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Effectiveness of environmental regulations: Monitoring by the regulated community under clean water act industrial stormwater runoff requirements

Kelly L. Gleaton
University of South Florida

Effectiveness of Environmental Regulations:

Monitoring by the Regulated Community under Clean Water Act Industrial Stormwater Runoff Requirements

by

Kelly L. Gleaton

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Major Professor: L. Donald Duke, Ph.D.
Michael Miller, Ph.D.
Rick Oches, Ph.D.

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EFFECTIVENESS OF ENVIRONMENTAL REGULATIONS MONITORING BY THE REGULATED COMMUNITY UNDER CLEAN WATER ACT INDUSTRIAL STORMWATER RUNOFF REQUIRMENTS

Kelly L. Gleaton

ABSTRACT

This research identified and evaluated possible uses of environmental monitoring data collected and reported by industrial facilities under the Clean Water Act requirements and determined whether the current regulatory system supported any of those uses. Federal policies and state-level policies in the United States, Florida, and California were evaluated in order to determine whether the current regulatory system supported any of the identified uses. Monitoring programs and currently available monitoring data were evaluated from Hillsborough County, Florida, and Los Angeles County, California, from the perspective of 1) the current implementation of the monitoring program, and 2) perfect implementation under full compliance with the monitoring program.

Four possible uses for monitoring data were identified by this research: (1) identification of high polluting facilities within a given jurisdiction, (2) assessment of pollutant load to receiving waterbodies, (3) documentation of improvement over time in the amount of pollutants discharged from a given industrial facility, (4) self-evaluation purposes, such as identifying on-site pollutant sources, adapting pollution prevention efforts, and evaluating the monitoring protocol. The research conducted a telephone survey and evaluated industrial facilities' reported analytical monitoring data. Telephone

questionnaires were administered to 63 industrial facilities, and analytical monitoring data were obtained from industrial facilities in Hillsborough County, Florida and Los Angeles County California.

The representativeness, sampling frequency and variation in the industrial facilities' analytical monitoring data do not assist in the identification of high polluting facilities within a given jurisdiction nor provide for documentation of facilities' improvements. Pollutant loads to receiving watebodies can not be assessed through the use of industrial facilities' analytical monitoring data because of the sample measurement, variation, and sample frequency of the data. Therefore, these uses can not be supported under current implementation/current data submitted or under perfect compliance. However, the telephone survey revealed facility operators are attempting to use the results from monitoring for self evaluation purposes.

1.0 INTRODUCTION

Storm runoff has been identified as a leading contributor of impairments to waterbodies of the U.S. Storm runoff conveys pollutants originating from urban activities such as transportation, industry, and lawn fertilization during rain events into local waterbodies. The pollutants carried into the waterbodies can have harmful effects on water resources and aquatic ecosystems. Runoff from urban areas is identified as the leading source of impairments to lakes and estuaries (U.S. EPA 1992b).

Since the 1980s, industrial runoff has been included in the Clean Water Act (CWA) policies for water quality protection and is recognized as a contributor to pollutants in urban runoff (NURP 1982). Stormwater regulations are implemented through the National Pollutant Discharge Elimination System (NPDES). The NPDES includes two different permits in order to regulate stormwater runoff: the Environmental Protection Agency Multi Sector General Permit (U.S. EPA MSGP) and the Municipal Separate Storm Sewer System (MS4) permit. The MSGP and the MS4 were created to work in conjunction with one another.

Every industrial facility is required to be in compliance with the stormwater U.S. EPA MSGP. First-stage compliance under the U.S. EPA MSGP requires industrial facilities to recognize their duty to comply by filing a notice of intent (NOI) with the regulatory agency. The U.S. EPA MSGP approach is implemented through NPDES to regulate the pollutants in facility storm discharges. However, the U.S. EPA MSGP does

not effectively achieve a high level of compliance, specifically first-stage compliance (Duke et al, 1999a).

Certain aspects of federal and state regulations allow prioritization in certain ways. One of the requirements of the operators of the MS4 is to identify and regulate facilities which are considered to be “high risk” for generating stormwater pollutants (FLS0000006, 2002). Research is beginning to show that grouping by industry type fails to segregate high-polluting facilities from others, and many facilities continue to be unregulated (Griffin, 2005). Agencies can effectively use their resources by focusing the on the high-polluting facilities contributing the highest amounts of pollutants.

Majore issues facing the stormwater permit approach are (1) the definition of industrial facilities, (2) the usefulness of monitoring data and (3) agency compliance strategies. The definition of industrial facilities the United States Environmental Protection Agency (U.S. EPA) has used in order to implement the two NPDES permits incorporates many facilities that are not subject to stormwater regulations. The definition is based on the facilities Standard Identification Code (SIC). The SIC can make it difficult for agencies to accurately identify which facilities are contributing to stormwater pollution. Facilities must report under one primary SIC code which, in theory should represent their major profit generating activity. However, facilities may perform other activities on-site that contribute pollutants to stormwater.

The second issue facing the stormwater permit approach is the usefulness of industrial facility’s monitoring data. The SIC of an industrial facility will determine if the facility is required to submit analytical monitoring data to the regulatory agency. However, many facilities are only required to analyze for one parameter. In addition,

there are several sources for which variability could occur when monitoring such as: the use of grab samples, untrained sampling personal and limited selection of monitored parameters (Stenstrom, 2005).

The third issue facing the stormwater permit approach is agency compliance strategies. The U.S. EPA has left compliance strategies up to the discretion of the local agencies/operators of the U.S. EPA MSGP and MS4. Agencies and counties or local municipalities take various approaches to achieve compliance with the U.S. EPA MSGP and MS4 permit. For example, the approach used by the Florida Department of Environmental Protection (FDEP) is to set up a sting-type operation in a particular location where the agency knows the facilities are not complying with the U.S. EPA MSGP, even after outreach and education has been conducted by the agency (Kelly, 2006). Another example is the MS4 approach is to start at one end of an agency's jurisdiction and work their way across the area conducting on-site inspections of industrial facilities (Griffin, 2005). However, this approach has proven to be ineffective at reaching a large number of facilities in a years time. Another attempt at the county level has been to use the current Small Quantity Generators list (SQG) to satisfy the MS4 requirements, which includes many facilities not subject to the stormwater regulations (Glicksburg, 2005).

This research will evaluate policies in the U.S., Florida, and California intended to terminate pollution associated with stormwater runoff from industrial facilities. This research will be a means of enhancing the effectiveness of current activities now required to be conducted by industrial facilities in order to comply with NPDES stormwater

permits. The overall objective is to evaluate the possible uses of monitoring data and determine whether the current program is meeting any of those uses.

The first specific objective was to evaluate the extent to which industrial facilities monitoring data collected under the regulations for stormwater discharges associated with industrial activities can support the goals and objectives of those regulations, and to identify ways in which the data do and do not support those goals and objectives. The research evaluated the monitoring programs from two viewpoints: first, whether the goals and objectives of the regulations are supported by the data as currently available, given the current implementation of the monitoring program under the industrial stormwater regulations; and second, whether the goals and objectives of the regulations would be supported if the regulatory requirements were perfectly implemented under full compliance with the regulations as designed and intended.

The second specific objective was to evaluate the extent to which industrial facilities monitoring data can support the needs or goals of related policies and regulations of the United States, such as other Clean Water Act regulations or other policies designed to protect water quality. The monitoring programs were evaluated from the same two viewpoints, assessing the data as currently collected and evaluating the data's potential usefulness under the case of perfect compliance with the monitoring requirements of the regulations.

The third specific objective was to assess the attitudes of the regulated community toward the monitoring requirements and the extent to which they make use of the results of their required monitoring. This objective evaluates one other category of use of the monitoring requirements that has been identified as a potential benefit of the regulations.

2.0 LITERATURE REVIEW

The USEPA defines stormwater discharges as discharges “generated by precipitation and runoff from land, pavements, building rooftops and other impervious surfaces. Storm water runoff accumulates pollutants such as oil and grease, chemicals, nutrients, metals, and bacteria as it travels across land. Heavy precipitation or snowmelt can also cause sewer overflows which, in turn, may lead to contamination of water sources with untreated human and industrial waste, toxic materials, and other debris” (U.S. EPA, 2005).

2.1 Stormwater Pollutants

During the 1960s, people were becoming concerned and began to raise awareness of stormwater issues as they realized their local waterbodies were beginning to become polluted (NURP, 1982). Stormwater conveys a variety of pollutants through stormwater runoff from various activities conducted outside. The pollutants conveyed by stormwater runoff can have a detrimental effect on receiving waterbodies. Prior to the 1960s, most reports and articles gave little consideration to the level of improvement attainable for stormwater or the need to improve the quality of the receiving waterbodies. Since stormwater controls for water quality had been implemented in only a few places throughout the nation, there was not enough information known about stormwater runoff.

The NPDES permit program was created in 1972 under the CWA to control water pollution by regulating point sources that discharge pollutants into waters of the United States. Point sources are defined as discrete conveyances such as pipes or man-made

ditches. Industrial, municipal, and other facilities must obtain permit coverage if their discharges go directly into surface waters of the U.S. (U.S. EPA, 2005). When the CWA was enacted, stormwater was not originally considered to be a point source. Not until the reauthorization of the CWA 1987 did stormwater become defined as a point source.

The lack of knowledge regarding the impacts of stormwater led to the development of the Nationwide Urban Runoff Program (NURP) (NURP, 1982). The overall goal of NURP was to provide information to local decision makers, states, the U.S. EPA, and other interested parties in order to determine if urban runoff was causing water quality problems. NURP also provided a basis for postulating realistic control options and the development of water quality management plans that were consistent with local needs and that would, in turn lead to the implementation of least cost solutions (NURP, 1982).

The NURP study led to the following seven conclusions:

1. Heavy metals including copper, lead, and zinc are the most prevalent priority pollutant constituents found in urban runoff. End-of-pipe concentrations exceed U.S. EPA ambient water quality criteria and drinking water standards in many instances. Some of the metals were not present enough and in high concentrations to be considered potential threats to beneficial uses of the waterbodies.
2. The organic priority pollutants were detected less frequently and at lower concentrations than the heavy metals.
3. Coliform bacteria were present at high levels in urban runoff and were expected to exceed U.S. EPA water quality criteria during and immediately after storm events in many surface waters.

4. Nutrients were generally present in urban runoff, but with a few individual site exceptions, concentrations did not appear to be high in comparison with other possible discharges to receiving water bodies.
5. Oxygen demanding substances were present in urban runoff at concentrations approximating those in secondary treatment plant discharges.
6. Total suspended solids concentrations in urban runoff are fairly high in comparison with treatment plant discharges.
7. A summary characterization of urban runoff has been developed and is believed to be appropriate to use in estimating urban runoff pollutant discharges from sites where monitoring data are scant or lacking (NURP, 1982).

Effects of urban runoff on receiving water quality are highly site specific and depend on the type, size, and hydrology of the water body. The effects also depend on the urban runoff quantity and quality characteristics, the designated beneficial use, and the concentration levels of the specific pollutants that affect that use. Observations and conclusions were drawn by individual NURP projects that examined the receiving waters effects in differing levels of detail and rigor. Conclusions were based on water type: rivers and streams, lakes, estuaries, and embayments, and groundwater aquifers (NURP, 1982).

NURP increased knowledge of the characteristics of urban runoff, its effects on designated uses, and performance efficiencies of selected control measures (NURP, 1982). NURP was the pioneer of stormwater research and served as the catalyst to better

understand urban runoff. In the 1992 Report to Congress, states took a more active role in stormwater issues and its impacts.

The National Water Quality Inventory (Inventory) provides a national assessment of surface water impacts associated with runoff from various land uses. Section 305(b) of the CWA requires states to prepare this report every two years summarizing their water impact findings. The Inventory 1992 Report to Congress provides a general assessment of water quality based on state reports. The reports indicate the portion of the states' water that has been assessed are not supporting their designated uses and identifies the sources of impairment for those waters (U.S. EPA, 1995). The Inventory 1992, states concluded that water runoff from a number of diffuse sources is the leading cause of water quality impairment. The diffuse sources of runoff include agricultural, municipal separate storm sewers, urban runoff, and atmospheric deposition (U.S. EPA, 1995).

2.2 Federal Stormwater Regulations

In 1972, the CWA prohibited the discharge of any pollutant to navigable waters of the United States from a point source unless the discharge is authorized by a NPDES permit issued under Section 402 of the CWA. Point sources contributing to water pollution by discharging pollutants into waters of the U.S. are regulated under the NPDES permit program (U.S. EPA, 2005). U.S. EPA defines point sources as discrete conveyances such as pipes or man-made ditches (U.S. EPA, 2005). Industrial, municipal, and other facilities must obtain permit coverage if their discharges go directly to surface waters. States must receive authorization from the U.S. EPA in order to implement the

NPDES permit program themselves. The NPDES permit program has been responsible for significant improvements to our Nation's water quality (U.S. EPA, 2005).

Regulation of storm runoff as a separate class under the CWA began when a series of regulations addressing discharges from separate storm sewers (March 18, 1976, 41 FR11307), concentrated animal feeding operations (CAFOs) (March 18, 1976, 41 FR 24709), and aquaculture projects (May 17, 1977, 42 FR 25478) were issued in response to a court's decision in Natural Resource Defense Council (NRDC) v Train, U.S. EPA. Stormwater is now defined as a class of point source discharges that are subject to the NPDES permit program (U.S. EPA, 1995a).

After 1987, stormwater was included under the NPDES permit program because it was ruled to be a point source. In 1987, Section 402(p) was added to the CWA to address point source discharges composed entirely of stormwater under the NPDES program. This program established a phase approach for issuing NPDES stormwater permits (U.S. EPA, 1995a). The initial permit application requirements published by U.S. EPA was for certain categories of stormwater discharges associated with industrial activity and for discharges from municipal separate storm sewer systems located in municipalities with a population of 100,000 or more (Phase I sources) was effective on November 16, 1990 (55 FR 47990). The Phase II rule was promulgated August 7, 1995 (60 FR 40230, U.S. EPA, 1996).

2.2.1 Regulations for Industrial Discharges: Phase I

Phase I of the NPDES permit approach addresses stormwater from industrial facilities and discharges from municipal separate storm sewer systems serving a

population of 100,000 or more. “Stormwater discharge associated with industrial activity” has been defined by U.S. EPA in a comprehensive manner to address over 100,000 facilities (U.S. EPA, 1996).

> “All storm water discharges associated with industrial activity that discharge through municipal separate storm sewer systems or that discharge directly to waters of the United States are required to obtain NPDES permit coverage, including those which discharge through systems located in municipalities with a population of less than 100,000” (U.S. EPA, 1996).

Phase I focuses on the largest cities and counties, which contain about one-third of all the facilities in both regulated and nonregulated categories (U.S. EPA, 1995a). The NPDES regulations 40 CFR 122.26(b) (4) and (7) define municipal separate storm sewer systems that serve a population of 100,000 or more to include:

- Incorporated cities with a population of 100,000 or more
- Counties with populations of 100,000 or more in unincorporated, urbanized areas (excluding the population of towns and townships)
- Municipalities designated by U.S. EPA or an authorized NPDES State as having Phase I municipal separate storm sewer systems (U.S. EPA, 1995).

Municipal separate storm sewer system discharges can also be addressed under Phase I NPDES program if they are designated as significant contributors of pollutants to waters of the United States, or if they have contributed to a violation of a water quality standard under Section 402(p)(2)(E) of the CWA. Phase I stormwater discharge permits

provide a mechanism for monitoring the discharge of pollutants from Phase I sources to waters of the United States and establishes appropriate controls (U.S. EPA, 1996).

2.2.1.1 Industrial Permit Application Options under Phase I

The stormwater regulations offer three permit application options for stormwater discharges associated with industrial activity;

1. The first option is to submit an individual application
2. The second option is to file a NOI to be covered under a general permit in accordance with the requirements of an issued general permit (U.S. EPA, 1996).
3. The third options it to submit a group application

2.2.1.1.1 Option 1

The submittal of an individual application requires an extensive amount of specific information about the facility. Information in the application includes a site drainage map, a narrative description of the site identifying potential pollutant sources, and quantitative testing data. Construction activities, oil and gas operations, and mining require specific requirements (U.S. EPA, 1996) and most facilities applying for an individual application are usually addressed by another NPDES permit. This research will not be focusing on option 1 permit applications.

2.2.1.1.2 Option 2

Stormwater dischargers that submit a NOI to be covered by a general permit are not required to submit an individual permit application. Submitting an NOI can be less burdensome than submitting an individual application because the NOI requirements for

general permits usually address only general information and typically do not require the collection of monitoring data for initial coverage (U.S. EPA, 1996).

The general permit approach is used by many states in order to regulated stormwater dischargers. The general permit approach is administratively efficient by allowing an agency to quickly specify compliance requirements for a large number of facilities when promulgating a new regulation (Duke et al, 1999a). However, the disadvantages to the general permit approach are facility identification and compliance assessment (Duke et al, 1999a). Facility operators are required to recognize their duty to comply with the general permit by self-identification through filing a NOI with the regulating agency (Duke et al, 1999a). The general permit approach is based on self identification and self regulation of facilities. Reliance on self-identification fails to generate a regulatory mechanism that could systematically identify and characterize facilities in a given geographic region (Duke et al 1999a).

Research has discovered there is a widespread failure among industrial facilities to comply with the NPDES regulations for stormwater (Duke et al, 1999a). A number of recent research findings demonstrate facilities completing first stage compliance are low in the U.S. and are likely to be similar in other states such as California (Duke et al, 2001). Filing a NOI can be considered first stage compliance (Duke and Beswick, 1997). The states' experience suggests that a large proportion of the regulated facilities have failed to regard the basic issue of self-identification, considered to be first stage compliance (Duke and Augustenborg, 2006).

