:00	1.65	0.236	1.92	12/23/2011	13:02	12/24/2011	12:02	24	185	115	150	18	38%	84%	411	266	345	43	35%	81%
		12/26/2011	14:45	12/27/2011	1:40	10:55	1.55	0.142	1.32	12/26/2011	19:37	12/27/2011	18:37	24	100	50	71	13	50%	90%	306	252	272	27	18%	77%
PH2	Limited or No PAM	1/7/2012	10:55	1/7/2012	12:15	1:20	0.27	0.200	0.84	1/7/2012	12:56	1/7/2012	17:56	4	430	0	72	175	100%	--	1,010	104	271	362	90%	--
		1/7/2012	16:35	1/7/2012	16:55	0:20	0.21	0.630	1.08	1/7/2012	18:56	1/8/2012	6:56	15	380	300	312	58	21%	--	995	833	839	155	16%	--
		1/8/2012	8:15	1/8/2012	9:10	0:55	0.28	0.310	0.36	1/8/2012	7:56	1/8/2012	11:56	5	420	300	341	49	0%	--	1,022	814	889	94	0%	--
										1/9/2012	17:23	1/10/2012	16:23	24	215	45	107	46	79%	--	501	196	304	100	61%	--
		1/11/2012	0:05	1/11/2012	1:45	1:40	0.30	0.180	0.36	1/11/2012	14:19	1/12/2012	3:19	14	215	110	174	23	49%	94%	549	430	493	36	22%	85%
		1/11/2012	4:55	1/11/2012	6:20	1:25	0.17	0.120	0.48	1/12/2012	4:19	1/12/2012	8:19	5	180	150	165	14	17%	92%	449	429	437	7	4%	85%
		1/11/2012	18:50	1/12/2012	8:20	13:30	0.10	0.007	0.12	1/12/2012	9:19	1/12/2012	13:19	5	185	150	167	13	19%	92%	426	404	415	8	5%	86%
		1/17/2012	14:15	1/17/2012	16:15	2:00	1.22	0.610	3.48	1/19/2012	15:46	1/20/2012	14:46	24	745	500	643	73	33%	93%	1,858	1,394	1,604	143	25%	86%
										1/21/2012	15:34	1/22/2012	14:33	24	540	205	346	103	62%	97%	1,170	502	736	213	57%	95%
		1/22/2012	23:15	1/23/2012	3:50	4:35	0.96	0.209	2.64	1/23/2012	11:54	1/24/2012	10:54	24	890	645	755	70	28%	61%	2,044	1,710	1,858	104	16%	41%
										1/24/2012	12:37	1/25/2012	11:37	24	895	395	489	99	56%	76%	1,644	1,116	1,335	160	32%	62%
	With PAM	1/26/2012	0:10	1/26/2012	1:00	0:50	0.11	0.132	0.24	1/26/2012	6:18	1/27/2012	5:18	24	385	220	296	56	43%	20%	905	480	632	135	47%	5%
		1/26/2012	5:20	1/26/2012	10:50	5:30	0.47	0.085	0.24																	
		1/26/2012	16:35	1/26/2012	19:05	2:30	0.16	0.064	0.36	1/28/2012	17:39	1/29/2012	16:39	15	220	15	96	55	93%	95%	507	243	305	75	52%	52%
		2/1/2012	4:25	2/1/2012	9:40	5:15	0.46	0.090	0.96	2/1/2012	7:12	2/1/2012	19:12	13	340	285	306	24	16%	74%	740	629	665	36	15%	67%
		2/1/2012	19:40	2/1/2012	20:05	0:25	0.25	0.610	1.44	2/1/2012	20:12	2/2/2012	6:12	11	585	400	500	53	32%	54%	1,330	1,072	1,197	82	19%	43%
										2/2/2012	14:24	2/3/2012	13:24	24	450	295	355	43	34%	66%	948	641	763	99	32%	66%
										2/3/2012	15:56	2/4/2012	11:56	11	305	235	274	22	23%	73%	646	435	534	66	33%	77%
		2/4/2012	9:45	2/4/2012	16:40	6:55	0.88	0.130	0.60	2/4/2012	13:56	2/5/2012	13:56	13	595	255	371	115	57%	76%	1,146	555	749	200	52%	71%

APPENDIX G: PLOTTED SEDIMENT BASIN DATA

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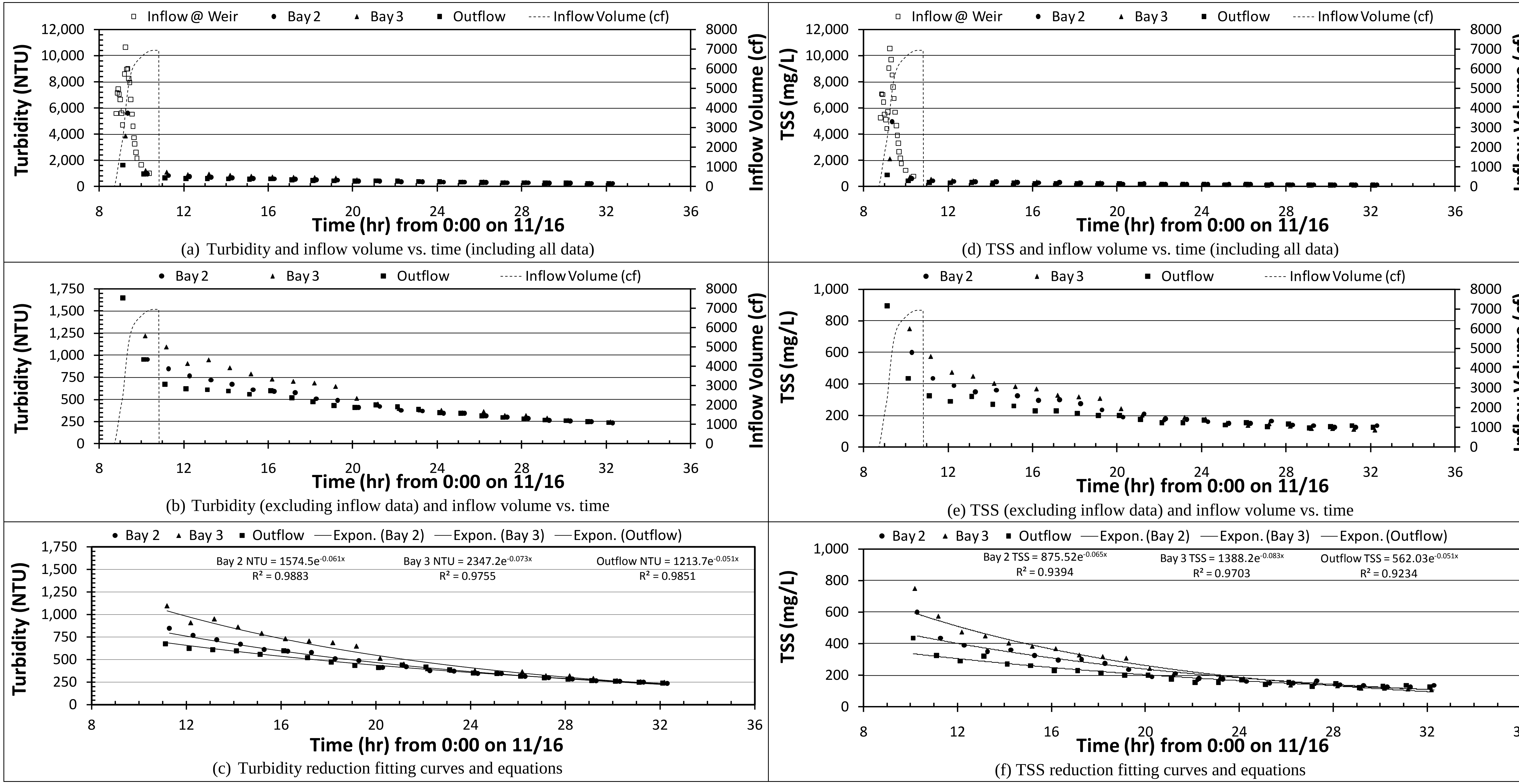


(a) Turbidity and inflow volume vs. time (including all data)

(d) TSS and inflow volume vs. time (including all data)

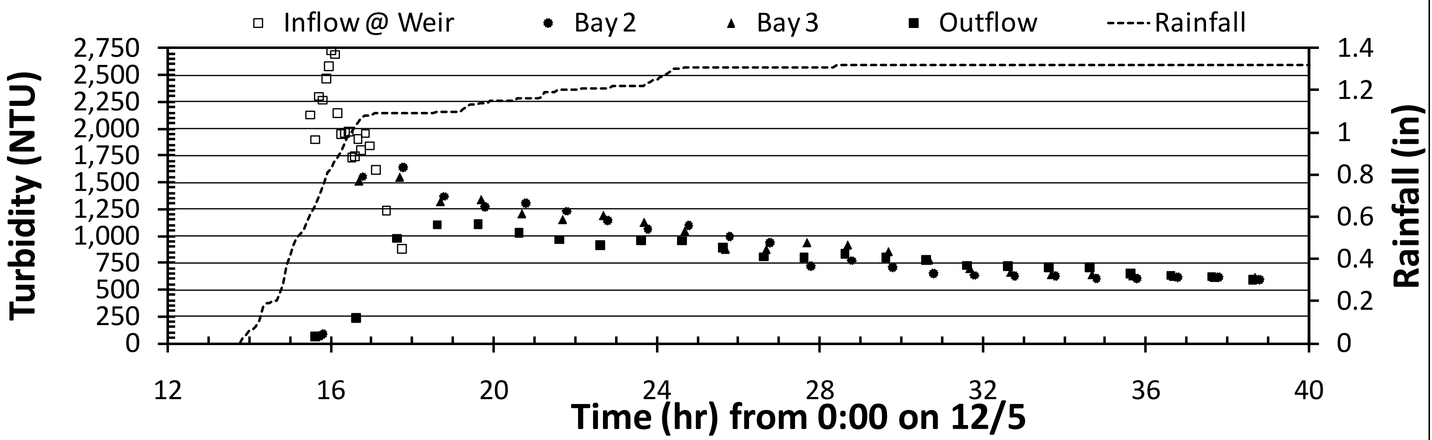
(b) Turbidity (excluding inflow data) and inflow volume vs. time

(e) TSS (excluding inflow data) and inflow volume vs. time

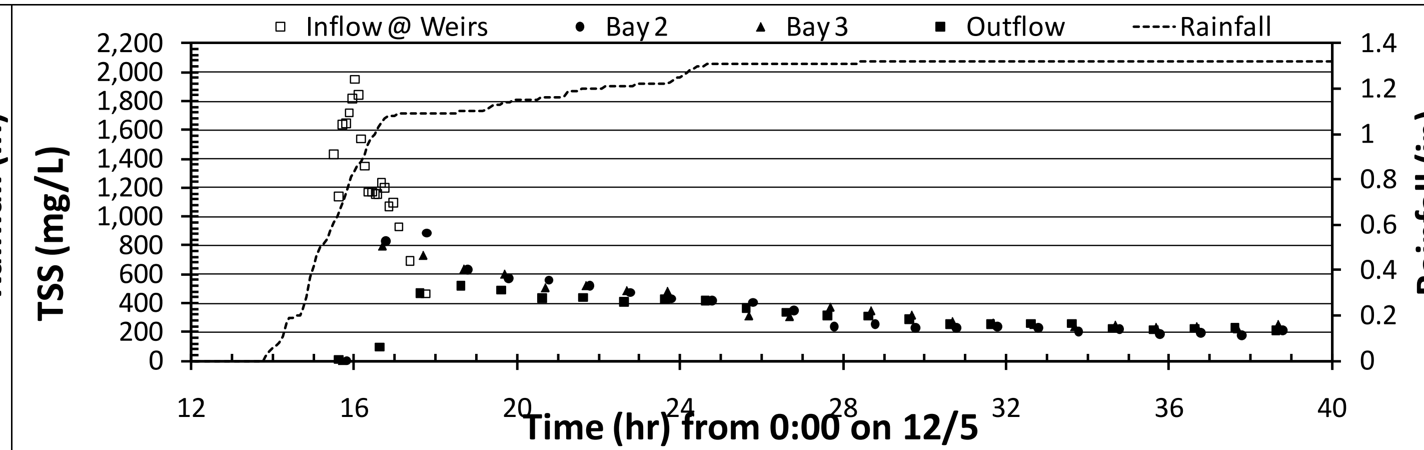
(c) Turbidity reduction fitting curves and equations

(f) TSS reduction fitting curves and equations

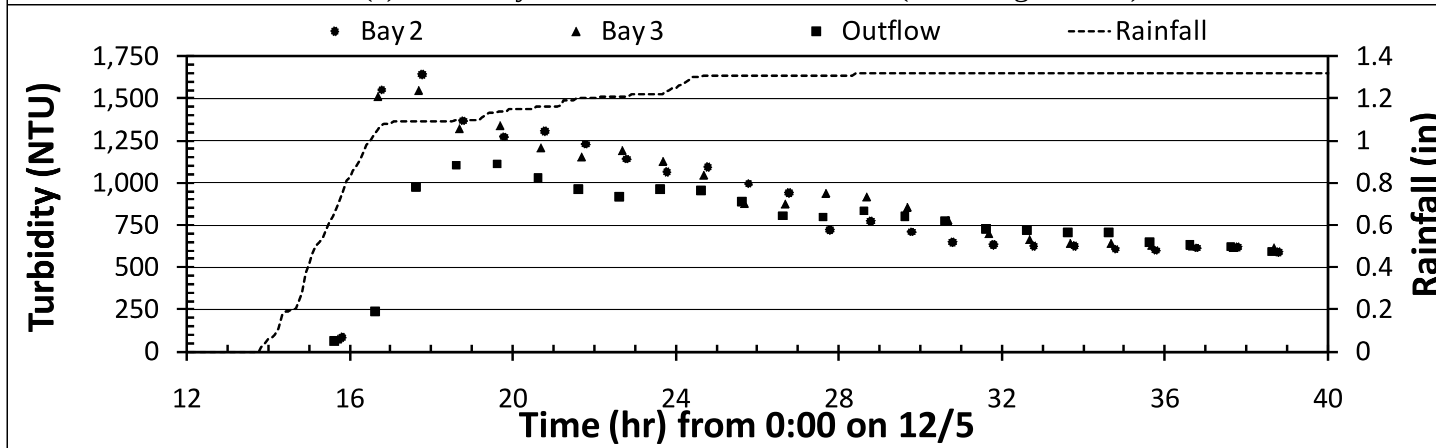
Figure G.1: Sediment basin performance data (i.e., time-series of turbidity and TSS at inflow, in-basin, and outflow) for rain event on 11/16/2011.



