City of Cape Coral, FL
Public Works Department

Review of the
Stormwater Maintenance Master Plan

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ABSTRACT

The City of Cape Coral Public Works Department (CITY) has created a "Stormwater Maintenance Master Plan" (SMMP) document that is ultimately intended to identify and quantify operation and maintenance practices, and future needs of the CITY's stormwater management program. Overall, the CITY has gone into great depth in trying to forecast future budgetary and staffing needs of the Maintenance Division. Consideration of expected life cycles and production rates are commendable efforts by the division.

AIM Engineering & Surveying, Inc. has been contracted by the CITY to review the SMMP, and meet with applicable CITY staff and to understand current practices, capabilities, and methodologies related to the CITY's Stormwater Management Program.

The SMMP should include an introduction section which provides more general background and support to the details of each system component. Items could include but are not limited to: background, purpose, scope of report, organizational flow chart, permitting regulations, and inspection requirements. Providing a more general overview of the maintenance system will aid readers who are not as familiar with the inner working of the SMMP facilities as a whole. Much of this information is included in the 'Stormwater Annual Report' that is prepared for each Fiscal Year, which could be either added to or referenced in the SMMP.

The CITY's GIS database is an excellent means of storing, tracking, and reporting various aspects of each system component. It can also serve to schedule inspections and the replacement of system components. There are select columns in the GIS files that are incomplete and other columns that appear to hold unknown or unnecessary information, which could be eliminated if they are not essential.

Level of Service (LOS) criteria applicable to the Public Works and Utilities Departments are included in the Comprehensive Plan. However, specific LOS criteria for the Maintenance Division are not defined in the Comprehensive Plan. Having LOS standards establishes a defensible means to drive the prioritization of maintenance needs based on permitting regulations and required inspection intervals.

Development of stormwater related standard operating procedures (SOP) aids in facilitating consistency in procedures for new staff members, as well as having a written document that can be referenced when appropriate. The Public Works Department should have a written SOP for all stormwater maintenance activities should problems or questions arise as to how the Department is maintaining or replacing select facilities.

The CITY should consider documenting a methodology in the allocation of the annual budget for each of the system components. Such methodology can be reviewed yearly to ensure each component's allocated budget is within reason.

Examples of stormwater maintenance activities per the MS4 permit can be found in Appendix A. References in aiding the development of this SMMP review and recommendations can be found in the Bibliography section of this report in Appendix B.

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1 PURPOSE AND SCOPE

The CITY has created a “Stormwater Maintenance Master Plan” (SMMP) document that is ultimately intended to identify and quantify operation and maintenance practices, as related to the CITY’s stormwater program. The document includes information such as classification of facilities, maintenance activities and schedules, life expectancies, and staffing needs among other information. AIM Engineering & Surveying, Inc. (AIM) has been contracted by the CITY to review the document, meet with applicable CITY staff management to understand current practices, capabilities, and methodologies related to the CITY’s Stormwater Program. AIM will make recommendations for SMMP refinement so it can be used in long-term strategic and annual planning, and budgeting activities related to the stormwater management program.

AIM’s Scope of Services is to evaluate the document and make recommendations for the following:

- Level of Service provided to the Public & Prioritization;
- Comprehensive Plan components to allow for staff (man power) and budget planning;
- Life expectancy of Plan components;
- Proposed maintenance activities and schedule;
- Consistency with applicable permitting criteria;
- How the document compares to similar Plans from other municipalities.

2 FINDINGS AND RECOMMENDATIONS

2.1 INTRODUCTION: BACKGROUND AND SUPPORT

FINDING:

The current SMMP identifies the classification of facilities, maintenance activities and schedules, life expectancies, and staffing needs among other information. However, there is no discussion of items such as general background, purpose, scope of report, organizational flow chart, permitting regulations, or comprehensive inspection requirements.