First stage compliance requires facilities to identify themselves by filing a NOI. Clearly, compliance with the first stage does nothing in itself to reduce pollutants in

storm water discharges, but merely serves to place the facility under state or U.S. EPA supervision. However, this stage of compliance is a reasonable indicator of the number of facilities that undertake pollutant control activities although it is difficult to have an accurate proportion of covered facilities completing first-stage compliance (Augustenborg, 2001).

In addition, the degree of compliance by industrial facilities has been uncertain since the regulations were first established (Duke et al, 1999a). This is due mainly to the way the U.S. EPA MSGP defines the regulated community, based on their SIC code.

2.2.1.1.3 Option 3

Facilities may apply for a group application when seeking coverage under the MSGP. Group permits cover dischargers within a particular industrial group or that have similar discharge characteristics. Group applications can be comprised of as few as four entities and is designed to generate customized general permits within the groups. This application process is intended to reduce the expense and administrative burden on both industry and the permitting authority by requiring only selected members of the group to submit quantitative data (Bailey, 1993).

The group applications process consists of two parts; Part 1 identifies all participants, provides facility-specific information, and proposes a representative sampling subgroup; Part 2 consists of sampling data from each member of the subgroup identified in Part 1 (Bailey, 1993). This research will not be evaluating Option 3 of the MSGP.

2.2.2 Regulations for Industrial Discharges: Phase II

Phase II of the stormwater regulations include additional stormwater discharges not addressed by the Phase I regulation. Phase II discharges may include small municipal separate storm sewers systems, commercial and institutional facilities (U.S. EPA, 1995b). The focus of this research is on Phase I stormwater regulations.

2.2.3 Permit Approaches

The U.S. EPA created a general permit under which many stormwater discharge facilities could be addressed. The U.S. EPA MSGP (U.S. EPA MSGP) provides facility-specific requirements for many types of industrial facilities within one overall permit (U.S. EPA, 2005). The U.S. EPA MSGP authorizes stormwater discharges associated with industrial activities for most areas of the United States where the NPDES permit program has not been delegated (60 FR 50804). The MSGP is offered by U.S. EPA as a model for authorized states to use to implement their stormwater permitting activities. Most states appear to have modeled the U.S. EPA MSGP permits as a way to assure they meet U.S. EPA's minimum standards. The U.S. EPA must approve the state permits and grant authorization to the states for implementation of the permits (Griffin, 2005).

The U.S. EPA MSGP offers coverage to stormwater dischargers subject to effluent limitation guidelines. The U.S. EPA MSGP requires facilities to do the following:

1. Develop and implement a stormwater pollution prevention plan (SWPPPP).
2. A facility must submit a Notice of Intent (NOI) along with the application fee to be authorized by the U.S. EPA MSGP.

3. A facility must submit a Notice of Termination (NOT) if the facility is currently covered by the baseline general permit and intends to switch to the U.S. EPA MSGP.
4. U.S. EPA MSGP applicants must certify that no endangered species are in the proximity of the stormwater discharges.
5. Facilities that discharge to a large or medium municipal separate storm sewer system must submit signed copies of the NOT to the operator of the municipal system (U.S. EPA, 1996).

Stormwater discharges are also regulated under the Municipal Separate Storm Sewer permit. The 1987 CWA amendments specified NPDES water quality regulations for municipal drainage systems known as municipal separate storm sewer systems M.S.S.S.S. (MS4). Stormwater regulations were administered under the NPDES water quality regulations, and established a comprehensive permit program addressing MS4s. This new permit program created a new category of permitted dischargers subject to the NPDES program.

The MS4 permit may be issued on a system-wide or jurisdiction-wide basis. The role of municipalities has been defined in a flexible manner by the U.S. EPA to allow local governments to assist in defining priority pollutant sources within the municipality and to develop and implement appropriate controls for such discharges (U.S. EPA, 1996). Within the MS4 permit program, permittees are required to identify facilities that have a high risk of contributing to stormwater runoff. The MSGP and MS4 are designed to work together in controlling pollutant discharge in stormwater.

The 1990 regulations defined storm water discharges associated with industrial activities to include 11 categories of industrial facilities and established application requirements for such discharges (U.S. EPA, 1995a). Within the 11 categories, there are 30 sectors based on types of industries and within the sectors are specific subsectors or SICs. The Office of Management and Budget (OMB) classifies businesses into categories based on similarity of economic activity known as the SIC system (U.S. EPA, 1995a). Some major categories of industry and commerce covered under SIC codes 01-97 are (U.S. EPA, 1995a):

- Agriculture, Forestry, and Fishing
- Mining
- Construction
- Manufacturing
- Transportation and Public Utilities
- Wholesale Trade
- Retail Trade
- Finance, Insurance, and Real Estate
- Services
- Public Administration

2.2.4 Compliance

The SIC system is a useful framework for identifying the numbers and locations of facilities by allowing U.S. EPA to access information from many sources with detail. However, the SIC system does not capture some types of facilities or activities that

generate stormwater discharges because the SIC system is based on the primary activity in which an establishment is engaged (U.S. EPA, 1995a). A facility or business may be involved in numerous activities, but will be classified according to a single industrial code, which may not reflect the activities associated with stormwater discharges.

This can be problematic because the regulatory definition of industrial facilities specifies the regulations to be based on activities conducted on site rather than to the category of business. The category of business, the SIC, is what is reported to the U.S. Department of Commerce or other agencies. There are no databases, public documents, or reports are available to government agencies that reliably correlates the facility name with the types of activities defined in the U.S. EPA stormwater permits (Cross, 2005).

2.3 Stormwater Regulation at the State Level

Under the 1987 amendments to the CWA, Section 402(p) was added to establish a framework for regulating industrial stormwater discharges as point sources under the NPDES permit program. The Florida Multi-Sector Generic Permit, California General NPDES Storm Water Permit, and the individual municipal MS4 permits all address industrial stormwater. States must receive authorization from the U.S. EPA to administer the NPDES permit program.

2.3.1 Florida MSGP

In 2000, the U.S. EPA authorized the Florida Department of Environmental Protection (FDEP) to implement the NPDES stormwater permitting program in the state of Florida (with the exception of Indian country lands). Florida's NPDES programs are based on the federal NPDES permitting program. The state program regulates point

source discharges of stormwater from certain industrial facilities. Operators of the regulated industrial facilities must obtain NPDES stormwater permits and implement appropriate pollution prevention techniques to reduce the contamination of stormwater runoff (Augustenborg, 2001).

Florida adopted the federal stormwater general permit for industrial activities as specified in Rule 62-621.300(5)(a), F.A.C. Florida operates the Federal stormwater general permit as the state of Florida Multi-Sector Generic Permit (MSGP) for stormwater discharge associated with industrial activity. Some industrial facilities may have to obtain an individual permit as specified in Chapter 62-620, F.A.C. (FDEP, 2000e).

The MSGP has five main components:

1. Submission of application or notice of intent
2. Application fee
3. Development of a stormwater pollution prevention plan
4. Monitoring
5. Notice of termination

Receiving permit coverage under the MSGP, an application containing facility specific identification information must be submitted to the regulatory agencies along with a one time application fee. This initial submittal is considered filing a notice of intent putting the facility under regulatory control.

2.3.2 Stormwater Pollution Prevention Plan

The USEPA and various state permits all require facilities receiving MSGP permit coverage develop and implements a Stormwater Pollution Prevention Plan (SWPPP). The SWPPP is to be prepared in accordance with good engineering practices and must contain the three following criteria: (1) the plan shall identify potential sources of pollution which may reasonably be expected to affect the quality of stormwater discharges associated with industrial activities from the facility; (2) the plan shall describe and ensure the implementation of the practices used to reduce the pollutants in stormwater and assure compliance with the terms and conditions of the MSGP permit; (3) facilities must implement the provision of the SWPPP required under the condition of the MSGP (U.S. EPA, 1992b). Stormwater Pollution Prevention Plans allow for facility specific plans and controls as long as the three criteria are met.

The intention of the SWPPP is to facilitate the process whereby facility operators evaluate potential pollution sources on-site and select and implement the appropriate measures to prevent or control pollutants. The process is outlined in the Federal Register Vol. 60, No 189. The USEPA believes this approach to be the most environmentally sound and cost-effective way to control the discharge of pollutants in stormwater runoff from industrial facilities (F.R. Vol. 60, No. 189). The SWPPP provides the facility operator the opportunity to become more familiar with their facility in detail by having to identify potential sources of pollution. This is reiterated through the detailed requirements of the SWPPP.

The SWPPP must describe in detail all potential pollution sources. For example, all activities, material, and physical features of a facility must be evaluated if they contribute significant amounts of pollutants to stormwater runoff or result in a polluted discharge to storm sewers or drainage systems. This identification task of the SWPPP allows facility operators to identify and set priorities for necessary charges in material, materials management practices, or site features, as well as aid in the selection of appropriate structural and nonstructural control techniques. In addition, a facility operator must discuss the reasons each control or practice was selected and how each will address the source of concern (F.R. Vol. 60, No. 189). Best management practices (BMPs) should be incorporated into the facilities operations and identified in the SWPPP.

2.3.2.1 Best Management Practices

Best management practices are a combination of structural, nonstructural, and managerial techniques that are recognized to be the most effective and practical means to control nonpoint source pollutants and are compatible with the productive use of the resource to which they are applied (NSC, 2006). The SWPPP encourages a facility to use BMPs when ever applicable. Best management practices also include processes, procedures, schedules of activities, prohibition on practices, and other management practices that prevent or reduce the discharge of pollutants in stormwater runoff. Best management practices are additional ways facilities can help control the amount of pollutants being discharged. By having a set of BMPs in place and identified in the SWPPP, a facility has the opportunity to document changes that might occur as different BMPs are implemented.

2.3.3 Monitoring Requirements under the FL MSGP

Depending on the industry sector and sub-sectors/SIC, the operators of industrial facilities may have to perform as many as three types of monitoring of their stormwater discharges: visual examination, analytical monitoring, and compliance monitoring. Under the MSGP, facilities that perform analytical or compliance monitoring must report their results to the appropriate regulatory agency and the sampling data collected from the monitoring must be summarized and included in the SWPPP (U.S. EPA, 1999). In lieu of having to report monitoring data, there are waivers or exemptions a facility may receive such as; adverse weather conditions or unstaffed and inactive sites.

2.3.3.1 Sample Type

Samples taken to satisfy the MSGP monitoring requirements are to be grab samples for all three types of monitoring. Samples are to be collected from discharges resulting from a storm event greater than 0.1 inches in magnitude and that occurs at least 72 hours from the previously measurable storm event (U.S. EPA 1999).

2.3.3.2 Visual Examination

All facilities covered under the MSGP are required to perform visual examinations of their stormwater discharges on a quarterly basis throughout the duration of the five year permit. Facility operators are to examine a sample collected from a discharge location during the first half hour of discharge and note any color, odor, clarity, floating solids, settled solids, suspended solids, foam, oil and sheen and any other indicators of possible stormwater pollution. Visual examinations are intended to provide

a simple and inexpensive means of obtaining a rough assessment of stormwater quality at the facility (U.S. EPA 1999).

2.3.3.3 Analytical Monitoring

Analytical monitoring is required only by industry sectors or subs-sectors/SICs USEPA determined to have a high potential to discharge a pollutant at concentrations of concern (Table 2.3.3.3.1). Analytical monitoring is preformed on a quarterly basis in years two and four of the permit and the results must be submitted to the U.S. EPA on a Discharge Monitoring Report (DMR). The samples are required to be taken at each discharge location and analyzed for specific parameters at a certified laboratory. Specified parameters are determined by the federal MSGP and vary depending on industry sectors and subsectors/SICs. Through research, the U.S. EPA determined what types of pollutants are typically released by various industrial activities. This allowed the MSGP to determine specified parameters to be analyzed in water samples for each sector or subsector/SIC (F.R. Vol. 60, No. 189). The average results are compared to benchmark concentrations to evaluate the effectiveness of the facility's SWPPP (U.S. EPA 1999).

Table 2.3.3.3.1: MSGP Industry Sector/Subsectors Subject to Analytical Monitoring

MSGP Sector	**Industry Subsector**	**Required Parameters for Analytical Monitoring**
A	General Sawmills and Planning Mills	COD, TSS, Zn
	Wood Preserving Facilities	Arsenic, Cu
	Log Storage and Handling	TSS
	Hardwood Dimensions and Flooring Mills	COD, TSS
B	Paperboard Mills	COD
C	Industrial Inorganic Chemicals	Al, Fe, N (nitrate & nitrite)
	Plastics, Synthetic Resin, etc.	Zn
	Soaps, Detergents, Cosmetics, Perfumes	N (nitrate & nitrite), Zn
	Agriculture Chemicals	N (nitrate & nitrite), Pb, Fe, Zn, Phosphorus
D	Asphalt Paving and Roofing Materials	TSS

Table 2.3.3.3.1: Continued

MSGP Sector	Industry Subsector	Required Parameters for Analytical Monitoring
E	Clay Products	Al
	Concrete Products	TSS, Fe
F	Steel Works, Blast Furnaces, and Rolling and Finishing Mills	Al, Zn
	Iron and Steel Foundries	Al, TSS, Cu, Fe, Zn
	Non-ferrous Rolling and Drawing	Cu, Zn
	Non-ferrous Foundries (casting)	Cu, Zn
G	Copper Ore Mining and Dressing	COD, TSS, N (nitrate & nitrite)
H	Coal Mines and Coal-Mining Related Facilities	TSS, Al, Fe
J	Dimension Stone, Crushed Stone, and Nonmetallic Mineral (except fuels)	TSS
	Sand and Gravel Mining	N (nitrate & nitrite), TSS
K	Hazardous Waste Treatment Storage and Disposal	Ammonia, Mg, COD, Arsenic, Ca, Cyanide, Pb, Mercury, Selenium, Ag
L	Landfills, Land Application Sites, and Open Dumps	Fe, TSS
M	Automobile Salvage Yards	TSS, Al, Fe, Pb
N	Scrap Recycling	Cu, Al, Fe, Pb, Zn, TSS, COD
O	Steam Electric Generating Facilities	Fe
Q	Water Transportation Facilities	Al, Fe, Pb, Zn
S	Airports with dicing activities	BOD, COD, Ammonia, pH
U	Grain Mill Products	TSS
	Fats and Oils	BOD, COD, N (nitrate & nitrite), TSS
Y	Rubber Products	Zn
AA	Fabricated Metal Products Except Coating	Fe, Al, Zn, N (nitrate & nitrite)
	Fabricated Metal Coating and Engraving	Zn, N (nitrate & nitrite)

2.3.3.4 Compliance Monitoring

The third type of monitoring under the MSGP is compliance monitoring. Compliance monitoring provides coverage to only very specific types of discharges that are subject to effluent guidelines and are not already subject to an existing individual NPDES stormwater permit. Compliance monitoring is to be performed on an annual basis throughout the term of the permit and the results may be used to meet the quarterly

analytical monitoring requirements for the specified pollutants, where compatible (U.S. EPA, 1999). Evaluation of compliance monitoring is beyond the scope of this research.

2.3.4 Monitoring Requirements under CA MSGP

In California, the authority has been delegated to the California State Water Resources Control Board (CSWRCB). The CSWRCB promulgated a statewide rule for industry under the stormwater permit provisions for the NPDES program in 1992. In 1997, the rules were amended and re-authorized as the General NPDES Storm Water Permit for Industrial Activities excluding construction activities (Duke et al, 2001).

The General NPDES Storm Water Permit for Industrial Activities is designed to facilitate pollution prevention measures at industrial facilities to reduce pollutant loading into surface water of the state of California. Industrial facilities that are subject to the permit are required to apply for coverage under the regulation by submitting a NOI, develop and implement a SWPPP and conduct monitoring (Duke, 2001).

2.3.4.1 CA SWPPP

All facility operators receiving MSGP coverage in California must prepare, retain on site and implement an SWPPP. The two major objectives of the SWPPP are: 1.)to help identify the sources of pollution that affect the quality of industrial stormwater discharges and authorized non-stormwater discharges, and2.) to describe and ensure the implementation of BMPs to reduce or prevent pollutants in industrial stormwater discharges and authorized non-stormwater discharges (CRWQB, 2006).

The SWPPP emphasis on BMPS provides flexibility in the choice of BMPs for different types of industrial activities and pollutant sources. One of the major elements of

the SWPPP is the elimination of unauthorized non-storm water discharges to the facility's stormwater drain system (CRWQCB, 2006).

2.3.4.1 CA Monitoring Program

All facilities regulated under the general permit requires the development and implementation of a monitoring program. The objectives of the monitoring program are: 1.) demonstrate compliance with the General Permit, 2.) aid in the implementation of the SWPPP, and 3.) measure the effectiveness of the BMPs in reducing or preventing pollutants in stormwater discharges and authorized non-stormwater discharges (CRWQCB, 2006).

All facilities must perform visual observations of stormwater discharges and authorized stormwater discharges. Visual observation refers to when someone inspects the facility during dry periods or during times when rain is running off, to look for possible stormwater pollutant problems Facilities must also collect and analyze samples of stormwater discharges. The analysis must include the following parameters: pH, total suspended solids (TSS), total organic carbon (TOC), specific conductance, toxic chemicals, and other pollutants which are likely to be present in the stormwater discharges in significant quantities. The first sample is to be taken during the first rain event of the season and one rain event thereafter.

3.0 METHODOLOGY

The present research is based on the review of the federal and state regulations and the literature summarized above. This research is designed to determine if the current regulations are efficiently and effectively controlling stormwater runoff. This research consists of three stages: the determination and evaluation of possible uses of industrial facilities monitoring data; a regulatory analysis; and an analysis of existing monitoring data.