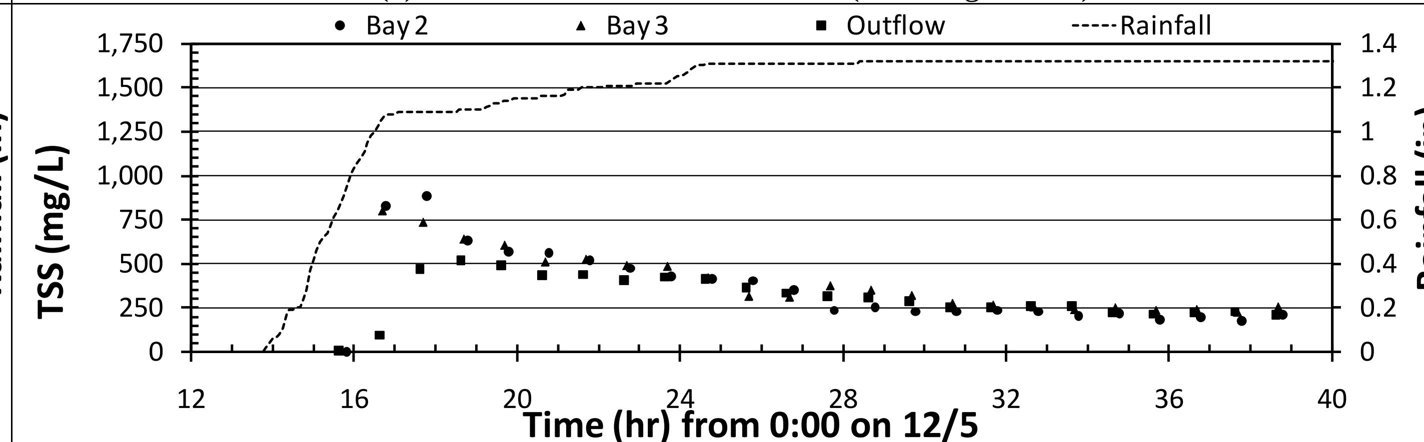
(a) Turbidity and inflow volume vs. time (including all data)



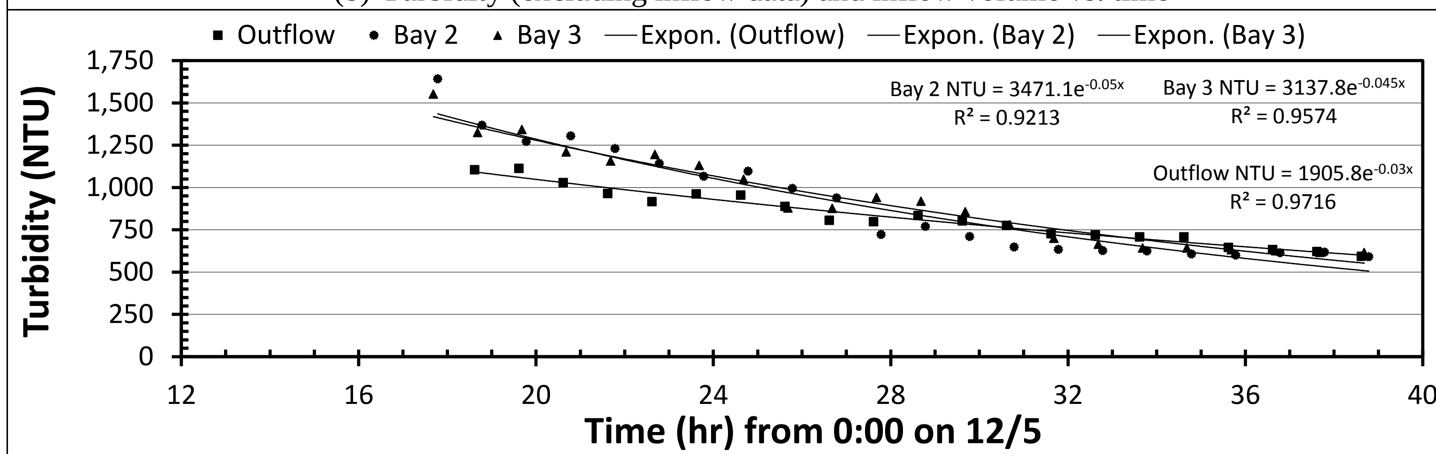
(d) TSS and inflow volume vs. time (including all data)



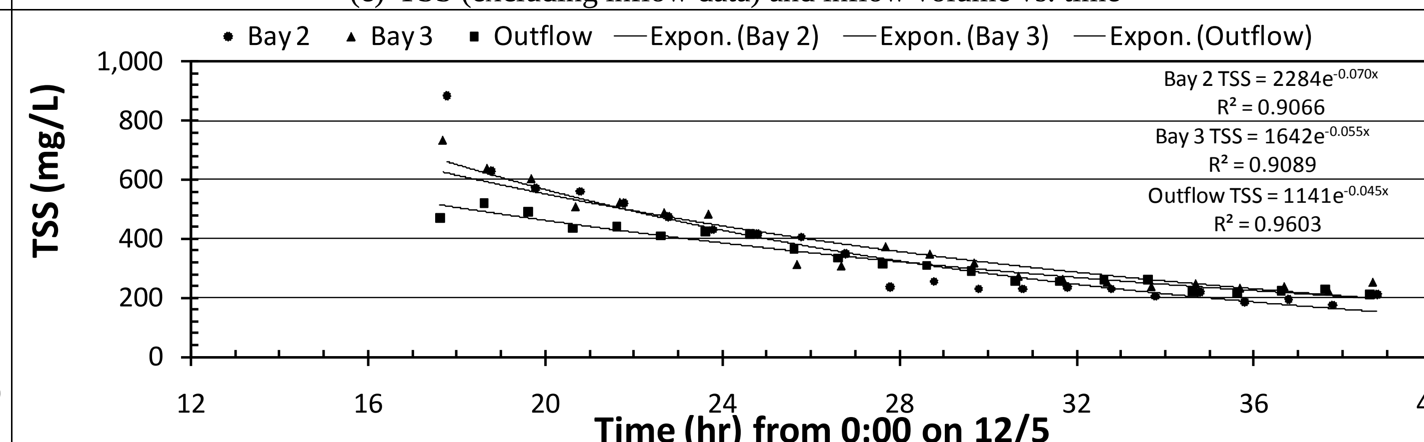
(b) Turbidity (excluding inflow data) and inflow volume vs. time



(e) TSS (excluding inflow data) and inflow volume vs. time

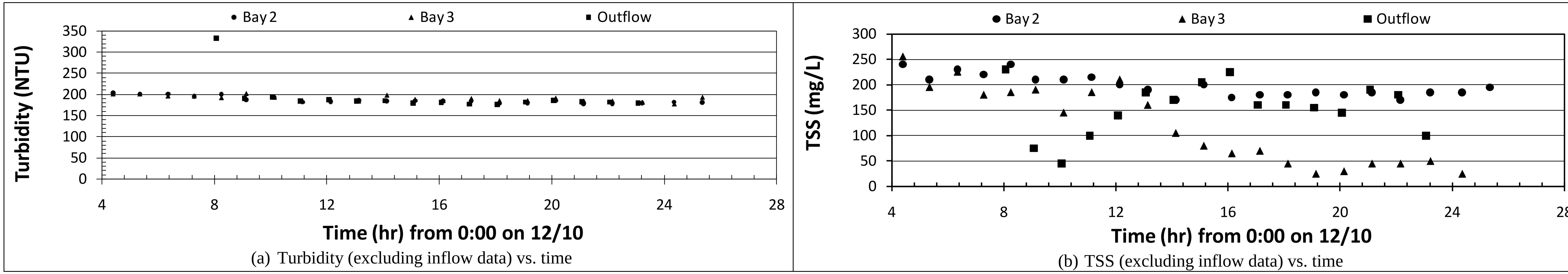


(c) Turbidity reduction fitting curves and equations



(f) TSS reduction fitting curves and equations

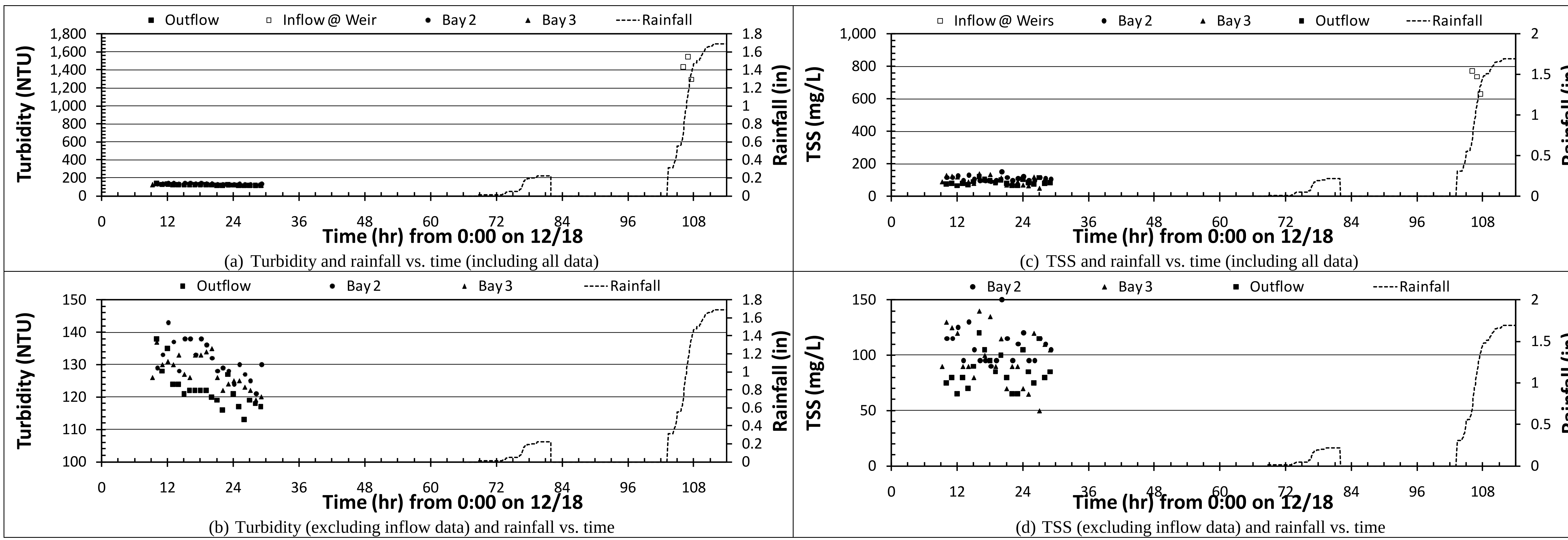
Figure G.2: Sediment basin performance data (i.e., time-series of turbidity and TSS at inflow, in-basin, and outflow) for rain event on 12/5/2011.



(a) Turbidity (excluding inflow data) vs. time

(b) TSS (excluding inflow data) vs. time

Figure G.3: Sediment basin performance data (i.e., time-series of turbidity and TSS at inflow, in-basin, and outflow) after rain event on 12/5/2011.



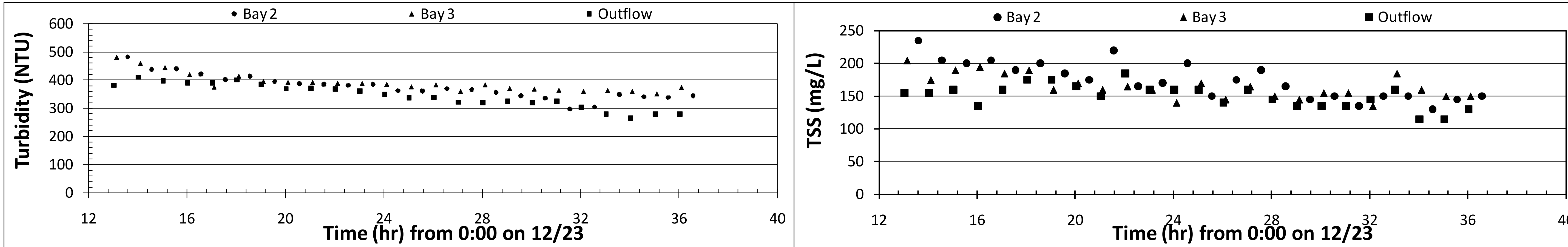
(a) Turbidity and rainfall vs. time (including all data)

(c) TSS and rainfall vs. time (including all data)

(b) Turbidity (excluding inflow data) and rainfall vs. time

(d) TSS (excluding inflow data) and rainfall vs. time

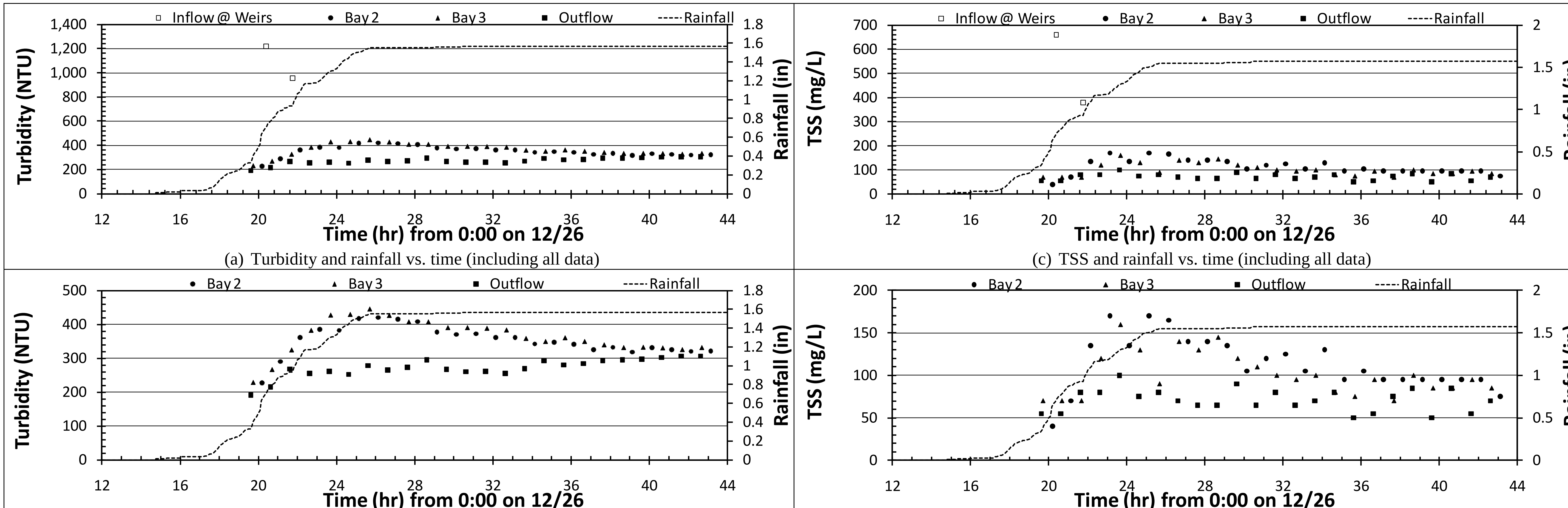
Figure G.4: Sediment basin performance data (i.e., time-series of turbidity and TSS at inflow, in-basin, and outflow) after rain event on 12/15/2011.



(a) Turbidity (excluding inflow data) vs. time

(b) TSS (excluding inflow data) vs. time

Figure G.5: Sediment basin performance data (i.e., time-series of turbidity and TSS at inflow, in-basin, and outflow) after rain event on 12/22/2011.