RECOMMENDATION:

The SMMP should include, or reference to, an introduction section which provides more general background and support to the details of each system component. Items could include but are not limited to: background, purpose, scope of report, organizational flow chart, permitting regulations, and comprehensive inspection requirements. Providing a more general overview of the maintenance system will aid readers who are not as familiar with the inner working of the SMMP facilities as a whole. Much of this information is included in the 'Stormwater Annual Report' that is prepared for each Fiscal Year, which could be either added to or referenced in the SMMP.

2.2 GIS SYSTEM UPDATING

FINDING:

The CITY's GIS database is an excellent means of storing, tracking, and reporting various aspects of each system component. There are, however, select columns in the GIS files that are incomplete, which could be eliminated if they are not essential.

The "Pipes" database has around 5,000 pipe entries of which there is no "Last Inspected" data indicated. It is unclear if an entry of "null" indicates that a given pipe has not been inspected, or if the entry is not up to date with inspection records. There is also a column that indicates "Composite" which appears to not be relevant.

The "Basins" database has around 2,000 entries of which there is no "Last Inspected" data indicated. There is also a column that indicates "Enabled" which appears to not be relevant.

The "Canals" dataset within the GIS database does not include available dredging data that is currently in Microsoft Excel format.

The CITY has a dedicated staff member who is responsible for updating the GIS database with data from other Capital Improvement Projects (such as the Utility Expansion Projects or Roadway Projects) that occur within the CITY.

RECOMMENDATION:

The CITY can consider adding columns which are linked to a condition rating or prioritization. A prioritization can be developed, for example, which rates an inspected pipe by condition to allow staff to query pipes that require attention. Examples which could rank a component higher in priority would be citizen complaints, age or condition, vacant vs developed, and Utility Expansion Project (UEP) efforts. Development of such a system can only be beneficial if the CITY uses the information. An internal review would be needed to discuss the potential application and effectiveness of such an effort.

The CITY should consider filling in incomplete columns such as "Last Inspected." After discussions with CITY staff, it was determined that all the system components have been inspected, and further investigation is needed to determine why the "last inspected" date is not entered throughout the GIS column. An implementation period for GIS updating, to fill the missing entries, can be developed.

After discussions with CITY staff, it was determined that the "Enabled" and "Composite" columns are no longer relevant, and should be deleted from the database.

The CITY should also consider including the Microsoft Excel dredging data into the GIS database so that a query can be run to provide a visual layout of selected canal dredging data. The current GIS database indicates canal name, water type (fresh or salt), last edited date, and canal length/area. It would be beneficial to be able to query canals based on other criteria such as "Last Dredged (yr)," "Average Dredge Depth," or "CITY" vs "Outsourced" dredging.

An efficient philosophy of data entry can be adopted to make the GIS tracking as clear, concise, and user friendly as possible. The CITY should maintain the effort in GIS tracking to provide valuable data for future use. The CITY should consider remote data logging to allow staff to input information directly, thereby avoiding a backlog or missing information.

2.3 LEVELS OF SERVICE

FINDING:

State regulations provide requirements for the adoption of a qualitative assessment of the operating conditions of government infrastructure such as roads and stormwater facilities. The term used in the regulations to characterize this assessment is Level of Services (LOS).

LOS criteria applicable to the Public Works and Utilities Departments are defined in the COCC Comprehensive Plan. However, specific LOS criteria for the Public Works Maintenance Division are not defined in the Comprehensive Plan. Some of the goals, objectives, and policies of the Comprehensive Plan can be used in formulating LOS. Examples of a few relevant items are outlined below:

- Goal 3: Stormwater drainage provisions – adequate stormwater drainage will be provided to afford reasonable protection from flooding and to prevent degradation of quality of receiving waters.
- Objective 3.1: By 2010, the stormwater drainage regulations contained in the City's Land Use and Development regulations will be reviewed and amended to ensure that future development utilized stormwater management systems compatible with an adopted comprehensive stormwater management plan.
- Policy 3.1.1. The Public Works Department will ensure that major drainage systems are inspected on an as needed basis, and that they receive required maintenance.
- Policy 3.1.2. The City will maintain a Stormwater Utility ordinance or an alternative funding system to fund improvements and maintenance of the stormwater drainage system within the City.
- Policy 3.1.3. The City will install a two (2) foot sump in the last accessible catch basin of each drainage system for new systems and as drainage systems are repaired and/or replaced.
- Policy 3.1.4. The City will combine stormwater retention/detention as part of development of public parks.
- Policy 3.1.5. The City will update a capital improvement schedule for correction of deficiencies in the stormwater drainage system based on historic flooding or pollutant loading conditions.