3.1 Possible Uses of the Monitoring Data

The overall approach was to first identify the range of possible uses for monitoring data envisioned in the regulations and assess whether the data collected succeed in meeting those uses. The possible uses of the monitoring data were derived from a review and evaluation of regulatory language, agency guidance, studies by implementing agencies, and others. Four main categories of possible uses were identified as follows:

1. Agencies' identification of high polluting facilities within a given jurisdiction
2. Assessment of pollutant loads to receiving waterbodies
3. Documentation of facilities' improvement in polluted discharges
4. Facility operators' self evaluation and identification for future improvements

3.1.1 Identification of High Polluting Facilities

Florida Department of Environmental Protection and other state agencies have the flexibility under the MSGP and MS4 to ensure that high polluting facilities in their jurisdiction are implementing effective BMPs. In Florida, the permitees of the MS4 are required to identify facilities that have a high risk of contributing to stormwater runoff. The design and structure of both the MSGP and MS4 permit, have the potential to work together in order to achieve a decrease in pollutant runoff.

One of the state's purposes for requiring monitoring was to allow municipalities to identify industrial facilities that might be potential sources of pollutants to stormwater runoff and focus their resources on the high polluting facilities. The U.S. EPA intends the proper use and coordination of limited regulatory resources to be the key in developing a workable regulatory program for controlling pollutants in stormwater discharges associated with industrial activities. This is especially important when addressing the appropriate role of municipal operators of large and medium municipal separate storm sewer systems in the control of pollutants in stormwater associated with industrial activity, which discharges through municipal separate storm sewer systems (F.R. Vol. 65, No 210).

This research evaluated existing monitoring data from industrial facilities in Hillsborough County, Florida and Los Angeles County, California in order to assess whether the current data is successful in identifying high polluting facilities. The evaluation included the following: identification of potential high polluting industrial facilities within a jurisdiction and evaluation of analytical monitoring data in identifying

potential high polluting facilities. The research reviewed the stormwater regulations and evaluated how the regulations specifications for monitoring frequency, on-site locations, etc. could be expected to produce data sufficient to identify whether a facility discharged pollutants with high concentrations over time.

3.1.2 Assessment of Pollutant Loads to Receiving Waterbodies

The Inventory (U.S. EPA, 1995b) and NURP (U.S. EPA, 1983) both concluded that receiving waterbodies were being degraded from various sources, one being stormwater runoff. Pollutants conveyed by stormwater runoff can have a detrimental effect on receiving water bodies. The U.S. EPA has developed a permitting system to control discharge of those pollutants. The U.S. EPA's approach is a flexible four tier permitting strategy for issuing NPDES permits for discharges. The four tiers are: Tier I Baseline Permitting, Tier II Watershed Permitting, Tier III Industry-Specific Permitting, and Tier IV Facility Specific Permitting. Tier II Watershed Permitting, includes facilities within watersheds shown to be adversely impacted by stormwater discharges associated with industrial activity, which U.S. EPA specifies will be targeted for individual or watershed-specific general permits (F.R. Vol. 60, No 189).

The TMDL program under the CWA, requires jurisdictions to identify all sources of the target pollutants in watershed of an impaired waterbody. States, territories, and authorized tribes are required under section 303(d) of the 1972 CWA to develop lists of impaired waters that do not meet the water quality standards set for them. This requires jurisdictions to establish priority ranking for impaired waters and to develop a TMDL. A TMDL specifies the maximum amount of a pollutant that a waterbody can receive and

still meet water quality standards. Pollutant loading is allocated among point and non-point pollutant sources located within the impaired watershed. The TMDL is considered to be the sum of all allocated loads of pollutants set at a level necessary to implement the applicable water quality standards. This includes wasteload allocations from point sources, non-point sources and natural background conditions. In addition, the TMDL maintains a margin of safety and considers seasonal variations (EPA, 2006).

The TMDL program requires jurisdictions to identify all sources of pollutants in a impaired waterbody and watershed. Knowledge of pollutant loads in runoff from specific facilities can allow watershed decision makers to better understand the total loading to watersheds and to make allocations that may require those loads to be revised.

This research obtained and evaluated existing monitoring data from Hillsborough County, Florida and Los Angeles County, California in order to determine whether the data were sufficient to reliably estimate the pollutant loads originating from industrial facilities. This research acquired data on the number of parameters monitored, the parameters being monitored, number of discharge locations, and the how often monitoring occurs. This will determine whether the current monitoring data can be used to help assess pollutant loads to receiving waterbodies. This research also assessed whether the current monitoring requirements can generate sufficient data in order to produce a reliable estimate of potential pollutant loads from industrial facilities in the case of perfect compliance.

3.1.3 Documentation of Improvement

One of the requirements of the MSGP is that each facility is to develop and implement a SWPPP. One aspect of the SWPPP is to discuss the reasons each selected control or practice is appropriate for the facility and how each will address one or more of the potential pollution sources identified in the plan at the facility. The plan must also include a schedule specifying the time(s) during which each control or practice will be implemented. The plan incorporates how each of the controls and practices relate to one another and when taken as a whole, produce an integrated and consistent approach for preventing or controlling potential stormwater pollution. In addition, when "minimize/reduce" are used in the SWPPP relative to pollution prevention plan measures, U.S. EPA means to consider and implement BMPs that will result in an improvement over the baseline conditions as it relates to the levels of pollutants identified in the stormwater discharges (F.R. Vol. 60, No. 189). The structure and design of the SWPPP require facility operators to document any changes occurring at the facility, which can be used to document improvements or any problems that might be taking place over time.

Analytical monitoring for discharges from certain classes of industrial facilities is required under the MSGP. Results for the analytical monitoring are quantitative and therefore can be used to compare results from discharge to discharge and to quantify the improvement in stormwater quality attributable to the stormwater pollution prevention plan. The results from the analytical monitoring can also be used to identify a pollutant that is not being successfully controlled by the plan (F.R. Vol. 60, No 189). The

analytical monitoring results are another means for the facility operator to document the facility's improvements in pollutants being discharged.

Evaluation of the literature, existing monitoring data from the two regions previously mentioned and a regulatory analysis was conducted. The evaluation of the existing monitoring data from industrial facilities was preformed in order to determine if facilities are able to document improvements, which will be dependent on the individual facilities ability to report/document occurrences taking place on-site. The analysis consisted of comparing the second and fourth year data, the change in concentrations, frequency of the monitoring data to detect trends, and the representativity of on-site locations. Additional information from a telephone survey was used in the analysis to help determine what the facility operators were using the results from the monitoring for.

3.1.4 Self Evaluation

Pollutants in stormwater discharges from industrial facilities may be reduced by incorporating the following into the SWPPP: eliminating pollution sources, implementing BMPs to prevent pollution, using traditional stormwater management practices, and providing end of the pipe treatment. The SWPPP approach used in the general permit has two main focuses: (1) to identify sources of pollution potentially affecting the quality of stormwater discharges associate with industrial activity from the facility; and (2) to describe and ensure implementation of practices to minimize and control pollutants in stormwater discharges associated with industrial activity from the facility and to ensure compliance with terms and conditions of the permit.

With these two main focuses, the SWPPP requirements are intended to facilitate the process whereby the operator of the industrial facility thoroughly evaluates potential pollution sources at the site and selects and implements appropriate measures designed to prevent or control the discharge of pollutants in stormwater runoff. One of the four steps involved in the SWPPP process is to periodically evaluate the effectiveness of the SWPPP to prevent stormwater contamination and ensuring compliance under the permit (F.R. Vol. 60, No. 189). The structure and design of the SWPPP requires the facility operator to evaluate the effectiveness of the facility ability to prevent further contamination of stormwater runoff. One of the intended purposes of the monitoring requirements under the permit is that facility operators use the data generated to evaluate their own activities, improve their SWPPPs, evaluate and reduce pollutants that maybe discharging in stormwater runoff.

The U.S. EPA and state regulatory personnel widely express the expectation that facility personnel will use the monitoring data to identify problems at the facility and make improvements to their operations (Kelly, 2006). This research assessed facility operators' perspectives towards the monitoring requirements and uses of the data obtained from monitoring by surveying a sample of facility personnel in Hillsborough County. Industrial facility operators were asked whether they use the monitoring data for self evaluation or any other purposes. The research collected this information systematically through a telephone survey, using a structure designed from the purpose.

3.2 Telephone Survey

This research gathered information on the perspectives of industrial facility operators on monitoring data by a survey of selected industrial facilities. Some of the key purposes of the telephone survey were to determine if industrial facility operators were incorporating the results from the monitoring data to make changes to the facilities on-site activities, or to document improvements the facilities might be making to activities in order to decrease the amount of pollution in stormwater runoff.

Industrial facilities located in Hillsborough County and Pinellas County, Florida that filed a NOI with FDEP were identified and contacted. The outreach was targeted to the manufacturing sectors, SICs 20 through 39, to produce a sample of facilities with reasonably similar industrial activities, production concerns, and compliance attitudes.

Prior to administering the telephone survey, an introductory letter was sent to each industrial facility. The purpose of the letter was to inform the facility operators about this research and inform they would soon be contacted requested for their participation in the telephone survey.

A pre-test of the telephone survey was conducted on a sample of eleven industrial facilities in Pinellas County, Florida to determine the effectiveness, structure and flow of the telephone questionnaire. All of the industrial facilities contacted in Pinellas County were required to conduct analytical monitoring. Phone calls to Pinellas County industrial facilities were completed in June 2006.A total of 63 industrial facilities were contacted in Hillsborough County, Florida. These industrial facilities included all those that received

MSGP permit coverage within the targeted sectors throughout Hillsborough County. Phone calls to Hillsborough County industrial facilities were completed in July 2006.

The response outcomes to the telephone survey are in Table 3.2.1. There was a 60 percent response rate. For the purposes of this research passive refusal referred to facilities that did not return the phone call or did not answer the phone. Facilities were labeled passive refusal after messages were left on answering machines and ten calls were attempted over a length of two to three weeks. Active refusal referred to facilities where a representative was reached and declined to participate in the telephone survey. The telephone survey was conducted for two months, June and July 2006.

Table 3.2.1: Telephone Survey Outcome

	Number of Facilities		
	Required to Conduct Analytical Monitoring	**Not Required to Conduct Analytical Monitoring**	
Questionnaire Attempted			**Percent of Attempted**
Completed Questionnaire	22	16	60
Passive Refusal	6	8	23
Active Refusal	7	4	17
Total	35	28	100
Questionnaire Not Attempted			**Percent of Not Attempted**
Facility Closed	3	1	29
Duplicate Facility*	3	1	28
Wrong Number	1	4	36
Wrong City	0	1	7
Total	7	7	100
Total Possible	42	35	

* Different MSGP number but same facility

The telephone questionnaire was structured into eight sections: Pre Questions, (I) Introduction and Facility Information, (II) Visual Observation, (III) Visual Examination,

(IV) Analytical Monitoring, (V) Training, (VI) Uses of the data, and (VII) Conclusion. The section's questions were based on Florida's monitoring requirements under the MSGP. The majority of the telephone questionnaire questions were designed so the respondent would choose yes, no or don't know responses. Every question and response in the telephone questionnaire received a number in order to transfer the raw data into an electronic database. The electronic database reflects the structure of the telephone questionnaire. The telephone surveys questions were based on the MSGP monitoring requirements for industrial facilities and the types of activities conducted outdoors on-site that have the potential to contribute pollutants to stormwater runoff. Visual observations, training, and uses of the data were also incorporated as questions into the telephone questionnaire in order to assist in the determination of facility operators' perspectives of the monitoring requirements.

The telephone survey was exempt from the University of South Florida Institutional Review Board (IRB) because this research did not put human participants at any risk or harm in participating in the telephone survey and facility information was obtained through public record.

3.3 Analytical Monitoring Data

This research obtained analytical monitoring data from FDEP for industrial facilities in Hillsborough County, Florida that submitted the results from their analytical monitoring as a requirement under the MSGP. The data was accepted in the form submitted to FDEP from the industrial facility. The results from the industrial facilities analytical monitoring were submitted to FDEP on Discharge Monitoring Reports (DMR).

The data was gathered from the DMRs and inputted into an electronic database for each of the targeted facilities. The sample included all facilities in the manufacturing sectors, SIC 20-39, required to conduct and submit analytical monitoring. All facilities that submitted data were included in the sample. There were 43 facilities that submitted analytical monitoring results from years 1998-2006.

Analytical monitoring data was obtained for the same industry sectors for industrial facilities in Los Angeles County California from the California Regional Water Quality Control Board, Los Angeles (CRWQCB) (CRWQCB, 2005). The analytical monitoring data results submitted by industrial facilities to CRWQCB as a requirement under the MSGP, were from 1998-1999 and were available in electronic format (CRWQCB, 2005). The number of industrial facilities that submitted monitoring data in 1998-1999 was 1,709 within the targeted sectors. The date of the data from industrial facilities in Los Angeles County is sufficient for the goals of this research because there is not to be much change is expected to have occurred since 1998-1999. In addition, the regulations were identical in 1998-1999 and any selected time period is adequate to test the hypothesis.

4.0 RESULTS

The results are organized in four categories according to the possible uses:

1. Identification of high polluting facilities within a given jurisdiction;
2. Assessment of pollutant loads to receiving waterbodies;
3. Documentation of improvement for facilities' improvement of polluted discharges;
4. Facility operators' self evaluation and identification of areas for future improvements.

4.1 Identification of High Polluting Facilities within a Given Jurisdiction

Facilities with a high pollutant discharge are known as high polluters. In order to single out high polluters in a jurisdiction with confidence, all industrial facilities within a jurisdiction need to be known. To determine the degree of success of the current structure of the stormwater regulation system for this purpose, the following was evaluated:

4.1.1 Identification of Potential High Polluting Industrial Facilities in A Jurisdiction

4.1.1.1 Identification of Industrial Facilities within A Jurisdiction and;

4.1.1.2 Knowledge of Which Industrial Facilities Are Required To Conduct Analytical Monitoring

4.1.2 Evaluation of Analytical Monitoring Data in Identifying Potential High Polluting Facilities

4.1.2.1 Identification of Industrial Facilities with The Highest Concentrations of Pollutants in Their Discharge;

4.1.2.2 Representativity of the data;

4.1.2.3 Sampling frequency and;

4.1.2.4 Storm variability.

4.1.1 Identification of Potential High Polluting Industrial Facilities in a Jurisdiction

4.1.1.1 Identification of Industrial Facilities within a Jurisdiction

To determine which industrial facilities are high polluters it is necessary to identify all industrial facilities within an agency's jurisdiction. The federal stormwater regulations require compliance for any facility conducting activities typical of a given SIC. The U.S. EPA requires facilities reporting under certain SICs to conduct analytical monitoring. It is the facility operator's responsibility to determine whether or not the facility needs to be in compliance with stormwater regulations by filing a NOI (Table 4.1.1.1.1).

Table 4.1.1.1.1: NOIs Filed

County	**NOI Filed**	**Year Filed***
Hillsborough	196	2001-2006
Los Angeles	2,718	1998-1999

* Years selected for this sample

Filing an NOI is considered to be the first step, or the first stage, towards compliance in receiving coverage under the MSGP (Duke, 1999a). The number of NOI filers within a jurisdiction will give the total number of industrial facilities that have identified themselves as being subject to stormwater regulations. However, since stormwater regulations are based on self identification, using the filed NOIs may not capture all of the industrial facilities within a jurisdiction.

Another method for identifying industrial facilities comes from the U.S. Census Bureau. Facilities are required to report to the U.S. Census Bureau in order for the bureau to provide quality data about the nation's people and economy to the United States government. Facilities are required to report under a primary SIC to the U. S. Census Bureau. For the purposes of Census, the primary SIC is defined as the activity where the facility earns most of its income. No facility reports under more than one SIC to the Census. Conversely, the stormwater regulations require compliance by any facility conducting activities under the specified SIC, even if that actually is a very small part of the facility's income. Many more facilities are expected to be subject to the stromwater regulations in a given SIC than reports to the Census.

The U.S. Census Bureau can provide an approximation of the number of industrial facilities there are within a given jurisdiction. For the purpose of this research, the 1997 U.S. Census Bureau data was used as it was the last year it had facilities reporting under the SIC system. Currently, the US Census Bureau requires facilities to report under the North American Industry Classification System (NAICS). However, the current stormwater regulations still use the SIC classification system.

There is a large difference in the number of facilities reporting to the U.S. EPA and to the U.S. Census Bureau. For instance, out of 270 facilities who reported to the U.S. Census Bureau in Hillsborough County Florida in 1997, 70 facilities had filed an NOI (2001-2006) in the target SICs. Differences between the numbers can be attributed to a change in industrial facilities over the nine years, a lack of knowledge of stormwater regulations since the regulations are fairly recent, or failure to comply. Conversely, in Los Angeles County California, 2,718 industrial facilities filed an NOI in 1998-1999 out

of 2,768 facilities who reported to the U.S. Census Bureau in 1997, (Table 4.1.1.1.2). The significant difference in the number of facilities filing with the two agencies makes it difficult for the regulatory agency, such as the U.S.EPA, to adequately identify all industrial facilities within a jurisdiction, which can result in a low confidence when trying to pinpoint potential high polluting industrial facilities.