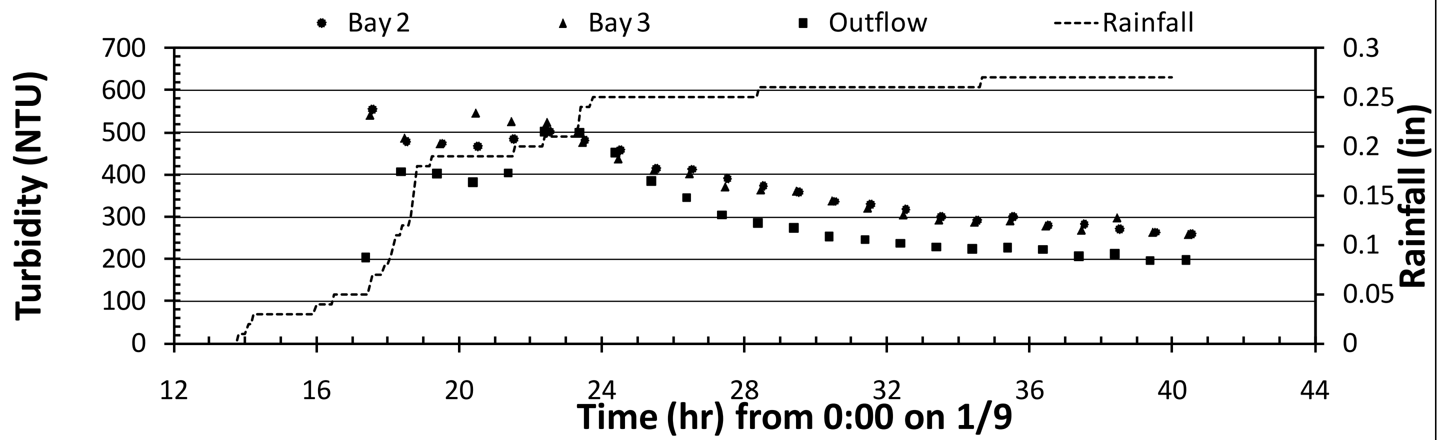
(a) Turbidity and rainfall vs. time (including all data)

(c) TSS and rainfall vs. time (including all data)

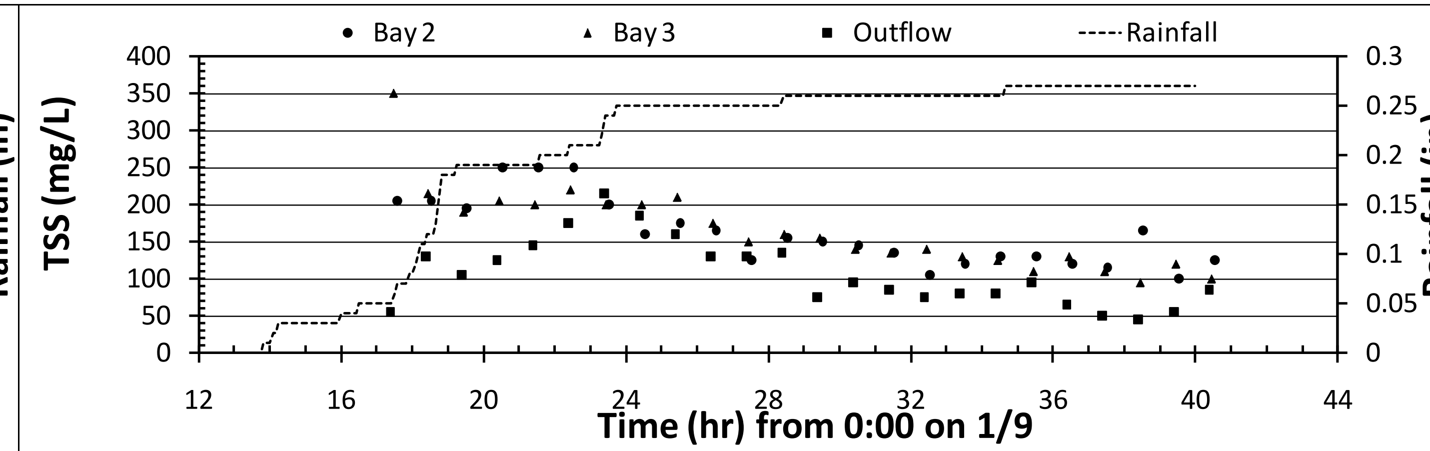
(b) Turbidity (excluding inflow data) and rainfall vs. time

(d) TSS (excluding inflow data) and rainfall vs. time

Figure G.6: Sediment basin performance data (i.e., time-series of turbidity and TSS at inflow, in-basin, and outflow) for rain event on 12/26/2011.

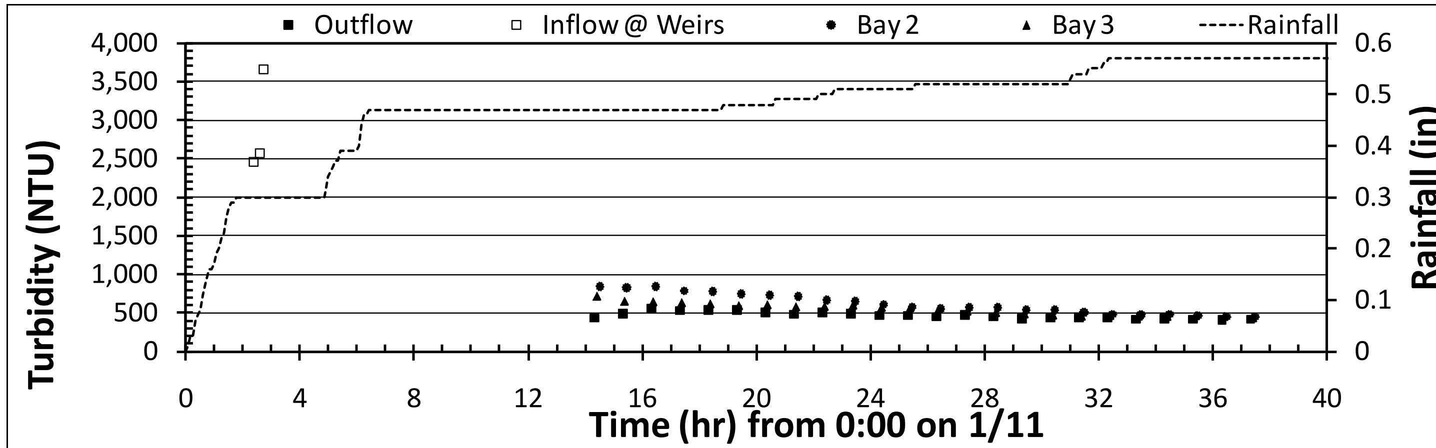


(a) Turbidity (excluding inflow data) and rainfall vs. time

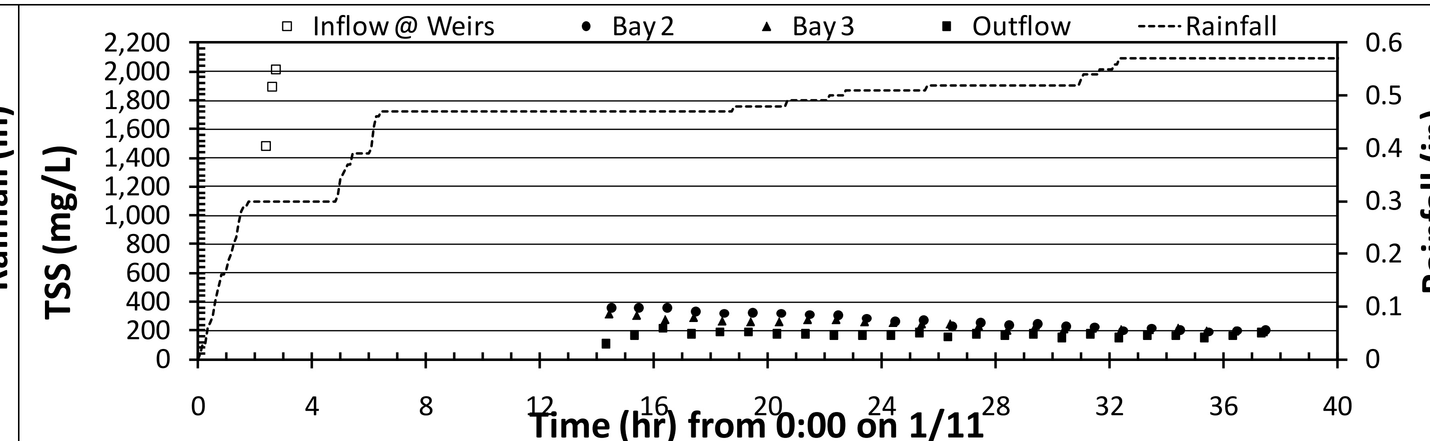


(b) TSS (excluding inflow data) and rainfall vs. time

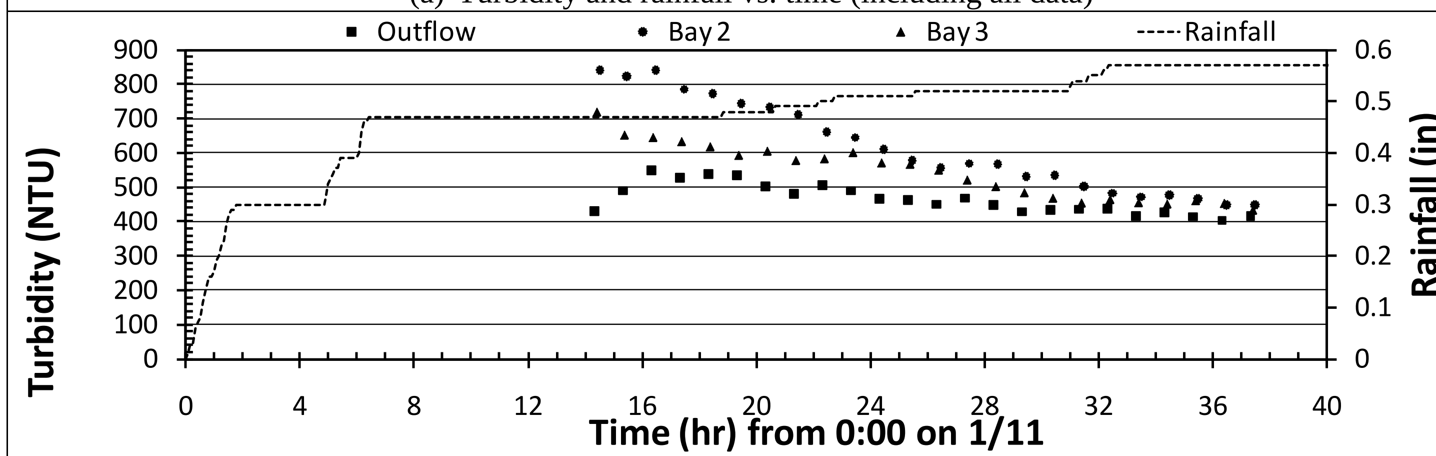
Figure G.7: Sediment basin performance data (i.e., time-series of turbidity and TSS at inflow, in-basin, and outflow) for rain event on 1/9/2012.



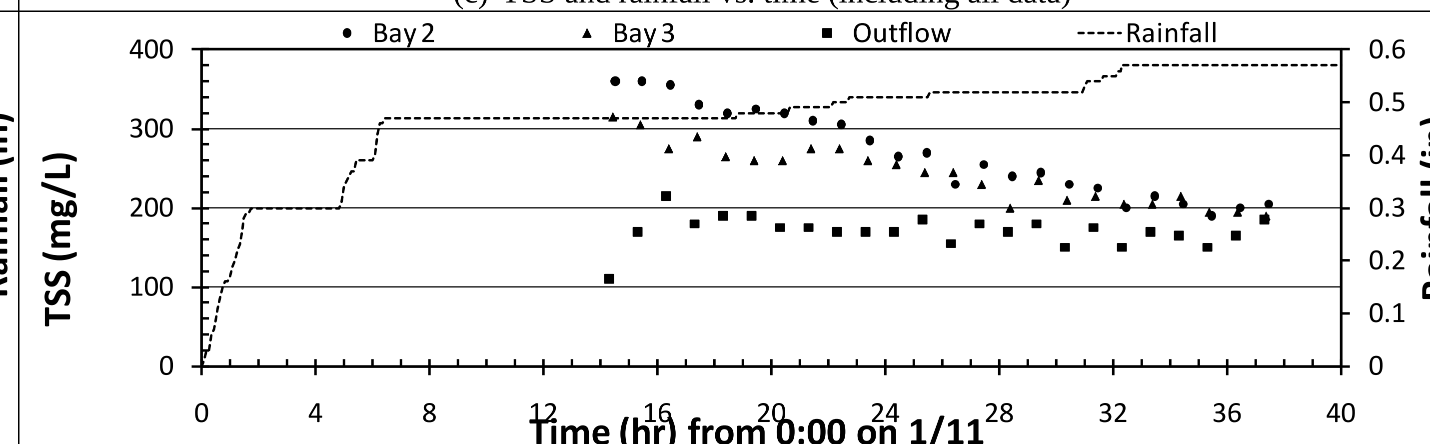
(a) Turbidity and rainfall vs. time (including all data)



(c) TSS and rainfall vs. time (including all data)

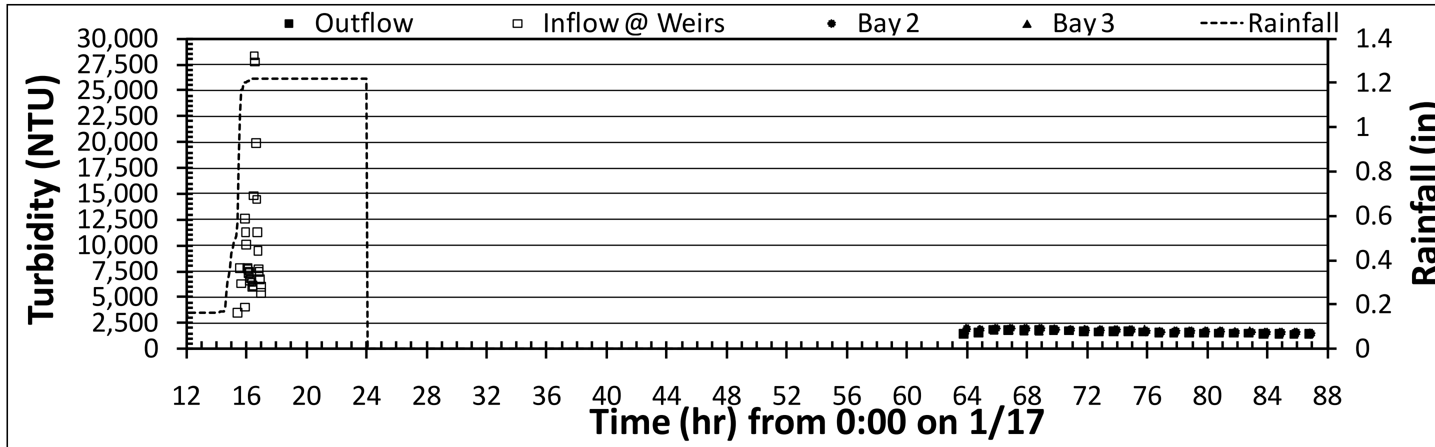


(b) Turbidity (excluding inflow data) and rainfall vs. time

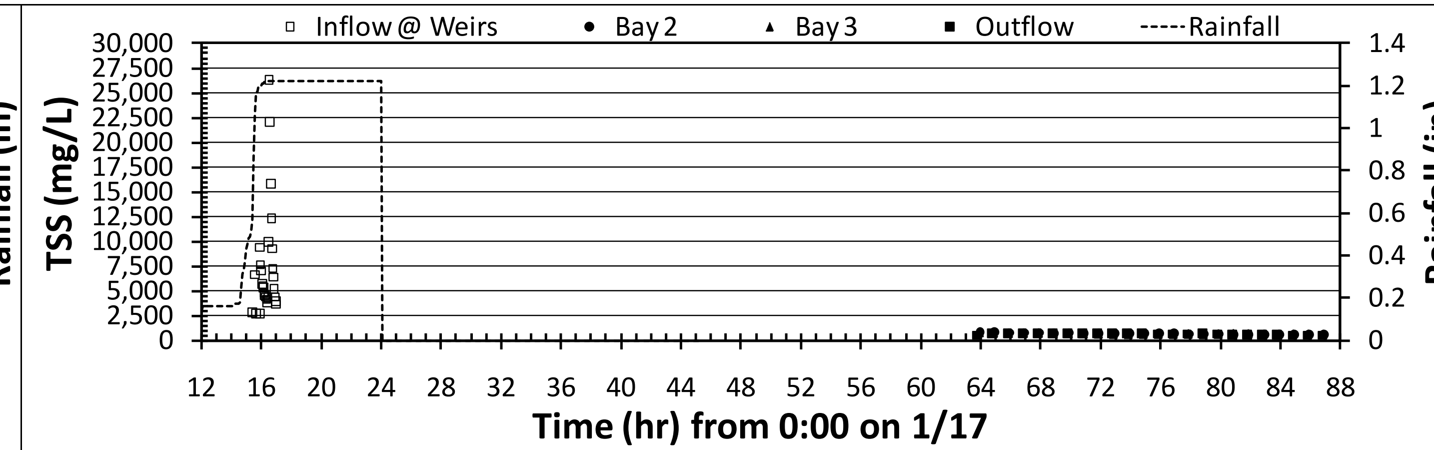


(d) TSS (excluding inflow data) and rainfall vs. time

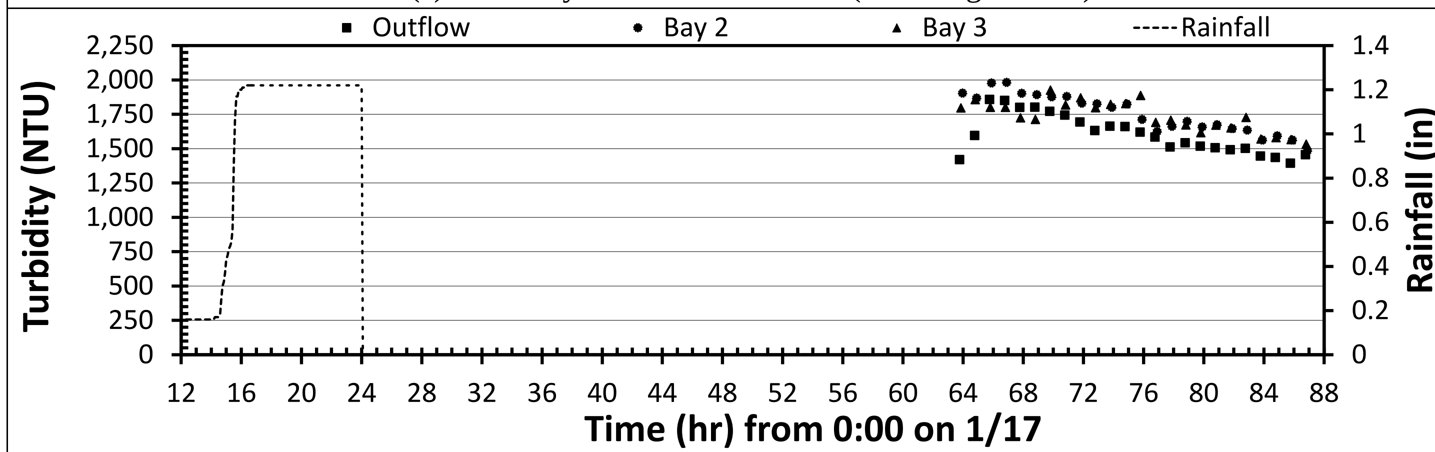
Figure G.8: Sediment basin performance data (i.e., time-series of turbidity and TSS at inflow, in-basin, and outflow) for rain event on 1/11/2012.



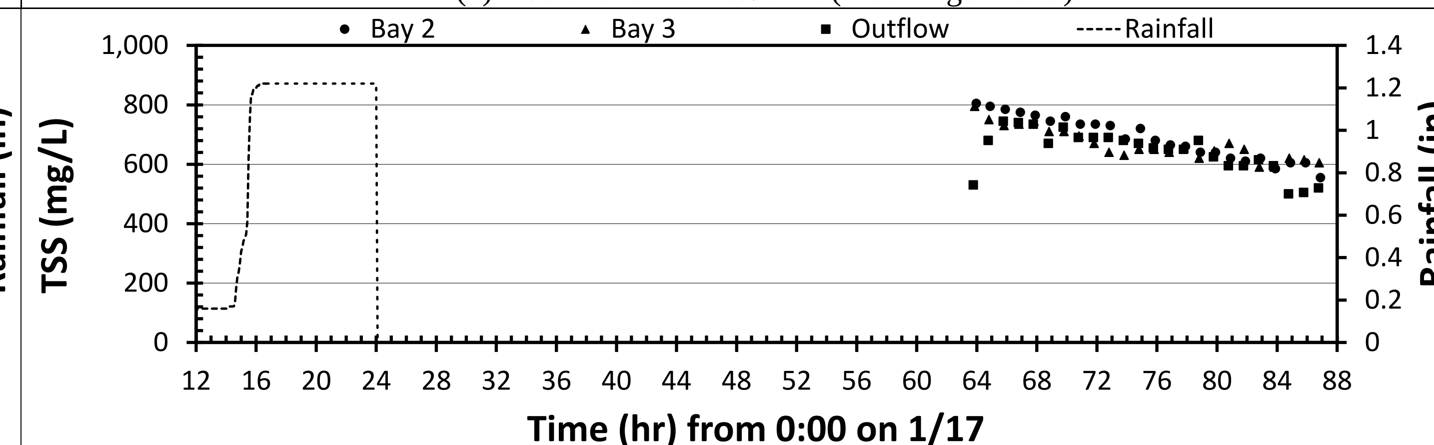
(a) Turbidity and rainfall vs. time (including all data)



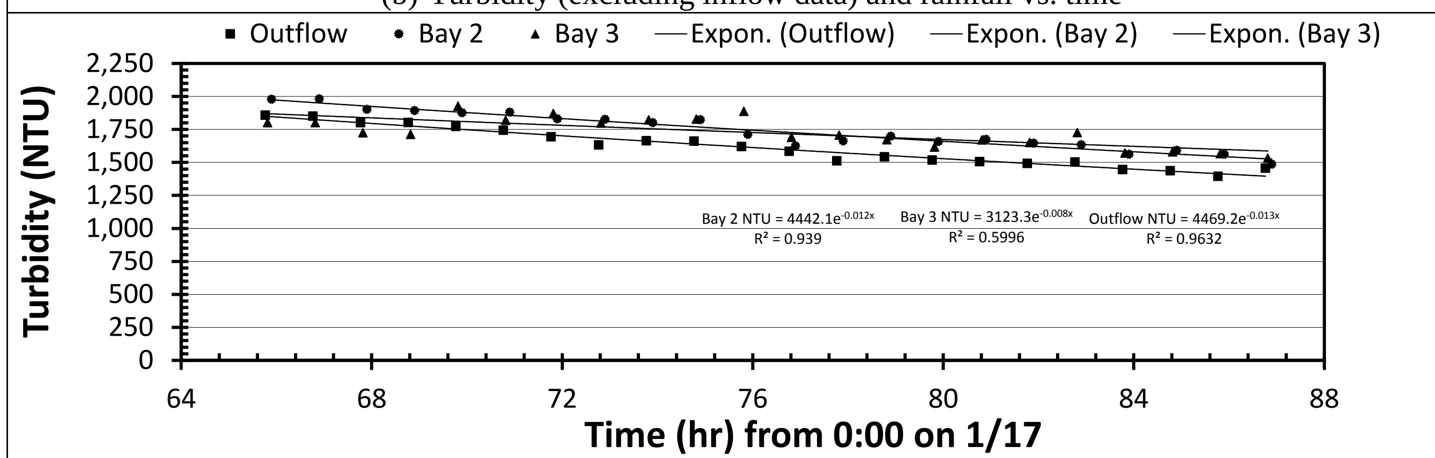
(d) TSS and rainfall vs. time (including all data)



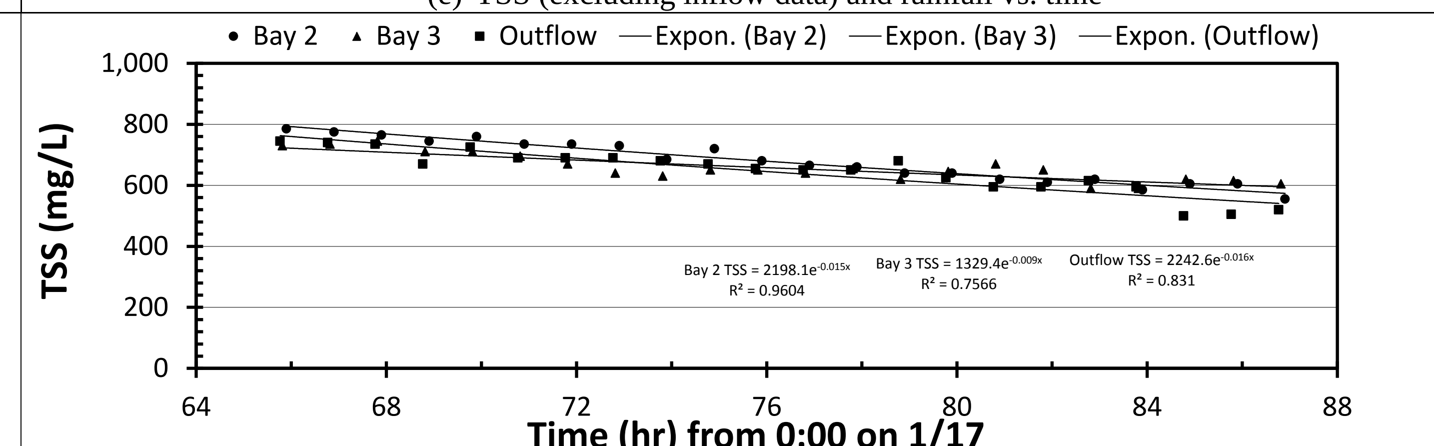
(b) Turbidity (excluding inflow data) and rainfall vs. time



(e) TSS (excluding inflow data) and rainfall vs. time

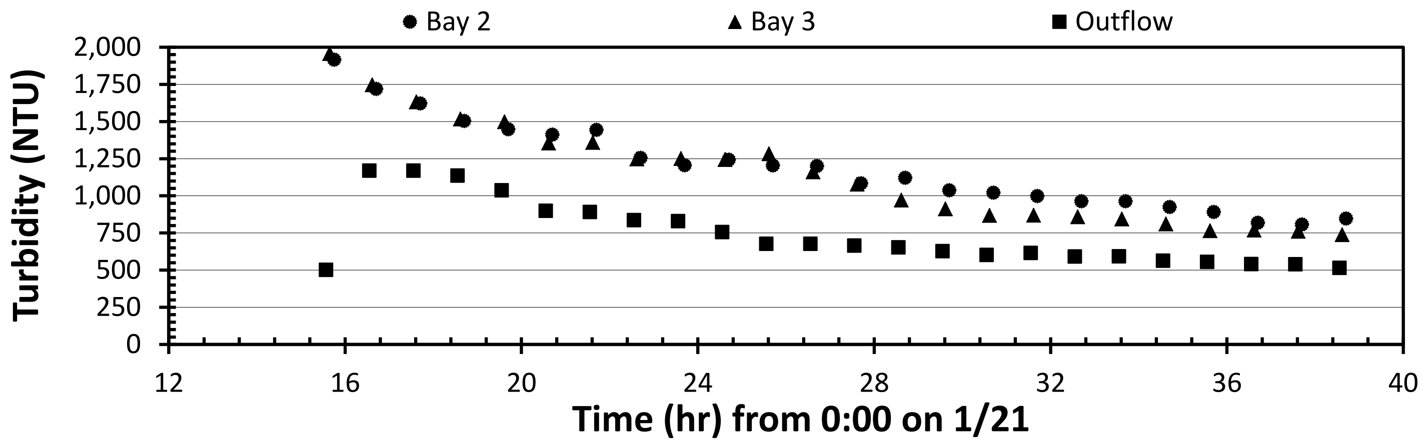


(c) Turbidity reduction fitting curves and equations

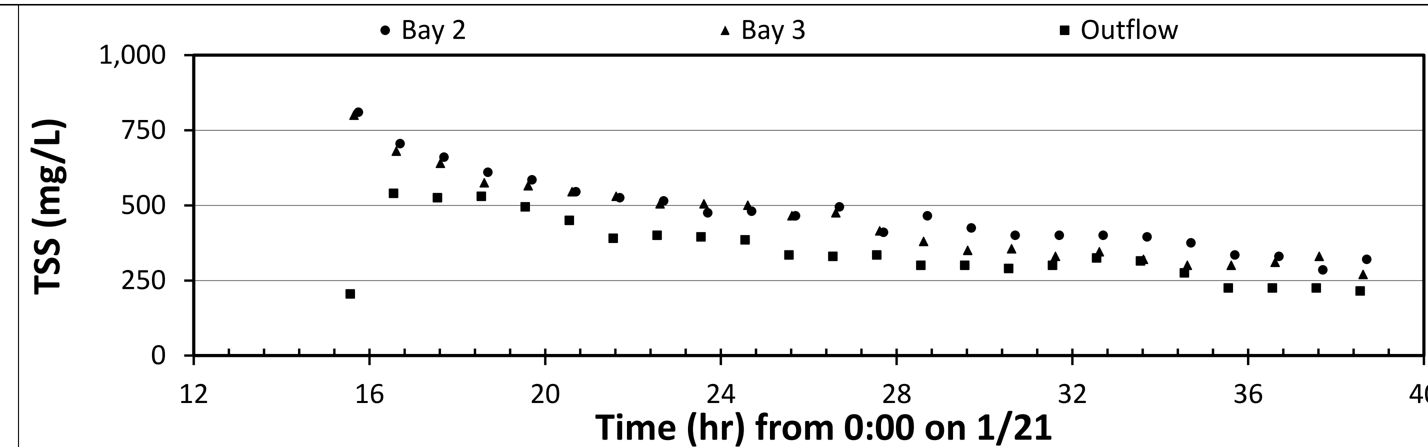


(f) TSS reduction fitting curves and equations

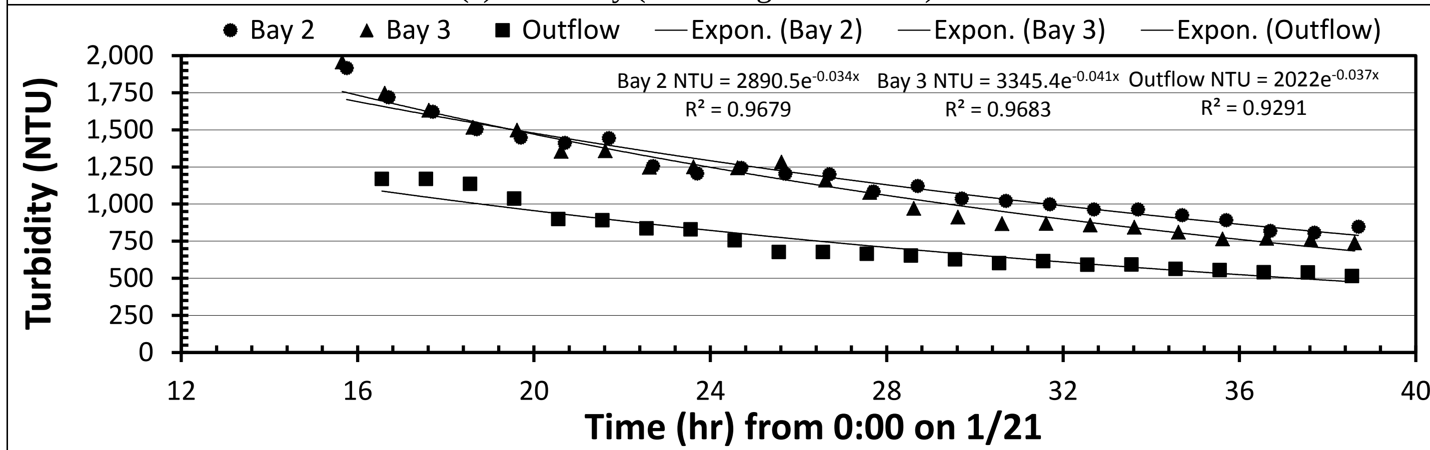
Figure G.9: Sediment basin performance data (i.e., time-series of turbidity and TSS at inflow, in-basin, and outflow) for rain event on 1/17/2012.