Table 4.1.1.12 Target SICs in Hillsborough County and Los Angeles County

Sector	SIC	Industrial Activity	Hillsborough County facilities			Los Angeles County facilities		
			Census (1997) [1]	Filed NOI [2]	Submitted Analytical Monitoring Data, 2001-2006 [3]	Census (1997) [1]	Filed NOI [4]	Submitted Analytical Monitoring Data, 1998-1999 [5]
A Timber Products								
	2431	Millwork	6	1	1	84	8	8
	2451	Mobile Homes	4	1	1	1	1	1
	2491	Wood Preserving	1	2	2	1	1	1
B Paper and Allied Products Manufacturing								
	2653	Corrugated and Solid Fiber Boxes	9	4	Not required [3]	55	12	12
	2656	Sanitary Food Containers, Except Folding	2	1	Not required [3]	4	1	1
C Chemical and Allied Products Manufacturing								
	2813	Industrial Gas	1	2	2	14	6	6
	2819	Industrial Inorganic Chemicals, Not Elsewhere Classified	1	1	1	14	9	9
	2842	Specialty Cleaning, Polishing, and Sanitation Preparations	7	2	2	39	3	3
	2844	Perfumes, Cosmetics, and Other Toilet Preparations	2	1	0	78	12	12
D Asphalt Paving and Roofing Materials Manufacturers and Lubricant Manufacturers								
	2951	Asphalt Paving Mixtures and Blocks	3	2	2	18	12	12
	2952	Asphalt Felts and Coating	2	1	Not required [3]	12	4	4
	2992	Lubricating Oils and Grease	1	1	Not required [3]	14	11	11
E Glass, Clay, Cement, Concrete, and Gypsum Product Manufacturing								
	3241	Cement, Hydraulic	1	1	1	7	0	0
	3271	Concrete Block and Brick	2	3	3	8	3	3
	3272	Concrete Products, Except Block and Brick	10	7	5	27	5	5
	3275	Gypsum Products	1	4	3	12	2	2

Table 4.1.1.1.2 Continued

Sector	SIC	Industrial Activity	Hillsborough County facilities			Los Angeles County facilities		
			Census (1997) [1]	Filed NOI [2]	Submitted Analytical Monitoring Data, 2001-2006 [3]	Census (1997) [1]	Filed NOI [4]	Submitted Analytical Monitoring Data, 1998-1999 [5]
F Primary Metals								
	3312	Steel Works, Blast Furnaces, and Rolling and Finishing Mills	3	1	1	7	0	0
	3354	Aluminum Extruded Products	1	1	1	12	3	3
	3369	Nonferrous Foundries, Except Aluminum and Copper	2	1	1	5	9	9
R Ship and Boat Building or Repairing Yards								
	3731	Ship Building or Repairing (establishments primarily engaged in building and repairing ships, barges, and lighters, whether self-propelled or towed by other crafts)	6	6	Not required [3]	18	2	2
U Food and Kindred Products								
	2013	Sausages and Other Prepared Meats	3	1	Not required [3]	41	5	5
	2048	Prepared Feeds and Feed Ingredients for Animals and Fowls, Except Dogs and Cats	2	2	2	10	0	0
	2051	Bread and other Bakery Products, Except Cookies and Crackers	10	1	Not required [3]	127	7	7
	2077	Animal and Marine Fats and Oils	2	1	1	3	0	0
	2082	Malt Beverages	3	1	Not required [3]	8	0	0
	2083	Malt	0	1	Not required [3]	1	1	1
	2086	Bottled and Canned Soft Drinks and Carbonated Water	2	1	Not required [3]	19	2	2
	2091	Canned and Cured Fish and Seafoods	0	1	Not required [3]	11	1	1

Table 4.1.1.1.2 Continued

Sector	SIC	Industrial Activity	Hillsborough County facilities			Los Angeles County facilities		
			Census (1997) [1]	Filed NOI [2]	Submitted Analytical Monitoring Data, 2001-2006 [3]	Census (1997) [1]	Filed NOI [4]	Submitted Analytical Monitoring Data, 1998-1999 [5]
Y Rubber, Miscellaneous Plastic Products, and Miscellaneous Manufacturing Industries								
	3069	Fabricated Rubber Products, Not Elsewhere Classified	5	1	1	45	6	6
	3085	Plastics Bottles	2	1	Not required [3]	19	2	2
W. Furniture and Fixtures								
	2515	Mattress, Foundations, and Convertible Beds	2	1	Not required [3]	57	0	0
X Printing and Publishing								
	2752	Commercial Printing, Lithographic	112	1	Not required [3]	1060	5	5
AA Fabricated Metals								
	3429	Hardware, Not Elsewhere Classified	3	1	1	69	9	9
	3441	Fabricated Structural Metal	8	1	1	73	10	10
	3444	Sheet Metal Work	22	2	2	193	8	8
	3449	Misc. Structural Metal Work	3	1	1	16	3	3
	3479	Coating, Engraving, and Allied Services, Not Elsewhere Classified	5	2	1	119	17	17
	3491	Industrial Valves	1	1	1	21	4	4
	3496	Misc. Fabricated Wire Products	6	2	2	52	1	1
	3499	Fabricated Metal Products, Not Elsewhere Classified	3	1	1	117	23	23
AB Transportation Equipment, Industrial or Commercial Machinery								
	3714	Motor Vehicle Parts and Accessories	5	1	Not required [3]	178	17	17

Table 4.1.1.1.2 Continued

Sector	SIC	Industrial Activity	Hillsborough County facilities			Los Angeles County facilities		
			Census (1997) [1]	Filed NOI [2]	Submitted Analytical Monitoring Data, 2001-2006 [3]	Census (1997) [1]	Filed NOI [4]	Submitted Analytical Monitoring Data, 1998-1999 [5]
AC Electronics, Electrical, Photographic and Optical Goods								
	3663	Radio and Television Broadcasting and Communications Equipment	5	1	Not required [3]	54	0	0
	3674	Semiconductors and Related Devices	1	1	Not required [3]	45	7	7

Sources: [1] U.S. Census Bureau 1997: [2] Florida Department of Environmental Protection collected 2006: [3] Florida Department of Environmental Protection MSGP facility monitoring data, collected 2006: [4] Los Angeles Regional Water Quality Control Board 1998-1999: [5] Los Angeles Regional Water Quality Control Board MSGP facility monitoring data, 1998-1999

4.1.1.2 Industrial Facilities Required to Conduct Analytical Monitoring

All industrial facilities that receive coverage under the MSGP are required to conduct visual examination monitoring. However, only facilities in industry sectors like timber or chemical manufacturing reporting under specific SICs are required to conduct analytical monitoring (Table 4.1.1.2.1). There are 533 SICs available for a facility to report under to various agencies for multiple purposes. Of these, 169 SICs, or 23 %, are required to conduct analytical monitoring according to the federal MSGP. However, California law requires all facilities receiving MSGP coverage to conduct analytical monitoring.

In Hillsborough County from 2001 there were 104 facilities required to conduct analytical monitoring based on NOIs filed with FDEP. Out of the 104 facilities, 49 were within the targeted sectors and SICs of this research (Table 4.1.1.2.1). In Los Angeles County there were 2,718 facilities that filed an NOI. Of these, 1,709 were within the targeted sectors and SICs of this research required to conduct analytical monitoring.

Table 4.1.1.2.1:Hillsborough County Industrial Facilities Required to Conduct Analytical Monitoring Targeted Industrial Sectors, SICs, and Activities

Sector	SIC	Industrial Activity Represented	Filed NOI
A Timber Products	2431	Millwork	1
A Timber Products	2451	Mobile Homes	1
A Timber Products	2491	Wood Preserving	2
C Chemical and Allied Products Manufacturing	2813	Industrial Gas	2
C Chemical and Allied Products Manufacturing	2819	Industrial Inorganic Chemicals, Not Elsewhere Classified	2
C Chemical and Allied Products Manufacturing	2842	Specialty Cleaning, Polishing, and Sanitation Preparations	2

Table 4.1.1.2.1: Continued

Sector	SIC	Industrial Activity Represented	Filed NOI
C Chemical and Allied Products Manufacturing	2844	Perfumes, Cosmetics, and Other Toilet Preparations	1
D Asphalt Paving and Roofing Materials Manufacturers and Lubricant Manufacturers	2951	Asphalt Paving Mixtures and Blocks	2
E Glass, Clay, Cement, Concrete, and Gypsum Product Manufacturing	3241	Cement, Hydraulic	1
E Glass, Clay, Cement, Concrete, and Gypsum Product Manufacturing	3271	Concrete Block and Brick	3
E Glass, Clay, Cement, Concrete, and Gypsum Product Manufacturing	3272	Concrete Products, Except Block and Brick	7
E Glass, Clay, Cement, Concrete, and Gypsum Product Manufacturing	3275	Gypsum Products	4
F Primary Metals	3312	Steel Works, Blast Furnaces, and Rolling and Finishing Mills	1
F Primary Metals	3354	Aluminum Extruded Products	1
F Primary Metals	3369	Nonferrous Foundries, Except Aluminum and Copper	1
U Food and Kindred Products	2048	Prepared Feeds and Feed Ingredients for Animals and Fowls, Except Dogs and Cats	2

Table 4.1.1.2.1: Continued

Sector	SIC	Industrial Activity Represented	NOI Filed
U Food and Kindred Products	2077	Animal and Marine Fats and Oils	1
Y Rubber, Miscellaneous Plastic Products, and Miscellaneous Manufacturing Industries	3069	Fabricated Rubber Products, Not Elsewhere Classified	1
AA Fabricated Metals	3429	Hardware, Not Elsewhere Classified	1
AA Fabricated Metals	3441	Fabricated Structural Metal	1
AA Fabricated Metals	3444	Sheet Metal Work	2
AA Fabricated Metals	3449	Misc. Structural Metal Work	1
AA Fabricated Metals	3479	Coating, Engraving, and Allied Services, Not Elsewhere Classified	2
AA Fabricated Metals	3491	Industrial Valves	1
AA Fabricated Metals	3496	Misc. Fabricated Wire Products	2
AA Fabricated Metals	3499	Fabricated Metal Products, Not Elsewhere Classified	1

4.1.2 Evaluation of Analytical Monitoring Data In Identifying Potential High Polluting Facilities

4.1.2.1 Identification of Industrial Facilities with Highest Concentrations of Pollutants in Their Discharge

Highest pollutant concentrations from industrial facilities in Hillsborough County and Los Angeles County varied among different types of industrial activities (Table 4.1.2.1.1).

Table 4.1.2.1.1: SICs with the Highest Concentrations

Parameter	Hillsborough County	Los Angeles County
TSS	3272, 3271	3271, 3714
Cu	2491, 3354, 3499	3561, 3714
Zn	3496, 3499, 3354	3471, 3463, 3714
Al	3496, 3444	3431, 3365, 3321
Fe	3444, 3496	3471, 3499, 3559
COD	2451, 2431, 3272	2834, 2621, 2076
N (nitrate & nitrite)	3499, 3491, 3496	3324, 2084, 3369

The majority of industrial facilities required to conduct analytical monitoring in Hillsborough and Los Angeles County reported under Sector E; Glass, Clay, Cement, Concrete, and Gypsum Product Manufacturing and SIC 3272; Concrete Products, Except Block and Brick. For both Hillsborough and Los Angeles County, SIC 32XX had the highest concentrations of all industrial facilities in one parameter, total suspended solids (TSS). Variation in concentrations for each of the monitored parameters: TSS, copper (Cu), zinc (Zn), aluminum (Al), iron (Fe), chemical oxygen demand (COD), and nitrogen (N); were present in monitoring data for both counties.

The three highest concentrations for seven parameters for both counties are shown in Table 4.1.2.1.2.

Table 4.1.2.1.2: Three Highest Concentrations

Parameter	Hillsborough County	Los Angeles County
TSS (mg/L)	610; 321; 210	20,700; 9,956; 6,640
Cu (mg/L)	148; .32; .042	8.34; 5.43; 4.1
Zn (mg/L)	8.53; 1.25; .74	742; 36.6; 33.2
Al (mg/L)	8.57; 2.5; 1.8	172; 49.8; 21.7
Fe (mg/L)	23; 17.5; 7.5	2,000; 1,010; 176
COD (mg/L)	628; 177; 1	17,900; 2,230; 2,000
N (mg/L) (nitrate & nitrite)	70; 31; 8.76	5.5; 4.79; 1.5

Although many of the highest concentrations in each of the parameter were from the same facility, there was extreme variation in the concentrations for each of the parameters.

The extreme variation in concentrations from one sample to another within a given facility for a given parameter makes it challenging for an agency to accurately determine whether a facility should be labeled as high risk. For example, in Hillsborough County the three highest concentrations for zinc were from different facilities and the values were 8.53 mg/L, 1.25 mg/L and 0.74 mg/L (Figure 4.1.2.1).

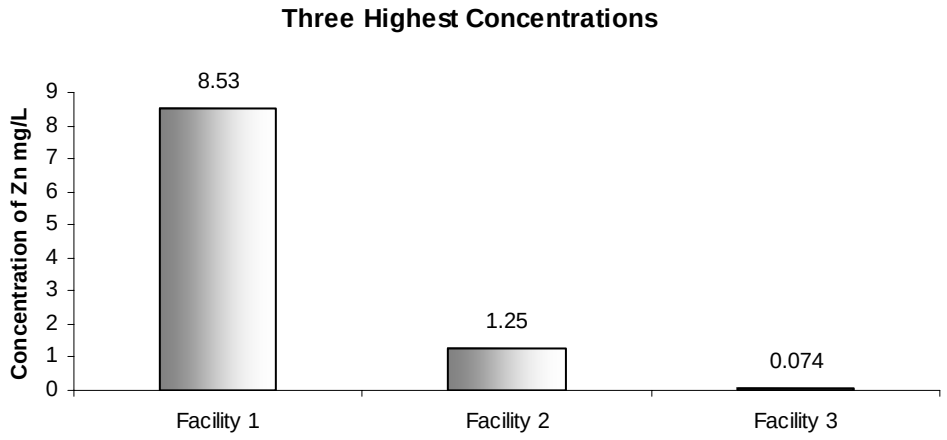

Figure 4.1.2.1: Three Highest Concentrations

There was a 7.79 mg/L difference between the highest and third highest concentration for zinc. Also, the two highest concentrations, 8.53 mg/L and 2.09 mg/L, were from the same facility, taken from the same discharge location four months apart. Sample result 8.53 mg/L was taken in April 2002 and 2.09 mg/L was taken in August 2002. There is a difference of 6.44 mg/L. Another sample taken from the same facility five months later yielded zinc at a concentration of 2.09 mg/L. The concentration values

for zinc show how concentration variations can change over time within a facility (Figure 4.1.2.2).

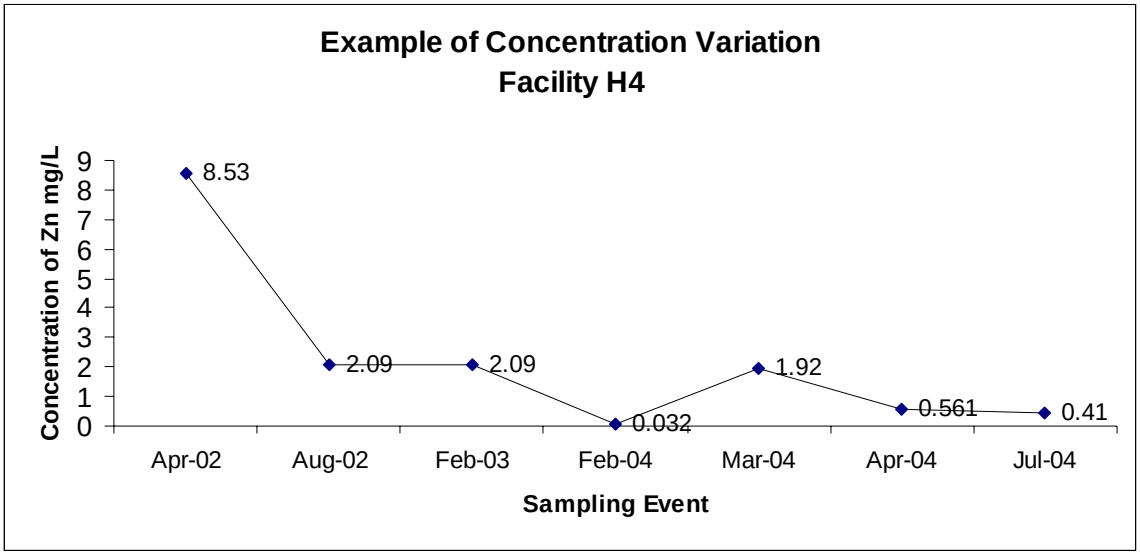

Figure 4.1.2.2: Example of Concentration Variation Facility H4

Due to the extreme variation in pollutant concentrations, it would be difficult for a regulatory agency to accurately assess an industrial facility's output to stormwater based on the results of the analytical monitoring data. Variation may be caused by multiple reasons such as untrained sampling personnel, change in the activities of a facility, discharge location, and the amount of rainfall.

4.1.2.2 Representativity of Data

The representativity of the data can depend on the relationship of a given parameter monitored to the activities conducted by a facility, the sampling frequency, and storm variability. Sampling frequency and storm variability will be discussed in detail below. Previous research has determined that analytical monitoring data in California could not be used to identify differences in discharges from different types of industries

(Stenstrom, 2005). The SIC a facility reports under may not represent the activities contributing pollutants to stormwater runoff (Duke et al, 1999). Since stormwater analytical monitoring requirements are structured around SICs, this can lead to the wrong parameters being monitored, which can cause monitoring data variability.