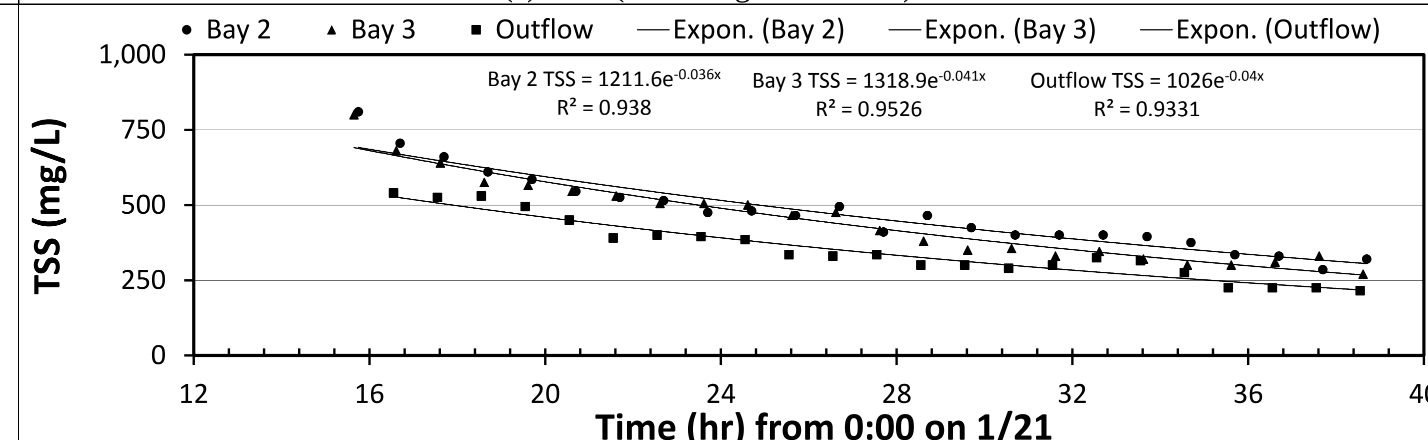
(a) Turbidity (excluding inflow data) vs. time



(c) TSS (excluding inflow data) vs. time

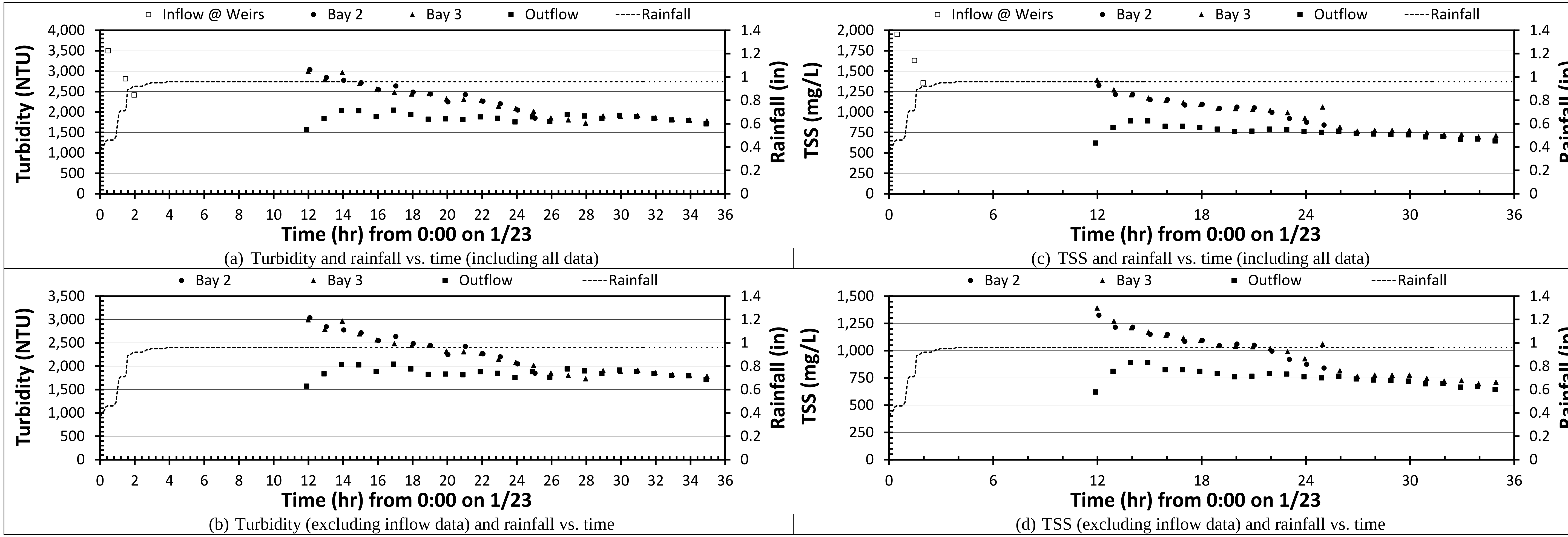


(b) Turbidity reduction fitting curves and equations



(d) TSS reduction fitting curves and equations

Figure G.10: Sediment basin performance data (i.e., time-series of turbidity and TSS at inflow, in-basin, and outflow) for rain event on 1/21/2012.



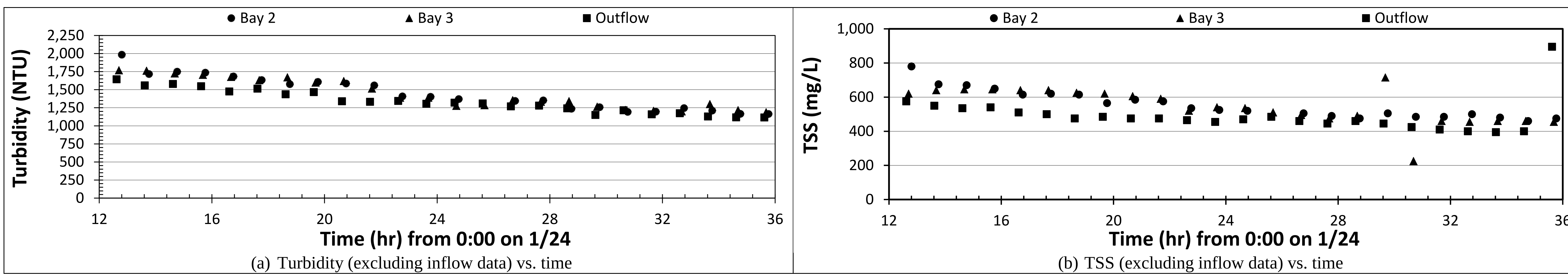
(a) Turbidity and rainfall vs. time (including all data)

(c) TSS and rainfall vs. time (including all data)

(b) Turbidity (excluding inflow data) and rainfall vs. time

(d) TSS (excluding inflow data) and rainfall vs. time

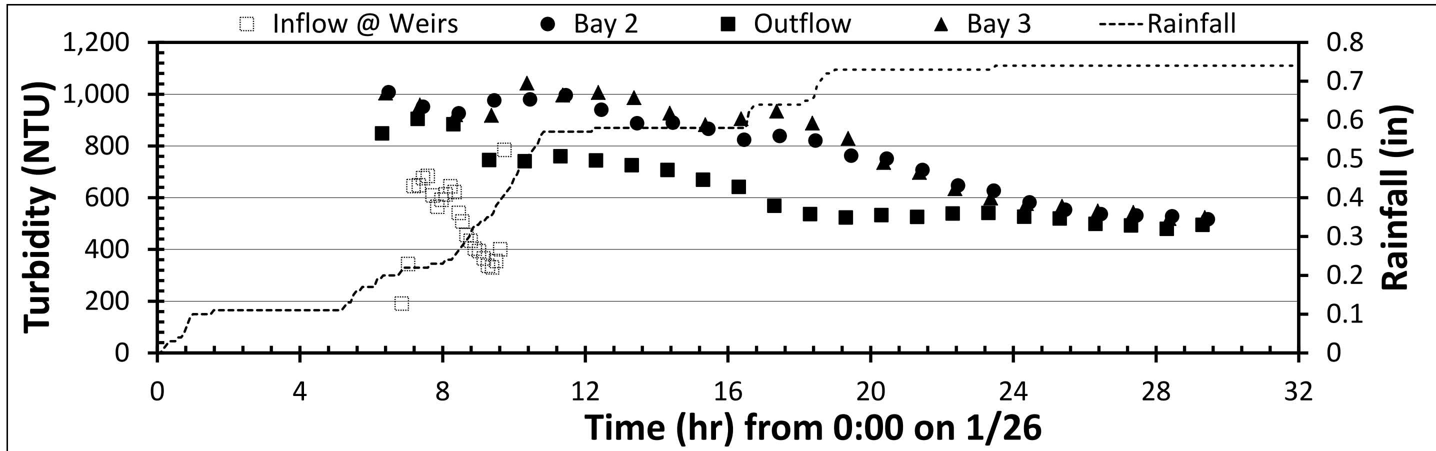
Figure G-11: Sediment basin performance data (i.e., time-series of turbidity and TSS at inflow, in-basin, and outflow) for rain event on 1/23/2012.



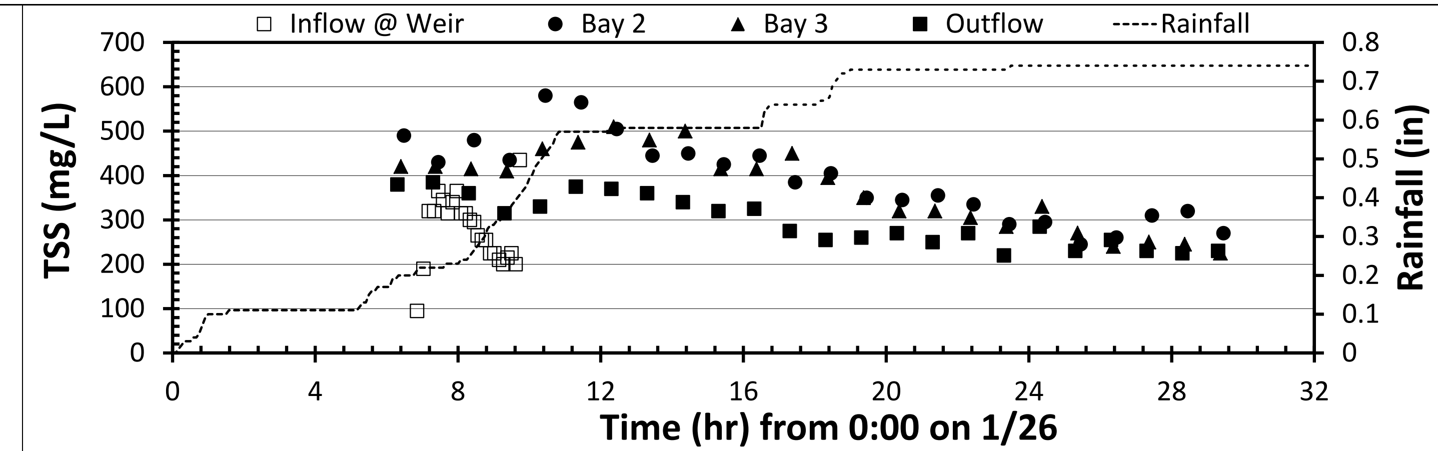
(a) Turbidity (excluding inflow data) vs. time

(b) TSS (excluding inflow data) vs. time

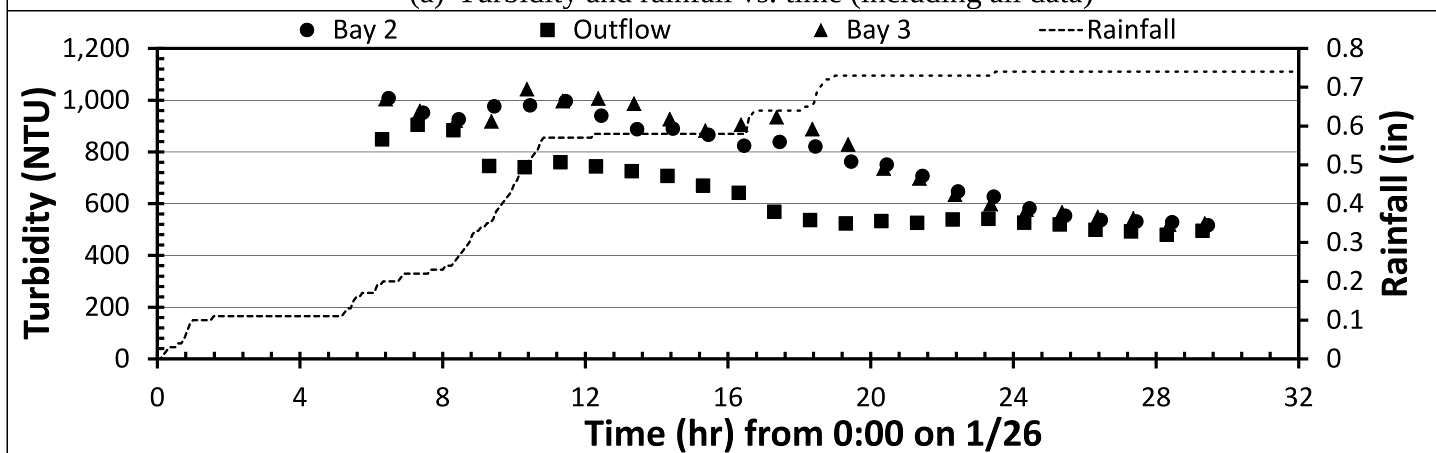
Figure G.12: Sediment basin performance data (i.e., time-series of turbidity and TSS at inflow, in-basin, and outflow) after rain event on 1/23/2012.



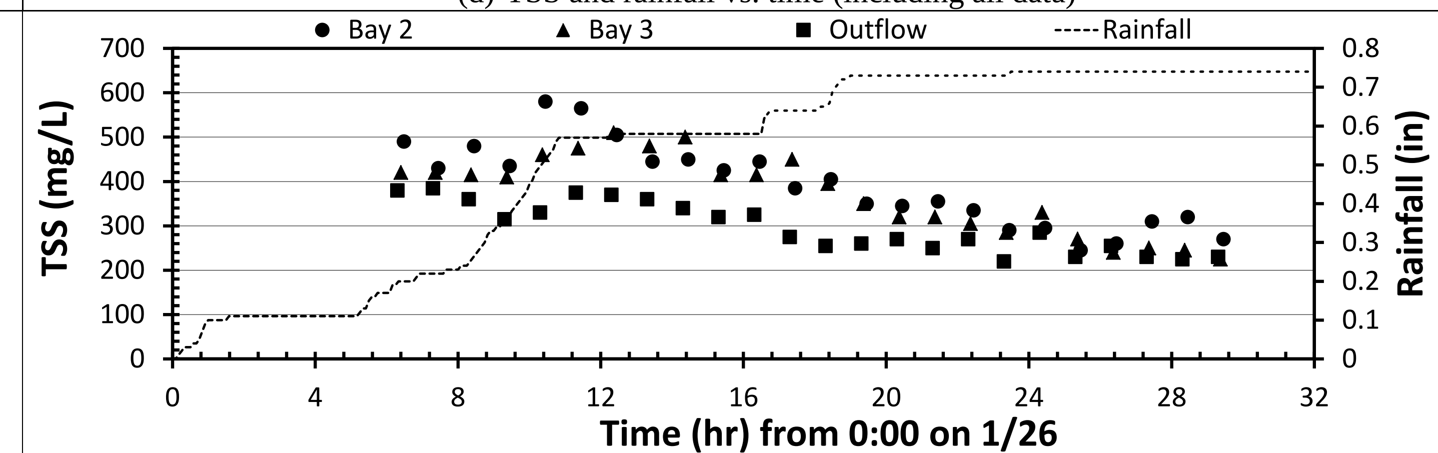
(a) Turbidity and rainfall vs. time (including all data)



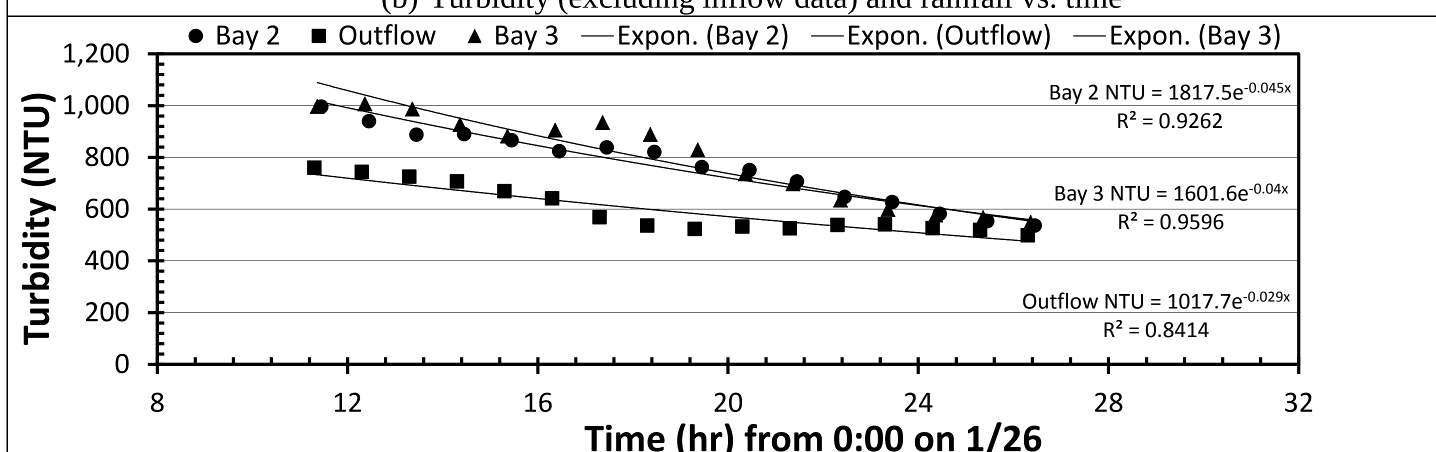
(d) TSS and rainfall vs. time (including all data)



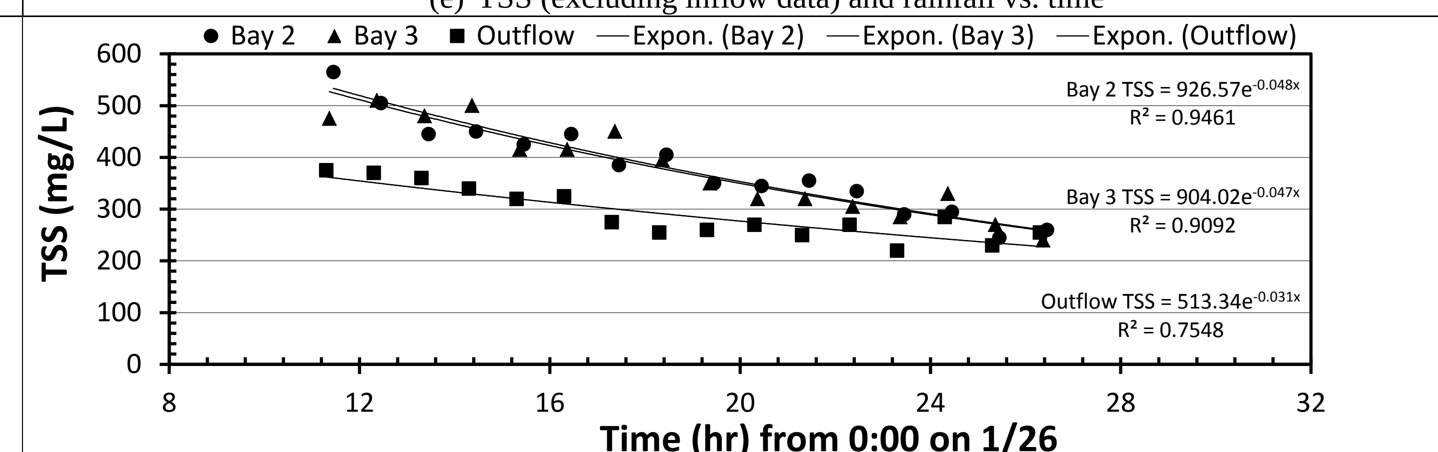
(b) Turbidity (excluding inflow data) and rainfall vs. time



(e) TSS (excluding inflow data) and rainfall vs. time

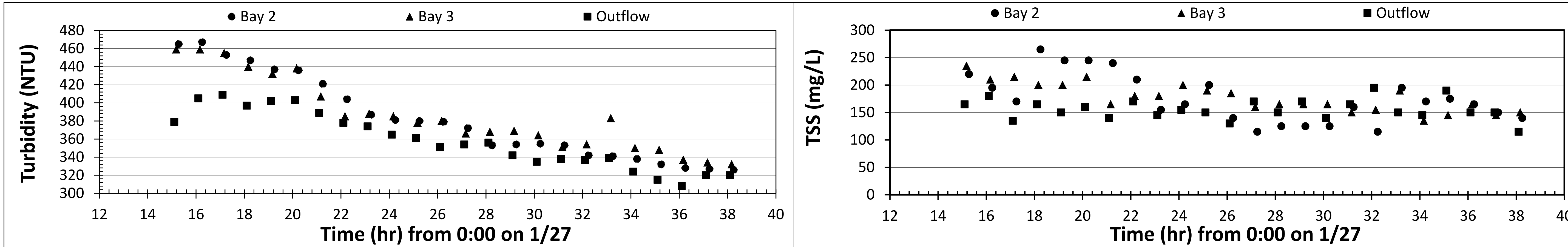


(c) Turbidity reduction fitting curves and equations



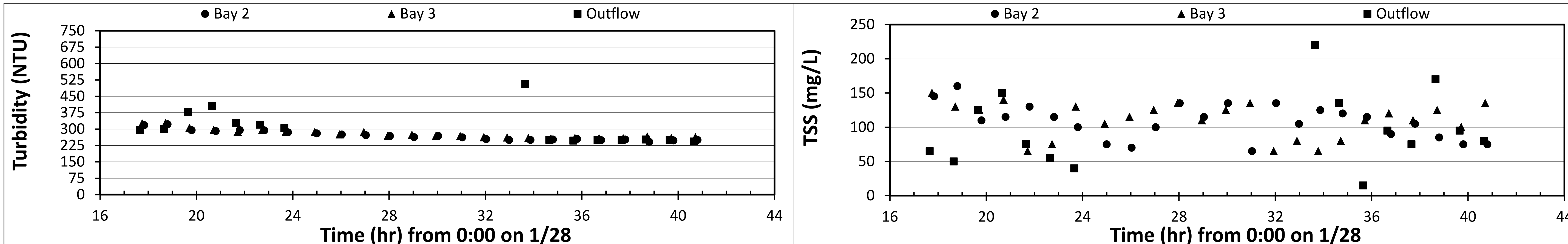
(f) TSS reduction fitting curves and equations

Figure G.13: Sediment basin performance data (i.e., time-series of turbidity and TSS at inflow, in-basin, and outflow) for rain event on 1/26/2012.



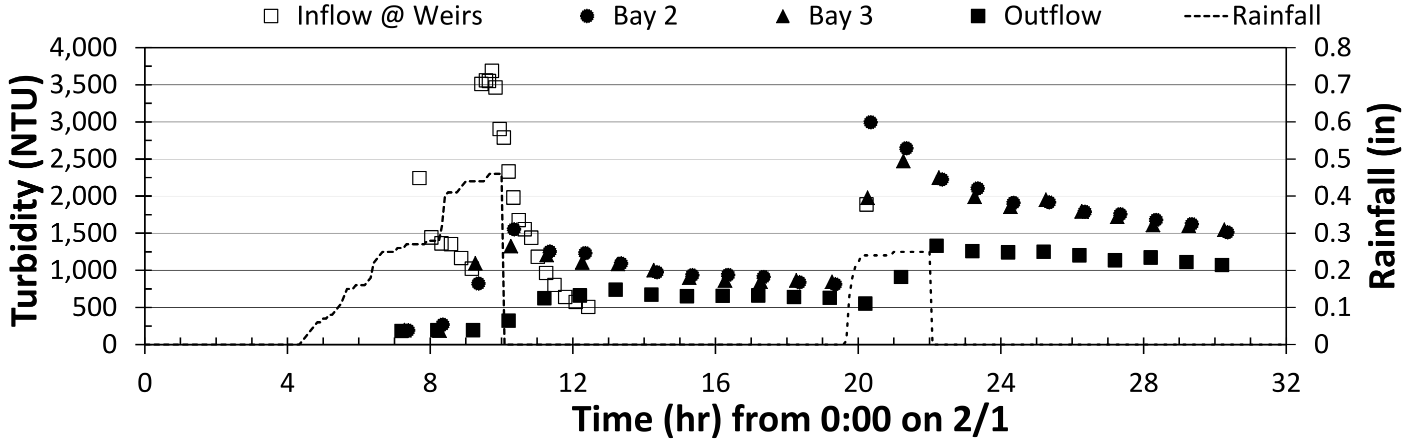
(a) Turbidity (excluding inflow data) vs. time (b) TSS (excluding inflow data) vs. time

Figure G.14: Sediment basin performance data (i.e., time-series of turbidity and TSS at inflow, in-basin, and outflow) after rain event on 1/26/2012.

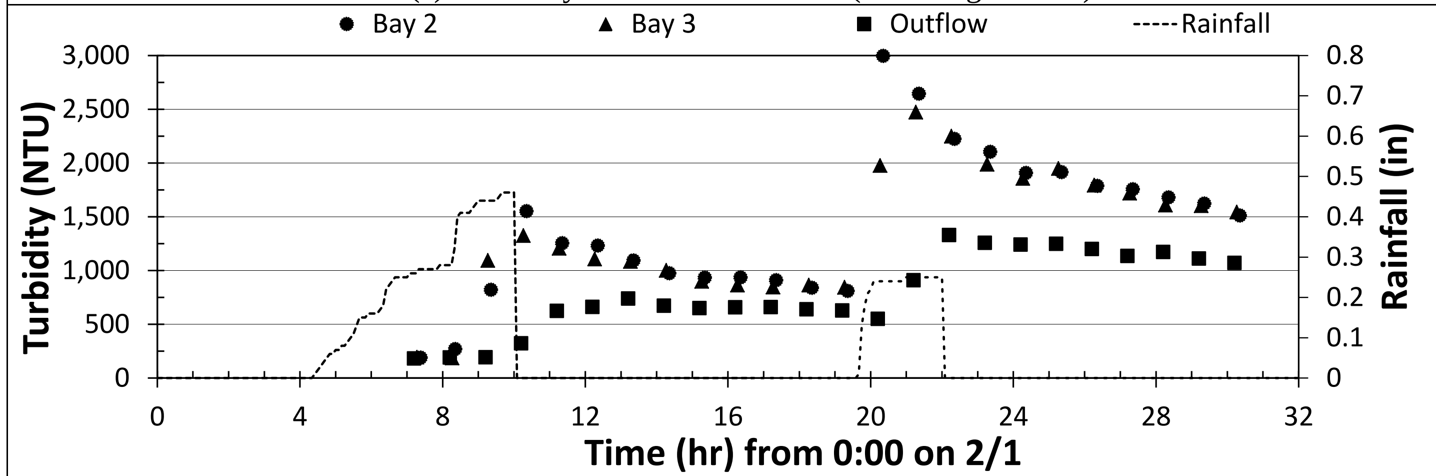


(a) Turbidity (excluding inflow data) vs. time (b) TSS (excluding inflow data) vs. time

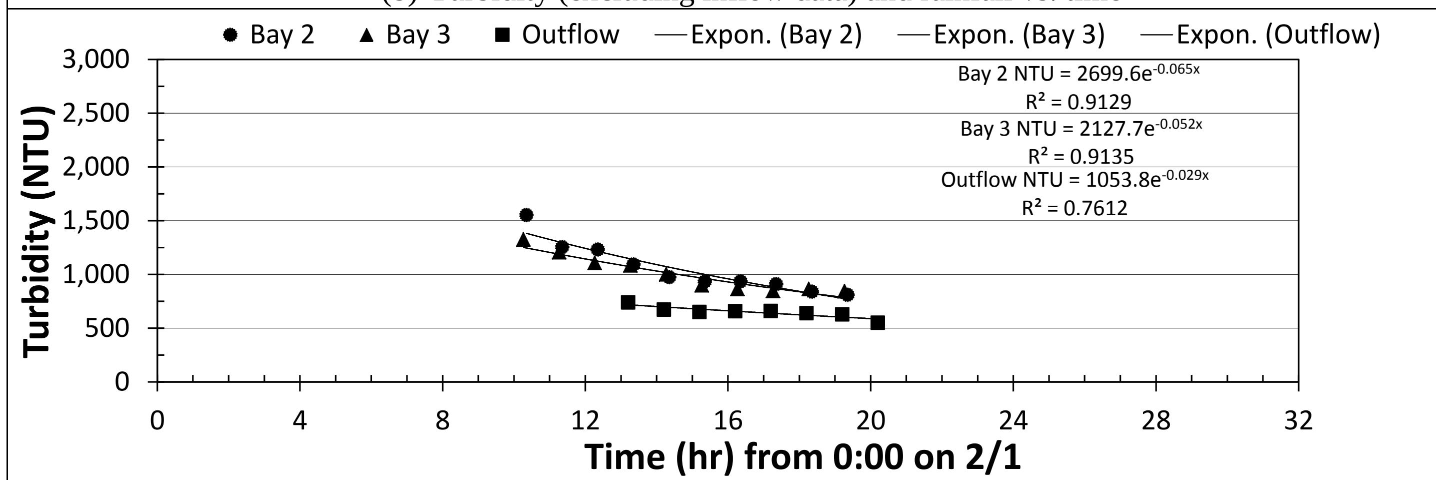
Figure G.15: Sediment basin performance data (i.e., time-series of turbidity and TSS at inflow, in-basin, and outflow) after rain event on 1/26/2012.