4.1.2.3 Sampling Frequency

Analytical monitoring must be conducted on a quarterly basis in years two and four of the federal MSGP permit. The facility may be exempt from fourth year monitoring if the average results from the second year monitoring are below benchmark levels set by U.S. EPA. If a facility has one discharge location and was exempt from fourth year monitoring, the agency would have results from four samples to represent the facility's activities over a five year period to determine whether a facility has a high potential to discharge pollutants at high concentrations. Current regulations allow for sampling frequency to be low. At a maximum a facility with one discharge is required to take eight samples during a five year permit cycle if not waived from fourth year analytical monitoring. The sampling frequency required under the MSGP regulations do not produce sufficient amount of data results in order to assist with the identification of potential high polluting facilities.

In Hillsborough County, the analytical monitoring results were sparse. Out of 42 facilities required to conduct analytical sampling, there were only 425 samples taken through out the permit cycles being issued from 2001-2005 with expiration dates from 2006-2011. In addition, there were 14 discharge monitoring reports (DMR) submitted by facilities to the FDEP for MSGP permits issued in 2001-2005 that were blank and other facilities submitted incomplete DMRs. One facility, H19, had six sample sites, sampled

in the second and fourth year of the permit cycle and submitted seven blank DMRs out of the 42 samples taken. Even if regulations are followed correctly, samples taken by facilities are low and do not produce enough information regarding the types of potential pollutants being discharged by a facility.

Unlike Florida, the California MSGP requires samples to be taken twice annually. The first sample is to be taken during the first storm of the wet season and one other sample is to be taken only once after. This allows a maximum of ten samples to be taken over a five year permit cycle. Ten samples are to represent the activities a facility conducts outdoors. In Los Angeles County from 1998-1999, there were a total of 4,474 samples taken from industrial facilities with some industrial facilities have multiple discharge locations. California has a different sampling frequency then Florida, but the amount of samples taken still does not provide for sufficient results to assist in identifying potential high polluting facilities.

In addition to requiring a small number of samples to be taken for analytical monitoring, there are sampling waivers available under the MSGP that allows facilities to be exempt from sampling or the sampling event is postponed. One type of sampling waiver allows for a facility not to conduct sampling if the facility is inactive and unstaffed thereby making sampling with the permit specifications not possible (U.S. EPA, 1999). One facility,H17 in Hillsborough County submitted a letter to FDEP stating the facility was unable to conduct MSGP analytical monitoring for the past two years due to a high turnover rate of staff.

Facilities have many opportunities to justify to the regulatory agency why sampling might not have taken place. It is up to the discretion of the state agency whether

or not to accept the reasons why sampling did not take place. If a large number of facilities are waived from analytical monitoring, it makes it difficult for regulatory agencies to identify high polluters.

4.1.2.4 Storm Variability

Storm variability can have an immense impact on samples facilities taken for analytical monitoring. Grab samples must be collected from the discharge of a facility after a storm event that is greater than 0.1 inches in magnitude and that occurs at least 72 hours from the previously measurable storm event. The permit allows for temporary waivers from analytical monitoring based on adverse climatic conditions. If samples cannot be collected within a specified sampling period due to insurmountable weather conditions, such as drought or hurricane, the facility must collect a substitute sample from a separate qualifying event in the next sampling period. The substitute sample must be taken in addition to the routine monitoring required for that period (U.S. EPA, 1999). In order for a sample to be collected, a discharge resulting from a storm must occur. In Hillsborough County from 2001 to present, there were four facilities which indicated that no discharge had occurred during their sampling period. In addition, one facility, H10, had not had a discharge in over four years. Situations like those for facility H10 may be contributed to low rainfall in a given year or unsuitable sampling locations. If a sampling location is at the outfalls of a retention or detention pond, then the pond must exceed its capacity before a discharge occurs. In Florida, were rainfall is frequent, sampling from a measurable storm event may not be as problematic as it would be in Los Angeles County, where the frequency and magnitude of storm events can be variable.

4.2 Assessment of Pollutant Loads to Receiving Waterbodies

In order to confidently assess pollutant loading to receiving water bodies, enough facilities to form a representative sample need to be known and representativity among facilities needs to be assessable. Each facility in the sample also needs to monitor rigorously enough to ensure confidence that the facilities discharges are well described. The research does the following:

4.2.1 Identification of potential pollutant contributors

4.2.1.1 Industry Sectors and SICs Required To Conduct Analytical Monitoring;

4.2.1.2 Facilities within a Given Jurisdiction Required To Conduct Analytical Monitoring and;

4.2.1.3 Identification of Required Parameters to Be Analyzed By Sector Subsector/SIC.

4.2.2. Evaluation of Current Analytical Monitoring Results for Load Assessment

4.2.2.1 Measure of Concentration vs. Load And;

4.2.2.2 Sample Frequency and Representativity.

4.2.1 Identification of Potential Pollutant Contributors

4.2.1.1 Industry Sectors and SICs Required to Conduct Analytical Monitoring

Industrial facilities that may be potential pollutant contributors to receiving waterbodies must first be identified to determine where the potential sources of pollution may be originating. The same issues in the identification of industrial facilities previously discussed directly apply in determining pollutant loading to waterbodies. Identifying

facilities required to conduct analytical monitoring under the MSGP is a starting point in attempting to assess pollutant loads to receiving waterbodies. The number of facilities within an area is essential in order to understand representativity.

The identification of industrial facilities within a given jurisdiction required to conduct analytical monitoring will assist in determining potential pollutant contributors.

4.2.1.2 Facilities within a Given Jurisdiction Required to Conduct Analytical Monitoring

The process previously discussed on determining facilities within a given jurisdiction required to conduct analytical monitoring can be applied to the approach of assessing pollutant loading to waterbodies. One of the issues when trying to assess pollutant loading in a waterbody using analytical monitoring results is that facilities required to conduct analytical monitoring are only required to have selected parameters analyzed.

4.2.1.3 Identification of Required Parameters to be Analyzed by Sectors or Subsectors/SICs

Through the U.S. EPA's analysis, they determined the parameters that needed to be monitored for by each sector or subsector/SIC (F.R. Vol.60, No. 189). In the analysis, the U.S. EPA identified potential pollutant(s) which may be directly related to industrial activities of the industry sector or subsector/SIC. The MSGP identifies which parameter(s) are required for analytical monitoring. If the U.S. EPA did not identify a potential pollutant in the sector or subsectors/SIC, then the permit does not require monitoring for that pollutant (F.R. Vol.60, No. 189).

For the majority of sectors or subsector/SIC, analytical monitoring is required for only two parameters. The majority of facilities monitor for total suspended solids (TSS).

In Hillsborough County, other common parameters monitored include copper (Cu), zinc (Zn), aluminum (Al), iron (Fe), chemical oxygen demand (COD), and nitrogen including nitrates and nitrites (N). Each sector or subsectors/SIC is required to monitor for one or more of the before mentioned parameters. In Los Angeles County, all of the industrial facilities receiving coverage under the MSGP must monitor for TSS, pH, specific conductance, total organic carbon (TOC), oil and grease (O & G), and "any other parameter likely to be present in significant quantities after two consecutive sampling events" (CA MSGP 1992). The parameters both counties monitor for are TSS, Cu, Zn, Al, Fe, COD, and N.

The total maximum daily loads (TMDL) program under the CWA, requires jurisdictions to identify all sources of given pollutants in a watershed of an impaired waterbody. Each jurisdiction has a list of impaired waterbodies. The top five causes of impairments to waterbodies in Florida and California are identified in Table 4.2.1.3.1.

Table 4.2.1.3.1: Top Five Causes of Impairments to Waterbodies in Florida and California

General Impairment Name	Cause of Impairment Reported	Percent of Reported
Florida		
Oxygen Depletion	567	28
Nutrients	553	27
Pathogens	375	18
Turbidity	209	10
Metals (other than mercury)	178	9
California		
Pesticides	343	18
Pathogens	311	17
Metals (other than mercury)	247	13
Nutrients	147	8
Sediments	131	7

In Florida, the leading cause of impairment to waterbodies is oxygen depletion. Under the oxygen depletion general impairment name, COD is one of the listed impairments but only one case was reported, while dissolved oxygen has the most causes reported, 492. The metals (other than mercury) general impairment category has similar cases reported of impairments as the required monitored parameters under the stormwater regulations, such as Zn and Pb. The similar parameters are COD, Cu, Fe, Pb, and Zn (Table 4.2.1.3.2)

Table 4.2.1.3.2: Top TMDL Parameters in Florida

General Impairment Name	Cause of Impairment Reported	Percent of Reported
COD	1	0.2
Cu	20	11
Fe	49	28
Zn	4	2
Pb	53	30

The leading causes of impairments in California are pesticides. Under the general impairment name for metals (other than mercury) there were only 247 reported cases. OF these, five metals are specified for industrial discharge monitoring, Al, Cu, Fe, Pb, and Zn.

In both states, most of the parameters required to by monitored under the stormwater regulations were not the parameters that contribute to the majority of impairments under the TMDL program. In order for the coordination of the two programs, stormwater and TMDL, to work successfully, both programs needs to be concerned with the same parameters when assessing pollutant loading to waterbodies.

4.2.2 Evaluation of Current Analytical Monitoring Results for Load Assessment

4.2.2.1 Measure of Concentration vs. Load

While the MSGP analytical monitoring measures concentrations of pollutants in runoff, other CWA programs need to know the pollutant load. Concentration in water is the mass of a substance in a given volume of water (Webster, 2006).Conversely, load is the total mass per unit of time of matter or thermal energy that is introduced into a receiving waterbody. In order to correctly assess the amount of a given pollutant entering

a receiving waterbody, the determination of that pollutant's load or loading would be more accurate than measuring concentration.

Knowledge of pollutant loads in runoff from facilities can assist watershed managers make better decisions and allocations that may require those loads to be revised. The analytical monitoring results could assist in the allocation of TMDLs if the pollutant loads were measured and every facility was required to conduct analytical monitoring. However, as previously mentioned the sampling frequency required under the MSGP is low and so does not adequately capture the amount of pollutants being discharged.

4.2.2.2 Sample Frequency and Representativity

As discussed in the previous section, the sampling required by the regulations is infrequent, and in turn the data are not representative over time of the pollutants being discharged by the industrial facility. Facilities in the two counties, especially Hillsborough County, took very few samples and the concentrations of the monitored parameters varied greatly from sample to sample. The regulations in Florida and California do not require enough samples to be taken by the facilities to produce sufficient data to be representative to determine with a high degree of confidence the amount of loading occurring from industrial facilities into receiving waterbodies.

4.3 Documentation of Improvement

Receiving coverage under the MSGP permit requires the permittee to develop a stormwater pollution prevention plan and implement best management practices (BMP) to reduce pollutant loads discharged. These are intended to reduce pollutant loads over

time. One of the intents of the monitoring requirements is for facilities to document improvements to their discharges over time. This section evaluates the stormwater regulations and reported data to determine the possibility of identifying changes in pollutant loads over time. The telephone survey assisted in determining if facility operators are using the monitoring results to document any changes occurring in their discharge.

4.3.1 Monitoring Specified by MSGP

As previously mentioned, the MSGP has three types of monitoring requirements; visual examination, analytical monitoring, and compliance monitoring. For the purpose of this research, the focus is on visual examination and analytical monitoring.

Visual examination and analytical monitoring has the potential to serve as a tool in documenting improvements overtime. The U.S.EPA believes visual examination provides a simple, low cost, and immediate means of assessing water quality of stormwater discharge (F.R. Vol. 60, No. 189). While visual examination cannot assess the chemical properties of stormwater discharge, it can perhaps provide meaningful results upon which a facility may act. One of the goals of visual examination is to relate the results of the examination to potential on-site sources of pollutant contamination (F.R. Vol. 60, No. 189). All the results from a visual examination are to be recorded and kept on file at the facility.

Analytical monitoring allows the permittee to better ascertain the effectiveness of their SWPPP. This is another way for a facility to document their improvements overtime. The analytical monitoring results are reported in quantitative concentration values for different pollutants and can easily be compared to results from other sampling

events, other facilities, or to national benchmarks. This type of monitoring allows a facility to evaluate the development and implementation of their SWPPP (F.R. Vol. 60, No. 189) as well as detect any trends that might be occurring in their discharges.

Although the MSGP requirements have specified various ways in which a facility has the potential to document improvements over time, the analytical monitoring requirements under perfect compliance do not provide for sufficient data to detect trends. Under perfect compliance, analytical monitoring requires quarterly samples to be taken in years two and four of the permit cycle. A total of eight samples are taken during the duration of the five year permit cycle, assuming the facility has one discharge location and the sampling is conducted correctly. The sampling frequency and sample representativity of analytical monitoring is too low to detect any trends that might be occurring in the facilities discharge. The sparse and/or incomplete data results inhibit a facility's ability to accurately document improvements over time or detect any trends.

4.3.2 Telephone Survey

The telephone survey was developed to provide insights regarding visual observations, visual examinations, analytical monitoring, and the uses of the monitoring data by a facility for any purpose.

The majority, 97%, of facilities who participated in the telephone survey, 44% were facilities not required to conduct analytical monitoring (NR) and 56% were facilities required to conduct analytical monitoring (R), indicated they conducted visual observations at their facility. Seventy-one percent of all of the participating facilities indicated they used the information from the observation to make changes to their monitoring plans, or to update their SWPPP with 48% of the facilities (NR) and 52% (R).

However, participants indicating they use the information from the visual observations to make changes to their monitoring plan, or to update their SWPPP did not disclose what types of changes they make or have made. While visual observations are not required under the MSGP, many facilities are conducting these observations and using the information gathered to make management decisions. The high percentage of facilities indicating they conduct visual observations can be attributed to what is considered to be visual observations. A walk through of the facility in the morning, as one facility revealed, can be considered a type of visual observation. Visual observation refers to when someone inspects the facility, during dry periods or during times when rain is running off, to look for possible stormwater pollutant problems. This is not to be confused with the required visual examination monitoring.

The visual examination monitoring section of the telephone survey revealed that 82%, 57% (NR) and 43% (R), of the participating facilities conducted visual examinations. Out of these, 93 % were involved in developing their facility's visual examination protocol. This is an indicator as to how familiar the participant is with his or her facility and the activities conducted on-site. The visual examination monitoring provides instant qualitative feedback on facilities discharges, while enabling a facility operator to evaluate the activities conducted on-site to determine the origin of pollutants found in the discharge. This provides the facility with the opportunity to document the facilities progress in its ability to decrease pollutants into stormwater overtime.

The analytical monitoring section of the telephone questionnaire revealed only 62%, 21 participating facilities conducted analytical monitoring. Of these, 35% were waived from fourth year monitoring of the current permit cycle, and 18% were waived

from fourth year monitoring during the pervious permit cycle. This low percent of facilities waived from fourth year monitoring is an indicator that the majority of facilities required to conduct analytical monitoring are discharging pollutants at concentration of concern. Facilities are required to monitor during the fourth year of the permit only if the average concentrations in year two of the permit exceed the benchmark concentration levels set forth by U.S. EPA.

Under the MSGP monitoring regulations, a facility should have sufficient data from visual and analytical monitoring to notice if there have been any improvements in the amount of pollutants being discharged into stormwater, especially since the majority of the facilities are required to monitoring during the fourth year of the permit. Under perfect compliance, a facility with one discharge location, not waived from fourth year analytical monitoring, should have eight analytical monitoring sample results and 20 visual examination sample results to assist he facility operator at determining if there has been any improvement or change from sample to sample. However, the sample frequency and representativity is too low for 100 percent confidence, but can serve as an indicator as to whether further analysis needs to be conducted. Of the facilities who conducted analytical monitoring, the majority did not appear to be using the results from their monitoring to reassess the activities of a facility in order to determine if any improvements have occurred or more facilities might be waived from fourth year monitoring.

The telephone survey revealed that 48 %, 63% being (R), of the participants have not revised their monitoring plans such as adding samples or visual observation sites based on previous findings. However, 16 facilities did revise their monitoring plan but

the questionnaire did not reveal what or how they revised their monitoring plan. The remaining three percent of the facilities indicated they did not know if the monitoring plans had been revised. The three percent of facilities indicating they did not know if the monitoring plans had been revised can be attributed to some facilities indicating they outsource the stormwater monitoring to consultants. One facility operator revealed he did not know anything about the stormwater regulations or monitoring requirements because the facility hires a consultant to do all of the work. Of these facilities, 59%, 50% (NR) and 50% (R) indicated they included particular equipment or activities that were not previously addressed in the SWPPP. Overall, 38% of the responding facilities did not include particular equipment or activities that were not previously addressed in the SWPPP but this indicates 62% of the participants are required to conduct analytical monitoring. These participants identified problems with runoff, potential pollutants and/or located potential on-site pollutant sources. A few facilities even indicated that monitoring results were used to maintain and uphold internal recording, to improve controls being used, to evaluate the site, and to correct potential problems.

Even though the monitoring requirements under the MSGP have issues regarding low sampling frequency, waivers/exemptions, poor representativity, and low frequency to detect trends, many of the facilities who conduct analytical monitoring are attempting to use the results for internal evaluations. This indicates the data results have the potential to be used to document improvements overtime and detect trends. However, if a facility does not have adequate data to evaluate the progress or regression of a facility, then it is impossible to document with confidence any trends or improvements that might be occurring.

4.4 Self-Evaluation

The fourth possible use of monitoring data is to determine if a facility operator can use the monitoring results for self-evaluation. The following sections of the telephone questionnaire provided insight on the facility operators' perspective on the possibility of self evaluation:

1. Visual observations of the facility;
2. Visual examination monitoring;
3. Analytical monitoring;
4. Training; and
5. Uses of data.