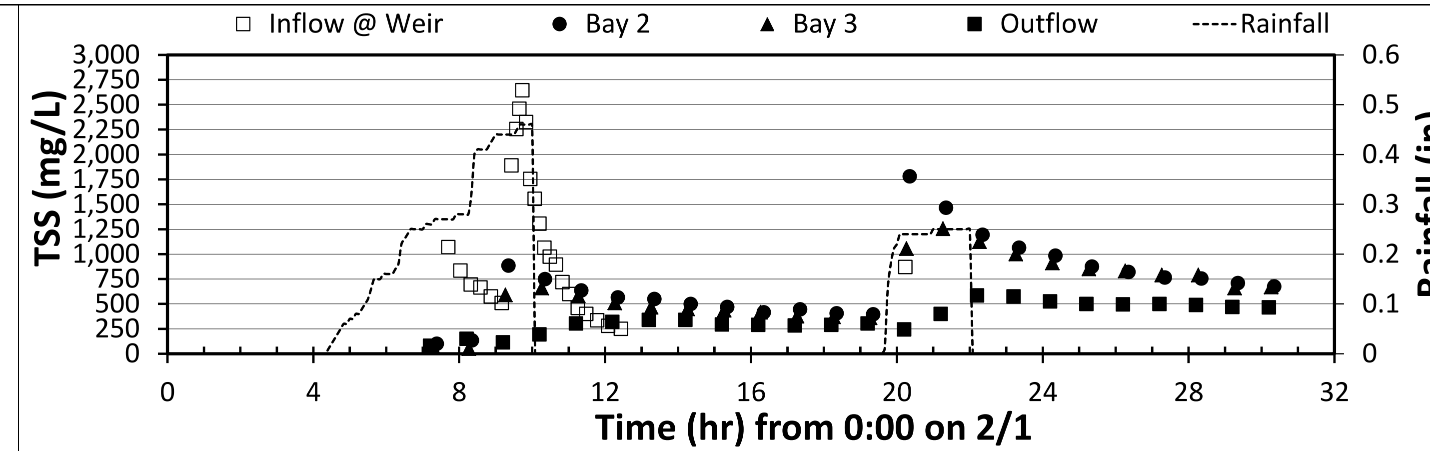
(a) Turbidity and rainfall vs. time (including all data)



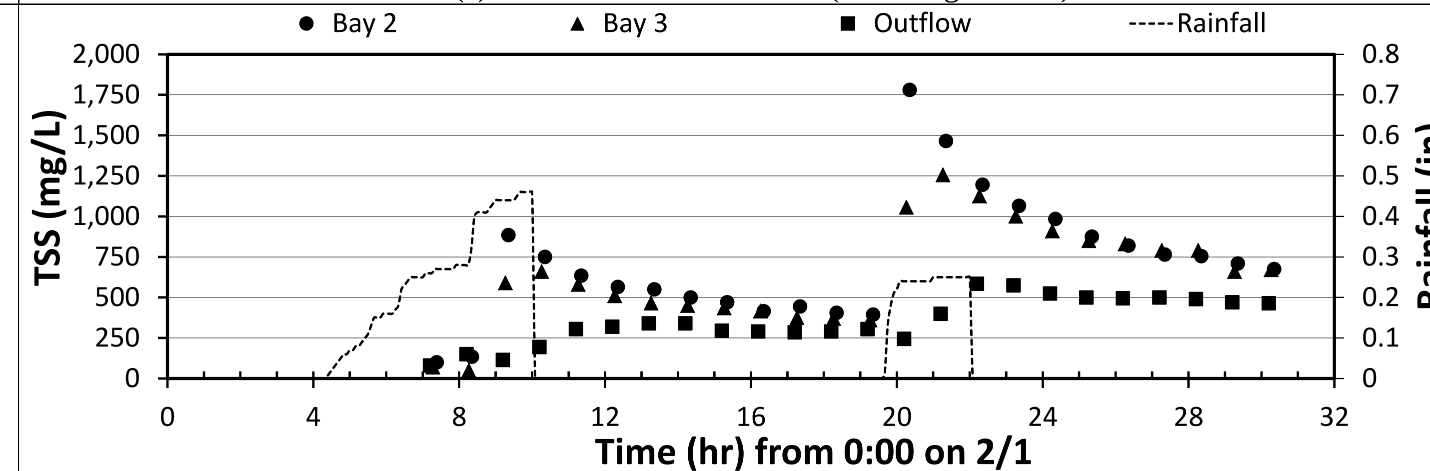
(b) Turbidity (excluding inflow data) and rainfall vs. time



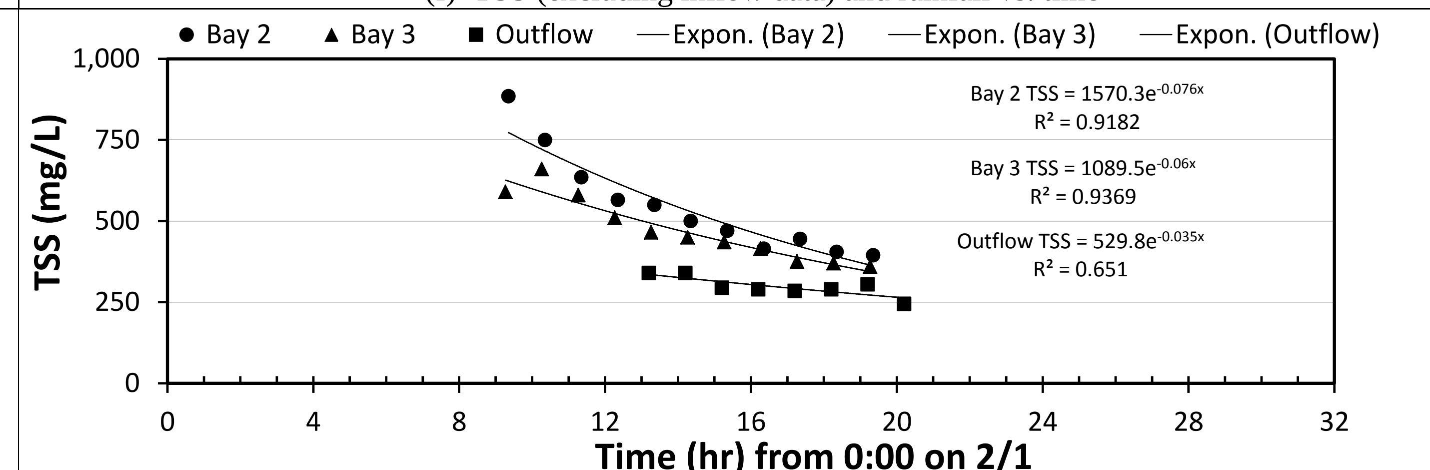
(c) Turbidity reduction fitting curves and equations



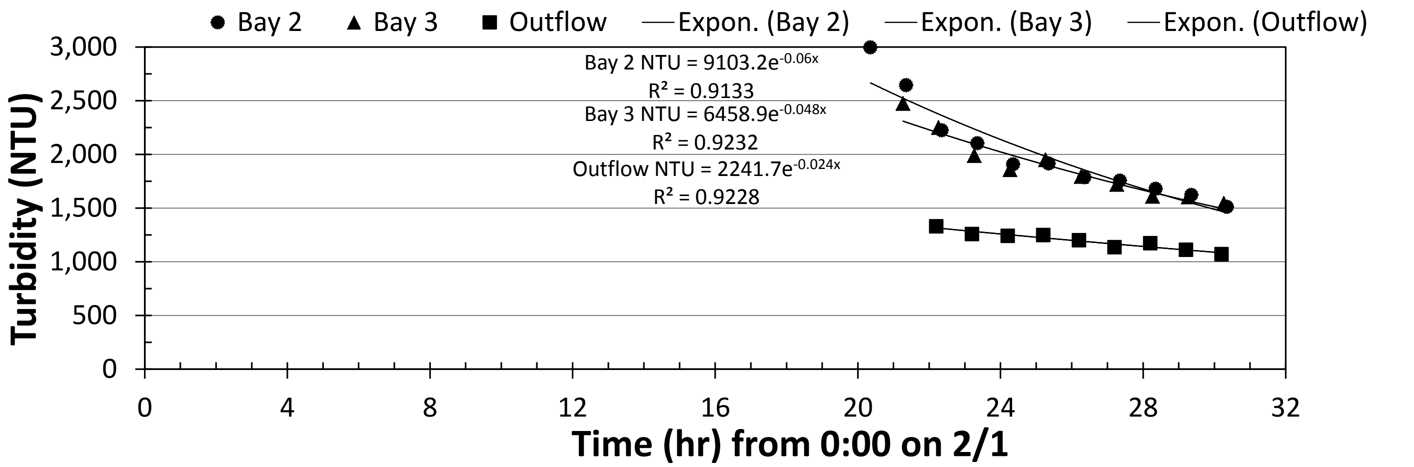
(e) TSS and rainfall vs. time (including all data)



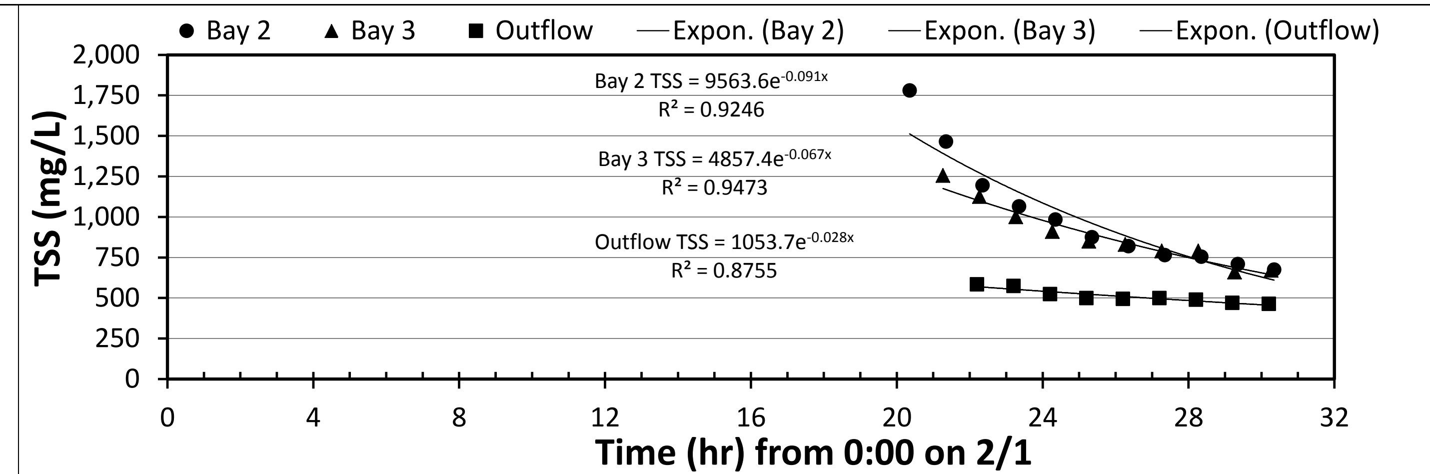
(f) TSS (excluding inflow data) and rainfall vs. time



(g) TSS reduction fitting curves and equations

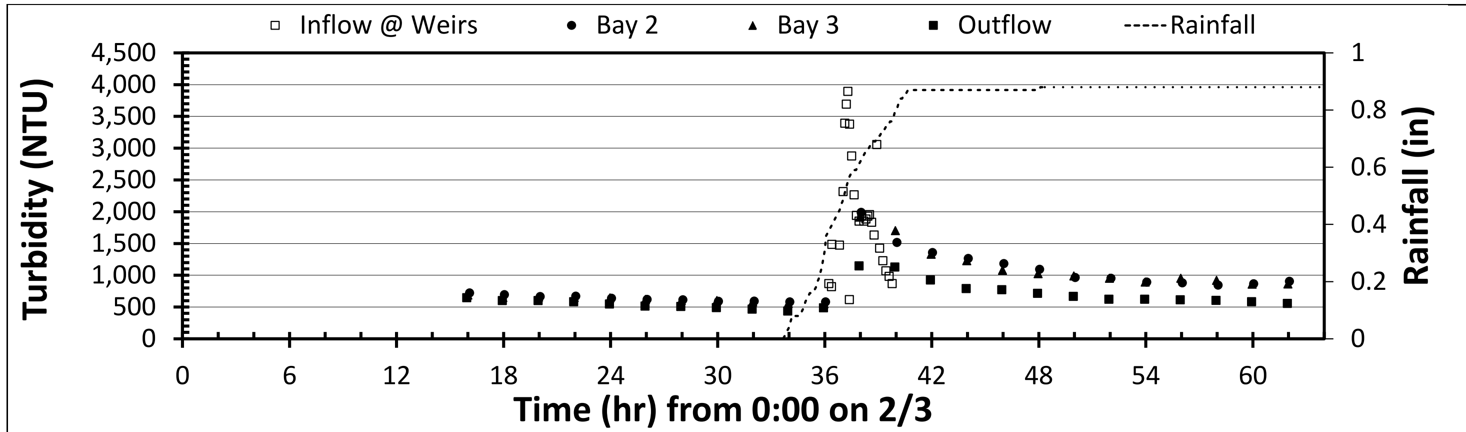


(d) Turbidity reduction fitting curves and equations

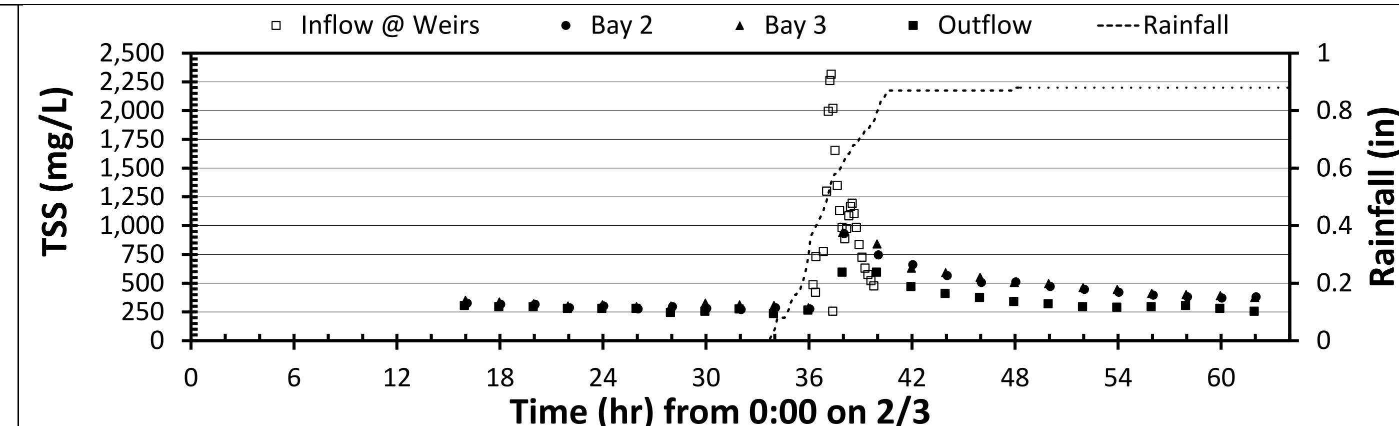


(h) TSS reduction fitting curves and equations

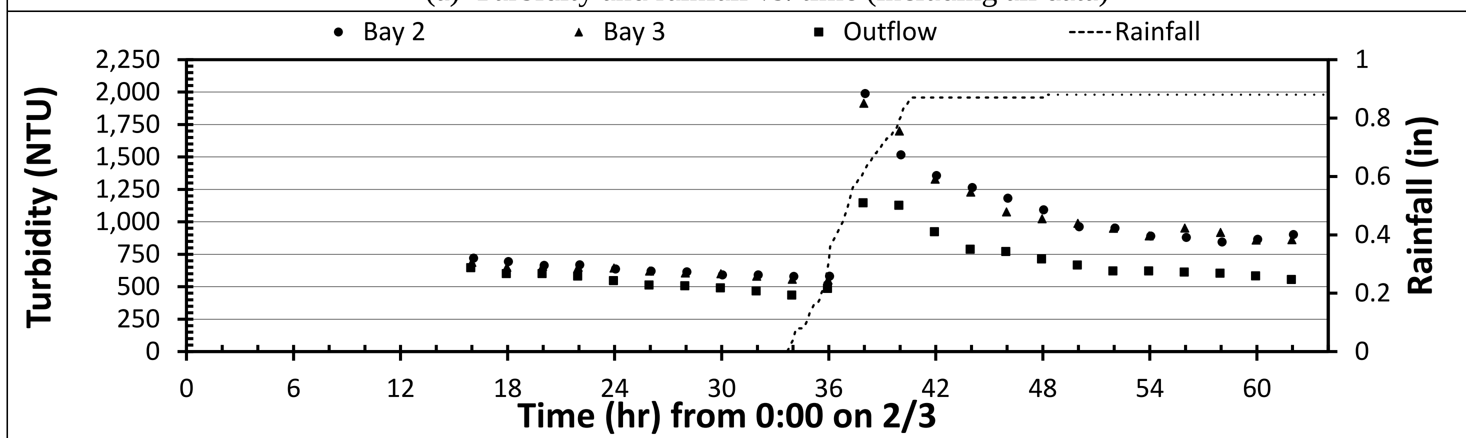
Figure G.16: Sediment basin performance data (i.e., time-series of turbidity and TSS at inflow, in-basin, and outflow) for rain event on 2/1/2012.



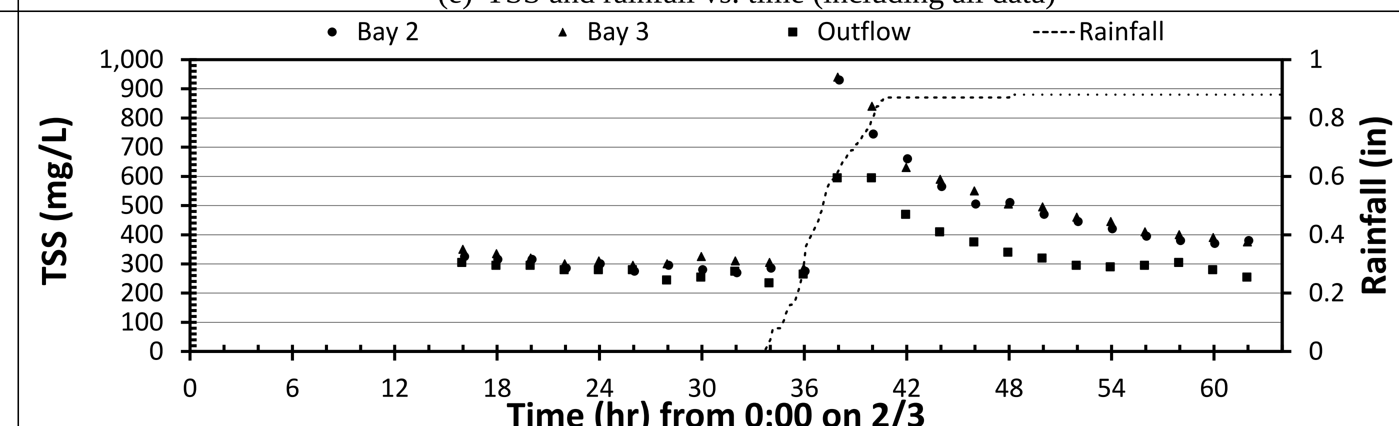
(a) Turbidity and rainfall vs. time (including all data)



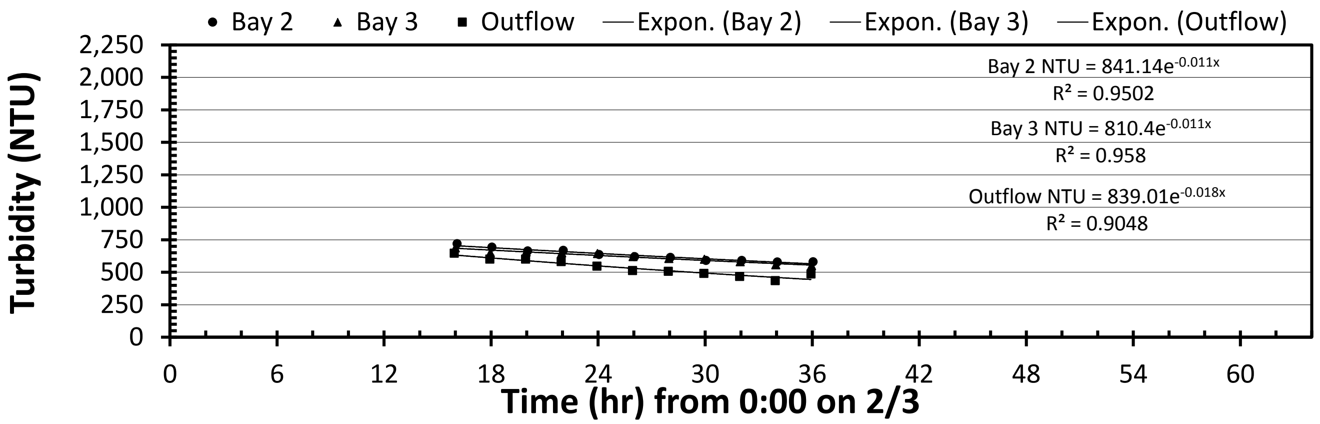
(e) TSS and rainfall vs. time (including all data)



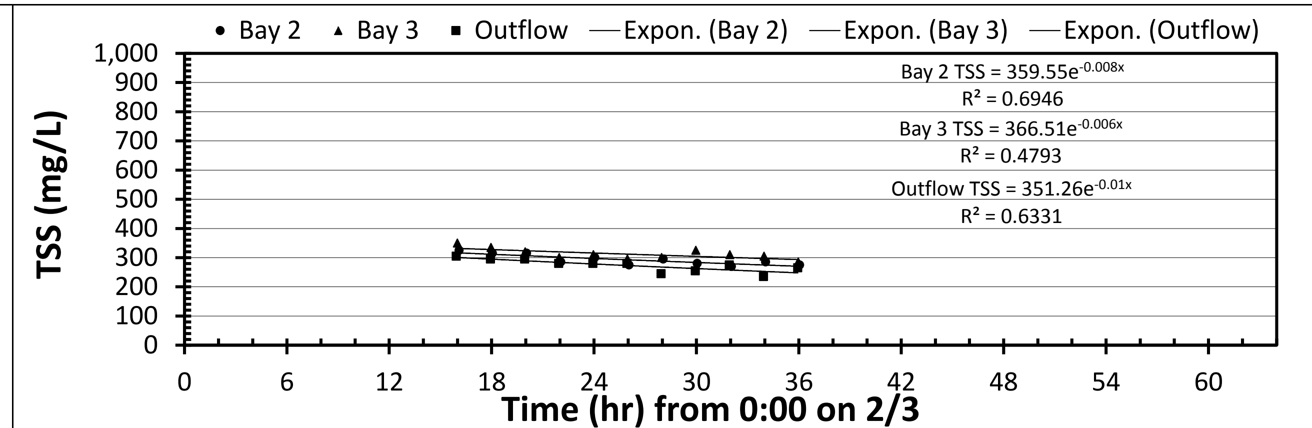
(b) Turbidity (excluding inflow data) and rainfall vs. time



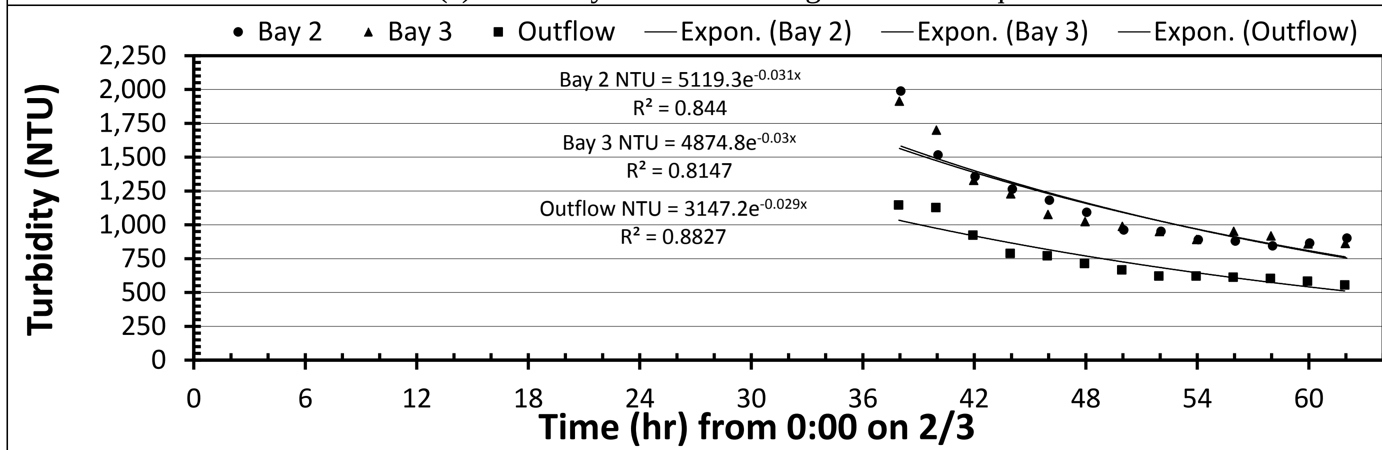
(f) TSS (excluding inflow data) and rainfall vs. time



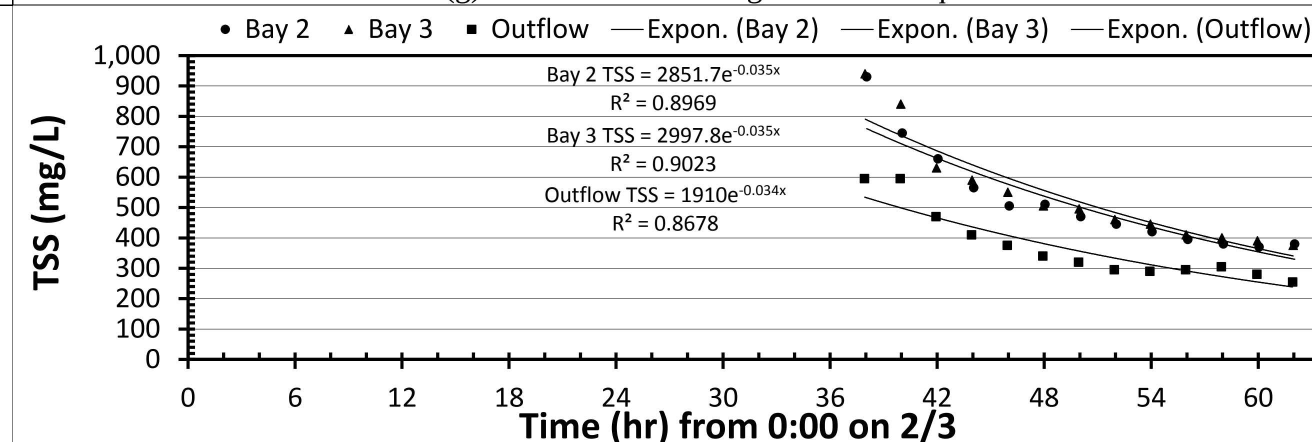
(c) Turbidity reduction fitting curves and equations



(g) TSS reduction fitting curves and equations



(d) Turbidity reduction fitting curves and equations



(h) TSS reduction fitting curves and equations

Figure G.17: Sediment basin performance data (i.e., time-series of turbidity and TSS at inflow, in-basin, and outflow) for rain event on 2/3/2012.

APPENDIX H: APS FLOC LOG RECOMMENDATION

Alabama Samples

(Silt Stop and Floc Log applications)

Sample	Location (108)	Description	APS Application	Results and Special Instructions
	1-30-12 Analysis done by NAO	**Soil Type / Sample**	**Floc Log Type**	**Reaction Time / NTU Reading**
	Sunshine Supplies	**W.S Newell, Franklin County**		
	1409 Republic Rd.			
	Birmingham, AL 35214	pH: 6.67	**Floc Log Type**	
	PHONE: 205-674-5656	NTUi: 62,700	706B	40 - 45 seconds / NTUf 15.4
	FAX: 205-674-7441	Hardness : 125 - 250 ppm CaCO3	**Soil Stabilization**	
			712	dry or spray application
	Devon Harper			
	dharper@sunshinesupplies.com			
	Chris Logan			
	logancp@auburn.edu			

Note: The Polymer Enhanced Best Management Practices Application Guide contains step by step instructions for using Silt Stop Products in soil stabilization and for using Floc Logs in water clarification. The guide can be found at www.siltstop.com.

Floc Logs are designed to work in flowing water conditions. Mixing / reaction times will be very important when using the Floc Log listed above. Mixing must be continuous for the time stated to obtain the best results. A mixing ditch, pipe, or flume system may be used with either a pump or gravity flow to meet this requirement. **We recommend positioning the Floc Logs close to the source of disturbance. For a reaction time of 40 - 45 seconds, the dosage rate should be 50 - 60 GPM flow / each Floc Log placed in a series or in a row. Particulate formed may be captured by filtering through or across a series of jute matting after the mixing and reaction has been completed.** (Please see page 42 of the PEBMP for more on Particle Collection.)

Stabilization of the soil at the source may be obtained by spreading the site-specific Silt Stop powder onto the soil surface (can be mixed with other additives such as seed, fertilizer, etc.), then covering the soil with open-weave jute, coconut matting, mulch, or straw. This will perform as a stabilizer for reducing soil and clay movement into the runoff water, as a tackifier to hold the soil/organic matrix in place, as well as providing surface area for attachment of flocculated sediment. For detailed application rates and instructions, please see the Soil Stabilization section beginning on page 5 of the PEBMP.

Areas where high water velocity may occur (ditch lines, swales, etc.) should be "soft armored" by placing "jute" matting flush to the ground surface then spreading the dry 712 powder over the jute. This will greatly reduce erosion in these areas. Please refer to pages 5 - 10 of the PEBMP.

We suggest using both methods to assure best stormwater quality discharges.

Applied Polymer Systems, Inc.
519 Industrial Drive
Woodstock, GA 30189
www.siltstop.com