4.4.1 Visual Observations of the Facility

Nearly all of facilities participating in the telephone survey stated that they conducted visual observation at their facilities 97%. As mentioned previously, the high percentage of facilities conducting visual observations can be attributed to the simplicity of what is considered a visual observation. Visual observations are either performed once a quarter or whenever they feel it is needed. The majority, 81% of the visual observations are conducted at stormwater outfalls and over half of the outfalls are from retention or detention ponds. The limitation to conducting visual examinations at retention or detention pond outfalls are the observer is unable to link any observed color or odor to the source of the activity because the pond is a mixture of many pollutants and is unable to determine when the pollutant release occurred because the pond stores pollutants over

time. Outfalls are places where the stormwater leaves the facility such as a ditch or channel that leads to as offsite drainage channel or pond. Other visual observation locations are included in Table 4.4.1.1.

Table 4.4.1.1: Visual Observation Locations

	Responses from a total of 36 facilities					
Visual Observation Locations	**Yes**		**No**		**Do not have**	
	NR*	**R***	**NR***	**R***	**NR***	**R***
Roof drainage, downspouts, or other drains were water runs off building roofs	10	6	5	12	1	2
Total	16		17		3	
Roof surface, equipment on roof or the like	10	7	3	9	3	4
Total	16		12		7	
Loading docks, unloading areas of the like	13	11	0	5	3	4
Total	24		5		7	

Table 4.4.1.1: Continued

Visual Observation Locations	Responses from a total of 36 facilities					
	Yes		No		Do not have	
	NR*	R*	NR*	R*	NR*	R*
Vehicle parking areas for service of delivery	12	15	0	4	4	1
Total	27		4		5	
Vehicle maintenance areas	2	6	0	3	14	11
Total	8		3		25	
Outdoor equipment	8	10	0	7	8	3
Total	18		7		11	
Facility fenceline	11	12	3	9	0	1
Total	23		12		Doesn't Know	

* NR- not required to conduct analytical monitoring
R- required to conduct analytical monitoring

Besides retention or detention ponds, most facilities conducted visual observations around vehicle parking areas for service or delivery, loading docks, unloading areas, and/or the fenceline. However, a greater number of facilities not required to conduct analytical monitoring conducted visual observations at roof drainage, downspouts, or other drains were water runs off building roofs, roof surfaces, equipment on roof or the like, and loading docks, unloading area of the like, while a greater number of facilities required to conduct analytical monitoring conduct visual observations around vehicle parking areas for service of delivery, vehicle maintenance areas, outdoor equipment and the facility fenceline.

In addition, the facilities required to conduct analytical monitoring 71% do not conduct visual observations at roof drainage, downspouts or other drains were water runs off buildings roofs and 75% do not conduct visual observations on roof surfaces, equipment or the like. These locations have the potential to carry pollutants into stormwater runoff that originate from various sources such as, hear ventilating and air condition units or air compressors located on the roofs of the industrial facilities. However, of the facilities who performed visual observation, 71%, 48% (NR) and 52% (R), responded that they used the information to make changes to their monitoring plans or to update their SWPPP.

4.4.2 Visual Examinations

Under the MSGP, visual examination monitoring is required by all facilities receiving coverage under the permit. Visual monitoring is when someone in the facility collects discharge samples for visual examination. Even though all facilities are required to conduct visual examinations, six out of 34 facilities indicated that they do not. In addition, there were many facilities that indicated they outsourced the monitoring and were not familiar with the MSGP requirements. However, out of those facilities that do conduct visual examinations, 93%, 44% (NR) and 55 (R), personally took part in developing the protocol. Taking part in the protocol is an indicator of how well the facility operator is familiar with the activities conducted on-site and the MSGP permit requirements.

The sampling locations for the visual examinations were similar to the visual observation locations. The majority, 93%, of the participating facilities took samples at outfalls, while 30% of facilities required to conduct analytical monitoring sampled from

one or more on-site areas with industrial activities, outdoor equipment, and/or material storage. Out of 25 facilities, 13 sampled at outfalls originating from retention or detention ponds, while the other 12 facilities sampled from other locations. Of the 13 facilities sampling from outfalls originating from retention or detention ponds, six facilities were not required to conduct analytical monitoring, while seven facilities are required to conduct analytical monitoring. The majority of the 13 facilities sampling from retention or detention ponds sampled from retention ponds.

Sampling from a retention or detention ponds obscures a pollutant's origin. A retention pond is where the water is kept on-site until (usually) the water is absorbed into the ground. During a heavy rain event the retention pond can overflow allowing sampling to occur. A detention pond is where the flow of the water is held back somewhat, for example to allow sediments to settle, and then discharges into storm drains offsite, usually after every substantial rainfall. The ponds may contain a mixture of pollutants that may have originated from numerous activities conducted on-site. The design and size of the retention and detention ponds can vary. In many cases, a discharge occurs only when the capacity of the pond is exceeded making sampling difficult. If a discharge does not occur, sampling can not take place. This means that the polluted water can remain in the ponds for any given length of time. This can make it difficult to identify which activity is discharging a pollutant, how often and in what concentrations. In addition, sampling from a pond complicates a facility's evaluation because the samples will not be linked to the activities being conducted on-site and the pollutants being discharged at a given time.

Facilities are required to examine samples for specific parameters. The parameters required to be observed during visual examination by participating facilities are shown is Table 4.4.2.1. The majority of facilities observed all of the parameters .Other parameters not required to be examined but were predominantly observed were TSS and floating particles.

Table 4.4.2.1: Parameters Observed During Visual Examination: Number of Facilities Observing Each Parameter.

Parameter Observed	**Not Required to Conduct Analytical Monitoring**		**Required to Conduct Analytical Monitoring**	
	No.	**%**	**No.**	**%**
Oily Sheen	14	52	13	48
Cloudiness	14	52	13	48
Color	14	52	13	48
Odor	14	52	13	48
Other	5	27	13	72

4.4.3 Analytical Monitoring

As mentioned, analytical monitoring is required under the MSGP for specific industrial sectors and subsectors/SICs. Out of the 34 participating facilities, 21 indicated that they conducted analytical monitoring. Of the 21 facilities indicating they conduct analytical monitoring, five facilities are not required to conduct analytical monitoring. The five facilities not required to conduct analytical monitoring but indicated they do, report under SICs 3731, 3299, 3663 and the other two are unknown. All three of the known SICs, 3731, 3299 and 3663, industrial activities are different and are in different sectors.

The facilities participating in the telephone survey appeared to be either in their second year of the five year permit cycle or just after. Half of the facilities had conducted the second year analytical monitoring requirements for their current permit cycle while the other half of the facilities had not and only 35%, 14% (NR) and 86% (R), of the facilities had conducted their fourth year monitoring. A greater percentage, 71% of facilities indicated they did conduct second year analytical monitoring during the previous permit cycle. This is an indicator of the facilities operators' knowledge of previous monitoring which can in turn assist in the next monitoring cycle and familiarity with facility. However, only half of the facilities were aware that the facility's fourth year monitoring can be waived, if the results of the second year monitoring show no constituents exceed the benchmark concentration shown in the regulations. This is an indication that not many facility operators are familiar with the MSGP permit requirements. In addition, only 18% of the participating facilities were waived from the fourth year analytical monitoring for its previous permit cycle in which only one facility waived is required to conduct analytical monitoring. This means the majority of facilities were discharging pollutants at concentrations of concern during the second year sampling. Although, half of the facilities indicated they would collect samples during the fourth year even if they are not required, 68%. Conversely, 80% of the facilities being required to conduct analytical monitoring, indicated they had not collected samples at additional times, other than the required second and fourth year monitoring.

The majority, 86%, of the participating facilities took their samples for analytical analysis from outfalls. However, only 42% of the outfalls are from retention or detention ponds and 62% of the facilities indicated they do not sample from one or more on-site

areas with industrial activities, outdoor process equipment, and/or material storage. Of the 62% facilities indicated they do not sample from one or more on-site areas with industrial activities, outdoor processes equipment, and/or material storage, 69% are required to conduct analytical monitoring. A few facilities indicated they sampled from places of drainage, such as where the stormwater drains into the city sewer or into the facility's main drains. Other sampling locations were not mentioned by the facility operators.

A list of common parameters that were analyzed by industrial facilities in Hillsborough County is shown in Table 4.4.3.1. The additional parameters that many facilities mentioned they analyzed for were chemical oxygen demand (COD) and oil and grease (O&G). Total suspended solids were the most common parameter analyzed while copper was the least.

Table 4.4.3.1: Parameters Each Facility Analyze

Parameter	**Not Required to Conduct Analytical Monitoring**		**Required to Conduct Analytical Monitoring**	
	No.	**%**	**No.**	**%**
TSS	4	24	13	76
N (nitrate & nitrite)	3	38	5	63
Al	3	38	5	63
Fe	4	40	6	60
Zn	4	45	5	55
Cu	4	57	3	43

4.4.4 Training

Participating facilities that provided training to their personnel is shown is Table 4.4.4.1. Most facilities provided training on recognizing evidence that pollutants may be

in stormwater, such as water color or oiliness in runoff during wet weather events. A few facilities did indicate that their entire facility was trained on overall environmental issues including stormwater, while other facilities had just one person trained or outsourced the monitoring work. The majority of the facilities had more than three trained personnel on staff. However, training on sampling or sample handling was not provided to personnel by any facilities.

Table:4.4.4.1: Types of Training Provided

Types of Training	**Not Required to Conduct Analytical Monitoring**		**Required to Conduct Analytical Monitoring**	
	No.	**%**	**No.**	**%**
Identify locations where evidence of potential stormwater pollutants may be found	12	46	14	54
Recognize evidence that pollutants may be exposed to stormwater	14	47	16	53
Overall aspects of stormwater regulations as they apply to the facility	14	52	13	48
State-wide mulit-sector general permit for industrial stormwater discharges	13	57	10	43
Environmental issues in general related to stormwater	14	48	15	52

4.4.5 Uses of the Data

This section of the telephone questionnaire was designed to determine in what way facilities used the information obtained from monitoring. Facilities indicating they

use the monitoring results Table 4.4.5.1 and facilities indicating they do not use the monitoring results Table 4.4.5.2.

Table 4.4.5.1: Facilities Indicating They Use the Analytical Monitoring Results

	Required to Conduct Analytical Monitoring	**Not Required to Conduct Analytical Monitoring**
Revise Monitoring Plan	50%	50%
Modify SWPPP	50%	50%
Identify Stormwater Runoff Issues	54%	46%

Table 4.4.5.2: Facilities Indicating They Do Not Use the Analytical Monitoring Results

	Required to Conduct Analytical Monitoring	**Not Required to Conduct Analytical Monitoring**
Revise Monitoring Plan	63%	38%
Modify SWPPP	63%	38%
Identify Stormwater Runoff Issues	60%	40%

The results from the telephone survey regarding the uses of monitoring results differed from those facilities not required to conduct analytical monitoring from those required to conduct analytical monitoring. Out of the 33 participants, 16 facilities revised the monitoring plan and 16 facilities had not and one facility did not know. Out of the 16 facilities that had revised the monitoring plan, half were not required to conduct analytical monitoring and half were required to conduct analytical monitoring. Conversely, 10 out of the 16 facilities that had not revised the monitoring plan were facilities required to conduct analytical monitoring.

Twenty participating facilities indicated that they used the information obtained from monitoring to modify the SWPPP to include particular equipment or activities that were not previously addressed in the SWPPP. Some participating facilities indicated they use the results to ensure compliance, internal purposes, to correct potential problems, but

not facility gave any examples of the way they specifically use the monitoring results. Half of the twenty facilities were not required to conduct analytical monitoring and the other half were required to conduct analytical monitoring. However, the facilities required to conduct analytical monitoring were the majority out of the 38% who has not modified the SWPPP.

Some facilities indicated they use the information to improve the controls being used and evaluate the site, while conversely, one facility indicated they use the monitoring protocol from their original Phase I & II audits from the 1960s. For example, one facility operator noticed there was sediments in the runoff from the facility and changed the groundcover in an area were the sediment was originating.

The industrial facilities SICs the U.S. EPA has indicated to released pollutants at concentrations of concerns by the nature of the industry to conduct additional monitoring other than visual examination, in order to ensure pollutants are not being released through their discharge, are the majority of facilities not using the monitoring results to revise the monitoring plan or modify the SWPPP. The proportion of facilities required to monitor that use the results is smaller that the proportion not required. Thirty-eight percent of the facilities indicated they have identified problems with runoff, potential pollutants and/or located potential on-site sources and majority of facilities will reapply for MSGP permit coverage.

Through the telephone survey, unexpectedly, industrial facility operators indicated they are attempting to use the monitoring results for self-evaluation purposes including those not required and required to conduct analytical monitoring. In order for an industrial facility to adequately evaluate the facility, the operator must go beyond the

monitoring protocol specified in the stormwater regulations in order to obtain sufficient monitoring result.

5.0 DISCUSSION

5.1 Facility Operator's Knowledge of Stormwater Regulations

There were six potential facilities out of 36 conducting analytical monitoring sampling correctly. The six potential facilities were the facilities that appeared to be conducting sampling correctly from the analytical monitoring results based on the discharge location, year, and month the sample was taken. The majority of the facilities appeared to be in the third year of the five year permit cycle. However, the majority of the potential facilities samples were over benchmark concentrations. Aluminum was the most monitored parameter, which usually was over the benchmark concentration.

Only two of the six facilities participated in the telephone survey. Three of the six were passive refusal, while one facility actively refused to participate in the telephone survey. Facility H33 outsourced the analytical monitoring to a consultant and relied on the consultant's stormwater regulations and monitoring experience. Facility H33's operator responded that he did not know if there was a fourth year monitoring waiver offered to facilities and hoped the consultant was aware of the waiver. However, both facilities participating in the telephone survey revealed they update their SWPPP as needed but did not indicate how or what has been updated.

The incorrect sampling by most facilities can be attributed to the lack of knowledge facility operators may have of the stormwater regulations. For instance, one facility did not know if the facility had sampled during the second year of the facilities current permit cycle, while another facility did not know if samples were being taken at

outfalls. Two facilities did not know if additional samples had been taken at other times then (THAN?) the required second and fourth year and thirteen facilities did not know if the facility was waived from fourth year monitoring. Surprisingly, six facilities were not aware of the waiver for fourth year monitoring, while four facility operators responded that they did not know when asked if they were aware of the waiver.

The lack of knowledge some facility operators appear to have about stormwater monitoring requirements is an indicator to the reason there appears to be large number of facilities not complying with the stormwater regulations correctly. This supports the argument of poor compliance with the stormwater regulations among industrial facilities.

5.2 Structure of stormwater regulations

The intent and goal of the stormwater regulations is to decrease pollutants being discharged at concentrations of concern from industrial facilities can be seen throughout the requirements. However, the requirements only lay the foundation in achieving this goal. The three tools SWPPP, BMPs, and monitoring set the stage in the attempt by the federal government at trying to reduce pollutants being discharged into stormwater runoff. The regulations are written with two opposing goals of project the environment and not placing more burden on the regulated community. The monitoring regulations for stromwater, appear to attain the latter goal better that the former goal.

The requirements under the SWPPP are very detailed and require a lot of work by the facility, while still allowing the flexibility for facilities to choose the BMP that best fits their activities. The facility is required to develop, implement, and keep onsite the SWPPP, but does not have to submit the SWPPP to the state. Therefore, many facilities

develop a SWPPP the first time the facility receives MSGP permit coverage. This SWPPP will remain the same with little change through out the years and through many permit cycles. Facility operators revealed they use the monitoring results to update or change the SWPPP or monitoring plans, but the analytical monitoring data submitted to the state suggests otherwise. The sparse analytical monitoring results provided by the facilities do not provide sufficient information to serve as reliable feedback. The results would not support decisions to update or change the SWPPP or monitoring plan in any major way other than name changes. The structure of the monitoring requirements contributes to the inaccuracy in the monitoring results, in turn not being sufficient to incorporate into the SWPPP or monitoring protocol.

The current monitoring requirements, under perfect compliance, attempt to provide enough information to determine if pollutants are being discharged in concentrations of concern. However, the sampling frequency and representativity as previously discussed inhibit the use of the data to make any conclusive determinations. The benchmarks set forth by the U.S. EPA only are used to determine if fourth year analytical monitoring needs to take place. There are no substantial regulatory repercussions for facilities analytical monitoring results to be over benchmark concentrations. In order to achieve the goals and intent of the stormwater regulations, analytical monitoring only one year out of the five year duration of the permit, for facilities the U.S. EPA has determined to have a high potential to discharge a pollutant at concentrations of concern does not assist in reducing pollutants being discharged into stormwater runoff.

Another challenge facing compliance under the stormwater regulations are facilities that were constructed before the implementation of the stormwater regulations. Through the telephone survey, facility operators offered information regarding new facilities verse older facilities build before there was a concern for stormwater runoff. The newer facilities are able to incorporate stormwater drainage designs into the layout of the facility prior to construction in order to accommodate for the activities conducted on-site that might discharge pollutants. One design that appears to be common among facilities is to have the entire facility all drain to one point on the facilities property were monitoring takes place. This single point of drainage is usually a retention or detention pond. The main issue with this type of design is trying to correlate pollutants to its origin, since all the runoff accumulates at one point. In addition, some retention and detention ponds are designed to hold a large quantity of water. For example, one participating facility's pond was designed to withstand the 100 year storm. In this case, the pond would not usually overflow causing no discharge to occur and therefore no monitoring would take place. The monitoring requirements need to be structured to produce more reliable and accurate data in order for facilities to better utilize the information.

5.3 Limitations

This research was successful at evaluating four possible uses of the monitoring data obtained under the MSGP permit and obtained facility operator's perspectives. Limitations to the findings include issues regarding the runoff data, sample size, reliability, and insurance.

The monitoring data results from the discharge monitoring reports submitted to FDEP were vary sparse. One explanation for the sparse data is the nature of the

stormwater regulations. As demonstrated through this research, the number of samples industrial facilities are required to take during the duration of the permit is minimal. The monitoring results did not inhibit the objectives of this research.

The sample size of industrial facilities available for participation in the telephone survey included all facilities receiving coverage under the MSGP permit in the manufacturing sectors. Hillsborough County is among the highest industrial counties in Florida and therefore was one of the reasons the county was chosen. The sample size for the purposes of this research was large enough not to affect the results.

Another potential limitation to this research is the reliability of the participant's responses to the telephone survey. When dealing directly with human participates there is always the chance of the participant's response not to be reliable. However, steps in this research, such as sending out an introductory letter and insuring confidentiality were taken in order to assist in the attempt to increase the response rate as well as increase the reliability of the participants.

Site visits to industrial facilities would have been a way to insure the accuracy in the responses to the telephone survey; however, this step was out of the scope of this research and should be considered for future research.

5.4 Future Research

This research has gained information on industrial facilities' perspective of monitoring data through a telephone survey. The telephone survey revealed that facility operators claim they conduct visual observations and use the data for self evaluation purposes. Future research needs to accompany a regulatory authority to inspect and evaluate the facilities SWPPP and their visual examination records. This will determine if

the information provided in the telephone survey was accurate and will discover how often changes or modifications are made to the SWPPP. In addition, on-site visits would provide more detailed information regarding how facilities are attempting to comply with stormwater regulations by using the tools the regulations offer for compliance.

5.5 Recommendations

The structure of the MSGP permit requirements was a good first attempt at decreasing the discharge of pollutants into stormwater runoff. However, the compliance tools, SWPPP, BMPs and monitoring needs to be better enforced by the regulatory agency. The regulatory agencies need to be more involved with facilities in order to work more closely with them in achieving compliance. In addition, visual observations should be required by the regulations and need to be conducted at least on a monthly basis to ensure the activities being conducted onsite are not contributing to stormwater runoff. The sampling requirements for both visual examinations and analytical monitoring need to be changed. Sampling needs to occur more often in order to get representative samples to determine the types of pollutants being discharged. Facilities need to be aware of the types of pollutants that have the potential to be discharged at their facility and have the samples analyzed for the applicable parameters. All documents and/or results need to be submitted and reviewed by the regulatory agencies. This will assist in achieving a higher compliance rate if facilities knew their information was being reviewed.

These recommendations to the stormwater regulations may cause more of a burden on the facilities. Some type of incentives need to be offered to those facilities complying correctly and do not have pollutant discharge issues. On incentive option is to waive or reduce the permit fees. Another incentive is a quick permit processing time. For

facilities that have continually not had pollutant discharge issues can apply to be waived from monthly visual examinations to only quarterly examinations. These recommendations could improve monitoring requirements so that facility monitoring data can be used to improve the agencies' abilities to protect the water quality of stormwater through the regulations for industry.

6.0 CONCLUSIONS

The first specific objective of this research was to evaluated the extent to which industrial facility monitoring data collected under the regulations for stormwater discharges associated with industrial activities supported the goals and objectives of those regulations from two viewpoints: first, whether the goals and objectives of the regulations are supported by the data as currently available, given the current implementation of the monitoring program under the industrial stormwater regulations; and second, whether the goals and objectives of the regulations would be supported if the regulatory requirements were perfectly implemented under full compliance with the regulations as designed and intended.

Under the current implementation of the MSGP monitoring program under the industrial stormwater regulations the monitoring results do not fully support the goals and objectives of those regulations. This research evaluated four possible uses of monitoring data and determined if the current program was meeting any of those uses.

The sampling frequency, represenativity, and variation in the monitoring results taken by the industrial facilities does not allow for the intended protection of the receiving waterbodies. Many facilities do not take the required amount of samples necessary under the MSGP.

The MSGP monitoring requirements of the stormwater regulations under perfect compliance do not allow for the goals and objectives of those regulations to be met. The monitoring requirements, especially the analytical monitoring requirements require only a

minimal amount of samples to be taken. Visual examinations, if performed correctly, have the potential to provide the most feedback to a facility as to pollutants in the discharge as well as carry out the goal and objectives of the stormwater regulations. This is because visual examinations required 20 samples to be taken during the duration of the five year permit which is more than the analytical monitoring requires. Even though analytical monitoring is required only for the industry sectors or sub-sectors that were determined by the U.S.EPA to have a high potential to discharge a pollutant at concentrations of concern are only required to sample four times a year if being waived from fourth year monitoring and have one discharge location. Four samples are suppose to represent the on-site activities conducted at an industrial facility over a five year period.

The second objective was to evaluate the extent to which industrial facilities monitoring data can support the needs or goals of related policies and regulations of the United States, such as other Clean Water Act regulations or other policies designed to protect water quality. The monitoring programs were evaluated from the same two viewpoints, assessing the data as currently collected and evaluating the data's potential usefulness under the case of perfect compliance with the monitoring requirements of the regulations.

The industrial facilities monitoring data does not support the needs or goals of related policies and regulations of the United States. The MS4 required under the CWA requires permittees to identify facilities having a high risk of contributing pollutants to stormwater runoff. The low sample frequency, representaivity and variation in the industrial facilities analytical monitoring results can not identify with confidence

potential high risk polluters. In addition even under perfect compliance, the sample frequency required by the MSGP monitoring requirements does provide for sufficient results.

The industrial facility analytical monitoring data does not support the goals and objectives of the CWA's TMDL program even under perfect compliance. The sampling frequency, representativity and variation of the samples do not provide for sufficient data when assisting with the TMDL program. In addition, the parameters required to be analyzed for under the MSGP are not always the same causes of impairments to waterbodies listed under the TMDL program. The MSGP measures the parameters in concentrations while the TMDL program measurements are in loads. The two types of measurements are not comparable. This difference is an inhibitor in trying to use the industrial facilities analytical monitoring data to meet or assist in meeting the goals and objectives of the TMDL program.

This research assessed the perspectives of the regulated community toward the monitoring requirements and the extent to which they make use of the results of their required monitoring. This assessment evaluated one other category of use of the monitoring requirements that has been identified as a potential benefit of the regulations.

Industrial facility operator's indicated from the telephone survey they use the monitoring results for self evaluation purposes. However, not many facilities made changes to their monitoring plans or SWPPP as an outcome of the monitoring data results. Conversely, the sparse analytical monitoring results suggest many facilities are not conducting analytical monitoring regularly or correctly. Many facilities indicated they are conducting visual observations at their facilities on a regular bases, which might be in

turn the information facility operators are using for self evaluation instead of using the analytical monitoring results.

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APPENDICES

Appendix 1: List of Acronyms

Al	Aluminum
BMP	Best Management Practices
CAFO	Concentrated Animals Feed Operations
C. F. R.	Code of Federal Regulations
COD	Chemical Oxygen Demand
Cu	Copper
CSWRCB	California State Water Resource Control Board
CWA	Clean Water Act
DEP	Florida Department of Environmental Protection
DMR	Discharge Monitoring Report
EPA MSGP	Environmental Protection Agency Multi Sector General Perm
F.A.C.	Florida Administrative Code
Fe	Iron
FDEP	Florida Department of Environmental Protection
ITB	Institutional Review Board
mg/l	Milligrams Per Liter
MS4	Municipal Separate Storm Sewer System
N	Nitrogen
NAICS	North American Industry Classification System
NR	Not required to conduct analytical monitoring
NOI	Notice of Intent
NOT	Notice of Termination

Appendix 1: Continued

NPDES	National Pollutant Elimination System
NRDC	National Resource Defense Council
NURP	Nationwide Urban Runoff Program
O&G	Oil & Grease
OMB	Office of Management and Budget
ppm	Parts Per Million
R	Required to conduct analytical monitoring
SIC	Standard Identification Code
SQG	Small Quantity Generator
SWPPP	Stormwater Pollution Prevention Plan
TMDL	Total Maximum Daily Load
TOC	Total Organic Carbon
TSS	Total Suspended Solids
U. S. EPA	United States Environmental Protection Agency
Zn	Zinc

Appendix 2: Telephone Survey Introductory Letter

Printed on USF letter head
Date

Individual Name (if available)
Environmental Compliance Manager
Facility Name
Address
City, FL Zip

We are contacting you as part of a research project learning about industrial facilities in Hillsborough County. We are a research team at the University of South Florida, conducting independent research on industrial storm runoff and its regulation in Florida. We would like to talk to you about your facility at (XXXXXX Address XXX), and we plan to phone you soon to ask that you share some information about that facility.

Recently, new state and county regulations were adopted regarding stormwater runoff and its effect on the environment. These regulations and their implementation requirements affect your business. Environmental protection is important to Hillsborough County citizens, contributing to their overall quality of life. However, environmental protection may also be burdensome to industry and businesses, such as yours.

Our purpose in conducting this research is to learn more about the possible uses of monitoring data that is required to be conducting under the Florida Multi Sector Generic Permit. The research results will be useful for determining how effectively environmental regulations are written and how they can be improved in ways that benefit both the environment and businesses. This research may also help to decrease the regulatory burden for facilities such as yours throughout Hillsborough County and across the nation.

Someone from the USF team should be contacting you by phone in the coming weeks to ask a series of questions about your facility. It is very important that we speak with the person responsible for environmental management and who is familiar with the monitoring requirements of the Florida Multi Sector Generic Permit at this particular facility. If this letter has been addressed to the wrong individual, please direct it to the correct environmental staff person or manager. The phone call should take only a few minutes of your time.

Information about your facility was gathered through public record from the Florida Department of Environmental Protection. This research has been approved by the USF Institutional Review Board, with a carefully designed protocol.

We look forward to speaking with you soon, and we thank you in advance for your assistance.

Sincerely,

Kelly L. Gleaton
Graduate Student Researcher

L. Donald Duke, Ph.D., P.E.
Associate Professor

Appendix 3: Telephone Survey

USF Industrial Stormwater Monitoring Questionnaire: 2006 Code: _____

INDUSTRIAL FACILITIES STORMWATER RESEARCH: MONITORING REQUIREMENTS

PRIOR TO COMPLETING THIS QUESTIONNAIRE: FILL IN ALL AREAS HIGHLIGHTED IN GRAY, THROUGH PAGE 6, WITH INFORMATION FROM THE NOI FILES.
PUT FACILITY CODE ON EVERY PAGE.

1. BUSINESS/COMPANY NAME:
_____

2. PERMIT NUMBER:
_____

3. DATE ORIGINAL PERMIT INITIALLY ISSUED:
_____

4. DATE CURRENT PERMIT ISSUED: 5. DATE CURRENT PERMIT EXPIRES:
_____

CONTACT INFORMATION

(NOT president/responsible signer, BUT person listed as "contact"**)**

6. CONTACT'S NAME: _____

7. CONTACT'S TITLE: _____

8. PHONE NUMBER / EXTENSION**:** _____

Calling History

Call#	Date:	Time:	Phone#	Person Spoken To:	Caller's Initials:
#1					

Appendix 3 (Continued)

USF Industrial Stormwater Monitoring Questionnaire: 2006 Code: _____

#2 _____

#3 _____-

#4 _____

#5 _____

GREETING:

"Hello, may I please speak with _____?

(IF NO CONTACT NAME, WRONG NAME, OR PERSON NO LONGER WORKS AT FACILITY**)**

"Then could you please tell me who is responsible for environmental compliance? I would like to speak to someone regarding stormwater runoff, and the compliance with stormwater permits."

9. CONTACT'S NAME:

_____

"What is their correct title and extension?"

10. CONTACT'S TITLE:

_____

11. PHONE NUMBER AND/OR EXTENSION: _____

"Thank you. Could you please connect me to (him or her)?

IF CONTACT PERSON IS NOT AVAILABLE AT THIS TIME:

"What is the best day and time to reach (him or her)?

Day: _____ Time _____

Appendix 3 (Continued)

USF Industrial Stormwater Monitoring Questionnaire: 2006 Code: _____

AFTER WE HAVE REACHED THE PERSON IDENTIFIED ABOVE AS THE CORRECT CONTACT PERSON:

> ***"Hello. My name is _____ I am a student researcher at the University of South Florida, here in Tampa. We're doing a study on industrial facilities and stormwater runoff in Hillsborough County and we would like to talk with you about your facility.***

12 ."Are you the person who is in charge of complying with the stormwater permit?

(IF ASKED**)** ***"The Florida statewide Generic Permit for industrial stormwater"***

12. Yes [1] No [2] Don't Know [3]

Comments:_____

13. **(**IF NO TO QUESTION 12**)** ***"Could you please tell me who that person is?"***
(IF YES TO QUESTION 12, PROCEED TO QUESTION 14**)**

13. Person's name_____

WHEN YOU HAVE THE CORRECT CONTACT PERSON, BEGIN THE INTERVIEW

14. ***"I am part of an independent, unpaid research group generating information on stormwater regulations for industries in Hillsborough County. Participation in this study is optional and you may withdraw at any time. We will not provide any information from these conversations to any government agency, and we will not use your name or the company's name in any publication or report. We hope to use the information to make recommendations that could make the regulations more useful and less burdensome to business. The questionnaire should take no more than 10 or 15 minutes. Would you mind taking a few minutes to answer some questions for me?"***

Appendix 3 (Continued)

USF Industrial Stormwater Monitoring Questionnaire: 2006 Code: _____

PARTICIPANT HAS GIVEN CONSENT TO PARTICIPATE IN QUESTIONNAIRE
14. YES[1] NO[2]

IF CONSENT GIVEN, PROCEED WITH THE INTERVIEW TO QUESTION 15 (NEXT PAGE)
IF HAS QUESTIONS SEE BELOW

(IF NO**)** ***"Is there a better time that I could call back?***

ENTER DAY:_____
TIME:_____

"Thanks. I look forward to speaking with you then."

(IF REFUSAL**)** ***"Ok, thank you for your time."***

(IF QUESTIONS ABOUT OVERALL NATURE OF THE RESEARCH**)** ***"I am part of an independent, unpaid research group generating information on industries in Hillsborough County. We are conducting a 6-month study on industrial stormwater regulations and how they affect Hillsborough County industrial facilities. As a result of your participation, we hope to make recommendations to the State and the County about the stormwater regulations, how they could be more useful, and ways they could be less burdensome to business."***

(IF QUESTIONS "WHY ME?"**)** ***"We are phoning people from about 100 facilities in Hillsborough County that are complying with the statewide stormwater permit. We acquired your name from the state's list of complying facilities, in records of the Florida Department of Environmental Protection.***

(IF QUESTIONS ABOUT USE OF THE RESEARCH**)** ***"We are not checking on compliance, and we are not working for the state. This is independent research through the University of South Florida. The questions we have relate only to your facility's choices of how to comply with these regulations, not to any private business information or any personal opinions. To safeguard confidentiality, this research has been approved by the USF Institutional Review Board. That is an independent body that verifies our procedures to assure protection for research participants."***

Appendix 3 (Continued)

USF Industrial Stormwater Monitoring Questionnaire: 2006 Code: _____

(IF QUESTIONS ABOUT WHO IS CALLING**)** ***"This research is conducted by the Department of Environmental Science and Policy at University of South***

Florida, supervised by Professor Don Duke. I can give you contact information if you would like to verify that."

PROVIDE NAME AND NUMBER IF REQUESTED

Professor Don Duke, (813) 974-8087, or by e-mail at ldduke@cas.usf.edu.

15. (IF YES TO PARTICIPATION**)** ***"Great. before we get started I'd like to know if you received the letter we sent you, letting you know we would be calling?*** (WAIT FOR RESPONSE.)

15. Yes [1] No [2]

(IF NO**)** ***"Would you like to receive another copy for you to keep in your records?"***

16. WOULD THE PARTICIPANT LIKE ANOTHER COPY OF LETTER

16. Yes [1] No [2]

(IF YES**) "Would you like me to mail or fax the letter to you?**

TAKE THE INFORMATION IF REQUESTED.

_____
_____
_____
_____
_____

Section I: INTRODUCTION and FACILITY INFORMATION

"First, could you please confirm the information we have for this facility?

Appendix 3 (Continued)

USF Industrial Stormwater Monitoring Questionnaire: 2006 Code: _____

17. "Is the correct name of the company that operates this facility:

_____

17. Yes [1] No [2]

18. (IF NO**)** ENTER CORRECTION:

_____

19. "Is the correct facility address: 19. Yes [1] No [2]

ADDRESS:_____

CITY: _____ZIP: _____

20. (IF NO**)**: ENTER CORRECTION:

ADDRESS:_____

CITY: _____ZIP: _____

21. "Is this where the facility is physically located?" 21. Yes [1] No [2]
(NOT SIMPLY THE MAILING ADDRESS)

22.* (**IF NO**) "Do you know what the physical street address is?
22. Yes [1] No [2]

23. ADDRESS:_____

CITY: _____ZIP: _____

24. "Could you tell me the approximate size of the facility within the following ranges? Is the facility"…

(A) Less than ½ acre _____[1] (B) Between ½ and 1 acre _____[2]
(C) Between 1 and 3 acres _____[1] (D) Between 3 and 10 acres_____[4]
(E) Larger than 10 acres _____[5]

25. Comments:

_____

Appendix 3 (Continued)

USF Industrial Stormwater Monitoring Questionnaire: 2006 Code: _____

"Our information shows the facility's main business activities are:

DON'T READ OFF THE SICs!!
FIRST, ENTER BUSINESS ACTIVITIES AND THEN FILL IN THE SIC(s) LISTED ON PERMIT:

26. Activity #1

_____

Is that correct? Yes [1] No [2] SIC ___/___/___/___ *(27)*

28. Activity #2

_____

Is that correct? Yes [1] No [2] SIC ___/___/___/___ *(29)*

30. Activity #3

_____

Is that correct? Yes [1] No [2] SIC ___/___/___/___ *(31)*

32. "Do you have any other on-site industrial activities that I have left out?"

32. Yes [1] No [2] Don't Know [3]

(IF YES**) "Could you please describe them?"**

33. Activity #1

_____

SIC ___/___/___/___ *(34) (for the researcher to fill in later)*

35. Activity #2

_____

SIC ___/___/___/___ *(36) (for the researcher to fill in later)*

USF Industrial Stormwater Monitoring Questionnaire: 2006 Code: _____

Section II: VISUAL OBSERVATIONS OF THE FACILITY

"First, I'd like to ask about the visual observation that may be part of your Stormwater Pollution Prevention Plan. Visual observation is where someone inspects the facility, during dry periods or during times when rain is running off, to look for possible stormwater pollutant problems."
(IF QUESTIONS:) ***"The purpose is to determine where any on-site activities might be contacted by stormwater in a way that could lead to pollutants entering the runoff after it rains."***

37. "Does your facility conduct that kind of visual observation?"

37. Yes [1] No [2] Don't Know [3]

38. (IF YES TO QUESTION 37***) "Approximately how often?"***

Once or twice in a five-year permit period_____[1]
Once a year_____[2]
Once a quarter_____[3]
Once a month_____[4]
Periodically, as you feel it's needed_____[5]

39. (IF YES TO PERIODICALLY:) ***"About how often would you say?"***
_____
_____

40. "Do you find you make use of that information in any way, for example to make changes to your monitoring plans, or to update your pollution prevention plan?"

40. Yes [1] No [2] Don't Know [3]

41. "*Which, if any, of the following kinds of areas at the facility do you or your staff observe? I have a short list":*

42. "Do your facility personnel do this observation for stormwater outfalls?"

(IF QUESTION**)** "***Outfalls are places where the stormwater leaves your facility, something like a ditch or channel that leads to an offsite drainage channel or pond"***

Yes [1] No [2] Don't have any channelized outfalls[3] Don't Know [4]

43. "Do you conduct the observations for any retention ponds or detention ponds?"

(IF QUESTION**)**: ***"By that I mean, holding ponds on your facility where rainwater collects, and either later runs off or remains there until it evaporates or seeps into the ground"***

Yes [1] No [2] Don't have any [3] Don't Know [4]

(IF QUESTION**)** ***"Just so you know how I'm using those terms: A Retention pond is where you keep the water onsite until it (usually) all enters groundwater, but sometimes it overflows after a heavy rain, so it may be sampled only during those overflows. A DEtention pond is where the flow is held back somewhat, for example to allow sediments to settle, and then discharges to storm drains offsite, usually after every rainfall of any substantial amount***."

44. "Does your facility have on-site any retention ponds or detention ponds?"

No Don't Know[2]

(IF YES) REtention _____[3] How many ponds _____[4]

DEtention _____[5] How many: ponds_____[6]

45. "Getting back to visual observations: Do your facility personnel conduct observations at places of roof drainage, that is, downspouts or other drains where water runs off building roofs?"

Yes [1] No [2] Don't have any [3] Don't Know [4]

46. "Do you go up on the roof and look at the roof surface, equipment up there, or the like?"

Yes [1] No [2] Don't have any [3] Don't Know [4]

47. "Do your facility personnel do this observation for loading docks, unloading areas, and the like?"

Yes [1] No [2] Don't have any [3] Don't Know [4]

48. "Vehicle parking areas for service or delivery?"

Yes [1] No [2] Don't have any [3] Don't Know [4]

49. "Do your facility personnel do this observation for vehicle maintenance areas?"

Yes [1] No [2] Don't have any [3] Don't Know [4]

50. "Does your facility personnel do this observation for outdoor equipment?"

Yes [1] No [2] Don't have any [3] Don't Know [4]

51. "At your facility, would you say that you have extensive outdoor equipment, such as concrete mixing, chemical processes, or something similar? Or on the other hand do you have only minor outdoor equipment such as air compressors, air conditioning or air handling, and similar items?

Extensive equipment_____[1] Minor, small items of equipment_____[2]

Don't know/unable to say_____[3] Other (medium-size or other comment)_____[4]

52. "Would you say you have extensive outdoor materials storage- bulk solid materials like sand or concrete, metal scrap, or liquid storage tanks? Or on the other had do you have only small materials storage, such as a few dumpsters or small scrap piles?"

Extensive equipment_____[1] Minor, small items of equipment_____[2]

Don't know/unable to say_____[3] Other (medium-size or other comment)_____[4]

53. "Do your facility personnel do this observation around the facility fencelines, for instance locations where water might leave the facility?"

53. Yes [1] No [2] Don't Know [3]

54. "Are there any other locations where you conduct observations that I have not mentioned?

54. Yes [1] No [2] Don't Know [3]

(IF SO**)***, "Would you please briefly describe them for me?"*

55._____

_____

56._____

_____

57._____

_____

58._____

_____

Section III: VISUAL EXAMINATION MONITORING

"Next I would like to ask about the visual examination and analytical monitoring that is a part of the Permit requirements for stormwater discharges. Visual monitoring means someone in the company goes out and collects samples of runoff for examination. Analytical monitoring is when the samples collected from the discharge locations are sent to a certified laboratory to be analyzed, and the results are submitted to the state in your monitoring reports. Does your facility conduct one or both of these types of monitoring?

59.	**Visual Examination Monitoring**	Yes [1]	No [2]	Don't Know
60.	**Analytical Monitoring**	Yes [1]	No [2]	Don't Know

61.Comments:_____

NOTE: ALL FACILITIES ARE SUPPOSED TO CONDUCT VISUAL EXAMINATIONS BUT NOT ALL FACILITES ARE REQUIRED TO CONDUCT ANALYTICAL MONITORING.

IF NO TO VISUAL MONITORING AND YES TO ANALYTICAL
THEN GO TO SECTION IV - PAGE NUMBER 11

IF THE FACILITY DOES NOT CONDUCT EITHER VISUAL OR ANALYTICAL MONITORING, THEN PROCEED TO SECTION VII – PAGE NUMBER 18

"First I have a few questions regarding visual examination monitoring conducted at your facility."

62. "Do you take part in developing the visual examination protocol?"

62. Yes [1] No [2] Don't Know [3]

*"**How would you describe the sampling locations, I have a short list:"***

63. "Are samples taken at the outfalls?"

63. Yes [1] No [2] Don't Know [3]

64. (IF YES TO QUESTION 63**)** ***"How many outfalls"*** _____

65. Comments:_____

"Is the outfall from a retention or detention pond?"

IF QUESTION: ***"As opposed to a surface channel onsite, or drainage directly from the facility"***

66. Yes, from retention/detention pond _____[1] No _____[2] Don't Know _____[3]

67. Outfall from REtention _____ How many locations :_____

68. Outfall from DEtention _____ How many locations:_____

(check if yes)

69. Comments: _____

70. "Do your facility personnel sample from one or more on-site areas with industrial activities, outdoor process equipment, material storage, or the like?"

70. Yes [1] No [2] Don't Know

71.* (**IF YES TO QUESTION 70**)** ***"If so, would you please describe the sample locations?"

72._____
_____

73._____
_____

74._____
_____

75. "Are there any other locations I have not described where you collect samples?"

75 Yes [1] No [2] Don't Know [3]

Appendix 3 (Continued)

USF Industrial Stormwater Monitoring Questionnaire: 2006 Code: _____

76 .(IF YES TO QUESTION 75) ***"If so, would you please describe?"***

(also enter any other Comments):

77._____
_____

78._____
_____

79._____
_____

Overall comments regarding sampling locations:
80._____

_____

81. "Does the facility take additional samples for visual examination, that is, more often than the QUARTERLY samples that are required during the duration of the permit?"

81. Yes [1] No [2] Don't Know [3]

82. (If YES TO QUESTION 81***) "Approximately how often do you take additional samples?"***

Once or twice in a five-year permit period[1]_____ Once a year[2]_____

Once a quarter[3]_____ Once a month[4]_____

Periodically, as you feel it's needed or useful [5]_____

83.(if yes to "periodically"): "*About how often have you done this*?"

83. _____

84. Comments: _____

USF Industrial Stormwater Monitoring Questionnaire: 2006 Code: _____

85. "When samples are taken for visual examination, what types of parameters are observed, such as:

oily sheen	86. Yes [1]	No [2]	Don't Know [3]
cloudiness	87. Yes [1]	No [2]	Don't Know [3]
color	88. Yes [1]	No [2]	Don't Know [3]
odor	89. Yes [1]	No [2]	Don't Know [3]
Are there any others?	90. Yes [1]	No [2]	Don't Know [3]

Others:
91._____
92._____
93 _____

94. Comments:
_____

<u>Section IV ANAYLTICAL MONITORING</u>

"Now I have a few questions regarding analytical monitoring, that is, collecting samples of runoff and having them sent out for analysis at a certified laboratory."

(IF QUESTIONS**)** ***"Analytical monitoring is where someone goes out and takes samples at discharge locations around the facility after a rainfall when stormwater is running off, and then sends the samples to a certified laboratory to be analyzed."***

95. "Is your facility one of the ones in Florida that is required to conduct analytical monitoring?"

95. Yes [1] No [2] Don't Know [3]

96. Comments:
_____

IF NO TO QUESTION 29, PROCEED TO SECTION V – PAGE NUMBER 14, QUESTION 135.

97. "Has the facility conducted its 2nd year monitoring requirement for its current permit cycle?"

97. Yes [1] No [2] Don't Know [3]

98. Comments: IF NO, "Why Not?"

_____

99. "Did the facility monitor conduct its 2nd year monitoring during its previous permit cycle?"

99. Yes [1] No [2] Don't Know [3]

100. Comments:

_____

IF NO TO QUESTION 97, PROCEED TO QUESTION 104

101. "Are you aware that the facility's required 4th year monitoring can be waived, if the results of the 2nd year monitoring show no constituents exceeded the "benchmark" concentrations shown in the regulations?"

102. Yes [1] No [2] Don't Know [3]

103. "Is the facility waived from the 4th year analytical monitoring for its current permit cycle?"

103. Yes [1] No [2] Don't Know [3]

104. "Was the facility waived from the 4th year analytical monitoring for its pervious permit cycle?"

104. Yes [1] No [2] Don't Know [3]

105. Comments:
_____

106. "Will you collect samples during the 4th year, even if they are not required?"

106. Yes [1] No [2] Don't Know [3]

107. Comments:
_____

"***How would you describe the sampling location(s)? I have a short list, and these are the same as I asked earlier for the visual examination monitoring"***

108. "Are samples taken at the outfalls?"

108. Yes [1] No [2] Don't Know [3]

109. (IF YES TO QUESTION 108**) *"How many outfalls"*** _____

110. Comments:
_____

111. "Is the outfall from a retention or detention pond?"
IF QUESTION: ***"As opposed to a surface channel onsite, or drainage directly from the facility"***

111. Yes, from retention/detention pond __[1] No __[2] Don't Know _____[3]

112. Outfall from REtention _____ How many locations :_____

113. Outfall from DEtention _____ How many locations:_____
(check if yes)

114. Comments:
_____

115. "Do your facility personnel sample from one or more on-site areas with industrial activities, outdoor process equipment, material storage, or the like?"

115. Yes [1] No [2] Don't Know [3]

116. **(**IF YES TO QUESTION 105**)** ***"If so, would you please describe the sampling locations?"***

117._____
_____

118._____
_____

119._____
_____

120. "Are there any other locations I have not described where you collect samples?"

120. Yes [1] No [2] Don't Know [3]

121.**(**IF YES TO QUESTION 120) ***"If so, would you please describe?"***

(also enter any other Comments):

122._____
_____

123._____
_____

124._____
_____

125. Overall comments regarding sampling locations:
_____
_____

126. "Have you collected samples at additional times, other than the required 2nd year and 4th year monitoring?"

126. Yes [1] No [2] Don't Know [3]

127. Comments:

_____

128.* (**IF YES TO QUESTION 126**) *"Approximately how often have you taken additional samples?"

Once or twice in a five-year permit period[1]_____

Once a year[2]_____

Regularly, once a quarter[3]_____

Every time the pond overflows [4]_____

Periodically, as you feel it's needed or useful [5]_____

129. (if yes to "periodically"): "*About how often have you done this*?"

129._____

130. Comments: (including, any other description of how often they've sampled)

_____

_____

131. "The stormwater permit requires the facility to have the samples analyzed for just a few parameters. If you know offhand, can you tell me which parameters you analyze for, such as":

total suspended solids	132. Yes [1]	No [2]	Don't Know [3]
***nitrogen (nitrate & nitrite*)**	133.Yes [1]	No [2]	Don't Know [3]
aluminum	134. Yes [1]	No [2]	Don't Know [3]
iron	135. Yes [1]	No [2]	Don't Know [3]
zinc	136. Yes [1]	No [2]	Don't Know [3]
copper	137. Yes [1]	No [2]	Don't Know [3]

138. "Are there any other parameters I did not mention that you analyze for?"

138. Yes [1] No [2] Don't Know [3]

(IF YES TO QUESTION 138**)** ***"What other parameters?"***

139. _____

140. _____

141. _____

142. _____

143. _____

144. _____

SECTION V. TRAINING

NOTE Need to do this section if respondent answered "yes" to EITHER the analytical or the visual monitoring. If "no" to BOTH then omit this section.

"What kind of training do you provide to the personnel who conduct the field sampling and sample handling? I have a short list –"

145. "Do you train them in how to identify locations at your facility where evidence of potential stormwater pollutants may be found?"

145. Yes [1] No [2] Don't Know [3]

146. "Do you train them how to recognize evidence that pollutants may be exposed to stormwater, such as observing color or oiliness in runoff during wet weather events, or similar?"

146. Yes [1] No [2] Don't Know [3]

147. "Do you train them in some of the overall aspects of stormwater regulations as they apply to your facility?"

147. Yes [1] No [2] Don't Know [3]

148. "Do you train them in particulars of the statewide multi-sector general permit for industrial stormwater discharges?"

148. Yes [1] No [2] Don't Know [3]

149. "Do you train them on environmental issues in general related to stormwater, such as potential for environmental harm by pollutants?"

149. Yes [1] No [2] Don't Know [3]

150. "Does your facility provide any other types of training to your monitoring personnel that I have not mentioned?"

150. Yes [1] No [2] Don't Know [3]

(IF YES TO QUESTION 150**)** ***"Would you please briefly describe it?"***

151._____
_____
152._____
_____
153._____
_____

154. **(**IF YES TO ANY OF THE ABOVE QUESTIONS**)** ***"How many trained personnel do you have on staff?"***

(A) 1 _____[1](B) 2 – 3 _____[2] (C) More than 3, How Many _____[3]

155. Comments:
_____

Section VI: USES OF THE DATA

NOTE Need to do this section if respondent answered "yes" to EITHER the analytical or the visual monitoring. If "no" to BOTH then omit this section.

USF Industrial Stormwater Monitoring Questionnaire: 2006 Code: _____

"We are almost finished. I would like to ask you just a few questions regarding the way you use the information obtained from monitoring."

"Would you say that you or your staff have ever used anything you've found from your monitoring results – either the visual or the analytical results? For example, have you used the results to:"

156. "Revise the monitoring plan, such as; adding sampling or adding visual observation sites based on previous findings?"

156. Yes [1] No [2] Don't Know [3]

157."Has the facility ever modified the facility's Stormwater Pollution Prevention Plan?"

(IF QUESTIONS**)** ***"To include particular equipment or activities that were not previously addressed in the Stormwater Pollution Prevention Plan."***

157. Yes [1] No [2] Don't Know [3]

158."Has the facility ever identified problems with runoff, potential pollutants and/or located potential on-site source?"

158. Yes [1] No [2] Don't Know [3]

159. "Are there any other purposes the facility has used the monitoring results for?"

159. Yes [1] No [2] Don't Know [3]

(IF YES TO QUESTION 159**)** ***"Could you please briefly describe the uses?"***

160._____
_____

161._____
_____

162._____
_____

163. Comments:

_____

_____

164. "Do you know if your company has ever revised or updated the Stormwater Pollution Prevention Plan for your facility?"

"I mean, in any major way, more than for example changing some staff names or some actions' dates?"

(IF QUESTIONS**)** ***"Perhaps because your operations have changed or because some of your monitoring results have suggested some new aspects that you could address in the Plan."***

(A) Yes, one time that I know of during the most recent permit cycle _____[1]
(B) Occasionally – more than once during the most recent permit cycle _____[2]
(C) With every new permit coverage _____[3]
(D) Don't Know _____[4]
(E) Other _____[5]

165. Comments:

_____

166."Some facilities find they can modify their operations or equipment so they do not need to apply for coverage under the stormwater permit. Do you expect your facility may do this? Or, alternately, do you plan to apply for coverage for this facility again when your current five-year permit expires?"

166. Yes (will reapply) _____[1] No (hope not to reapply) _____[2]
Don't Know _____[3]

167. Comments:

_____

_____

USF Industrial Stormwater Monitoring Questionnaire: 2006 Code: _____

SECTION VII. CONCLUSION

"That concludes our questionnaire. I appreciate your time and assistance in participating in this research. Do you have any further questions about this research effort?"

(IF HAS CONCERNS OR QUESTIONS**)** ***"I can give you a name and number of the research director at the University of South Florida."***

PROVIDE NAME AND NUMBER IF REQUESTED

Professor Don Duke, (813) 974-8087, or by e-mail at ldduke@cas.usf.edu.

Closing: "Thank you very much for your participation in this study and have a great day!"

168. ADDITIONAL COMMENTS:

_____
_____
_____
_____
_____
_____
_____
_____
_____