The purpose of specific LOS criteria can provide basis for allocating maintenance and prioritizing replacement resources, pollution source tracing, setting routine inspection and maintenance schedules, and compliance with State and Federal regulations.

New requirements from the federal Clean Water Act and the CITY's National Pollutant Discharge Elimination System (NPDES) permit for the Municipal Separate Storm Sewer System (MS4) require that all storm drainage facilities be properly operated and maintained.

RECOMMENDATION:

The goals and objectives outlined in the COCC Comprehensive Plan can be included to provide consistency between the COCC comprehensive Plan and the SMMP, as well as justification in establishing LOS criteria.

It is recommended to set LOS standards for operation and maintenance of all storm sewer systems in order to ensure proper operation. Operation and maintenance should be done to assure treatment of stormwater or reduction in pollutants in stormwater discharges consistent with appropriate federal, state, water management district, and local rules and permit requirements. Drainage systems are often in or near areas that are also fish and wildlife habitat. Setting LOS standards helps to ensure that stormwater facility maintenance is performed in a manner that adheres to regulations protecting water quality, and fish and wildlife.

The focus in setting LOS standards, for maintenance and operations of the stormwater system, should be on a performance based system. It should use the frequency of inspections of the system to define the LOS. Using actual inspection results to determine the need for maintenance action makes more efficient use of CITY resources. Therefore, only facilities which actually

require maintenance based on quantitative criteria will receive maintenance. Additionally, the inspections will include screening for illicit discharges which enforces the CITY's illicit discharge ordinance. Thus, the inspections will fulfill multiple CITY requirements and make optimum use of limited CITY resources.

An example of an effective LOS structure is referenced below as detailed in the Hillsborough County Stormwater Facility Maintenance Manual, which could be recomposed to conform to the conditions in Cape Coral.

Level of Service for Maintenance and Operations

Level	Definition	Bridge/Canal Crossings Inspected	Roadside Ditches/Swales Inspected	Off System Ditches Inspected & maintained as necessary
A	Optimum program based on unique needs of each segment of drainage system based on individual watershed needs determined in watershed management plans. Inspection of entire system after each 25 year /24 hour storm or equivalent over a 72 hour period.	Quarterly	Critical segments quarterly, all others annually, and all after 25yr/24hr storm or equivalent within a 7 day period.	Annually and after 25 year/24 hour storm
B	"Proactive" Improved program, inspection of entire system after each 50 year/24 hour storm or equivalent over a 72 hour period.	Annually	Critical segments Semi-annually, all others annually, and after 50yr /24 hour storm or larger.	Annually and after 50 year/24 hour storm
C*	Meets minimum National Flood Insurance Program CRS standards and minimum NPDES requirements. Inspection of entire system after each hurricane or 100 year/24 hour storm or equivalent over a 72 hour period.	Every 2 years and after hurricanes or 100year/24 hour storm	Annually, and after hurricanes, or 100 year/24 hour storm.	Every 2 years and after hurricanes or 100 year/24 hour storm
D	"Reactive" maintenance, no scheduled inspection program.	Every 2 years	On demand	On demand
E	"Failure"	Not expected	Not expected	Not expected

*Minimal target level of service

Level of Service for Maintenance and Operations (Continued)

Level	Definition	Canals/Ponds Inspected & maintained as necessary	Structures Inspected & maintained as necessary	Sediment trapping Devices Inspected & maintained as necessary
A	Optimum program based on unique needs of each segment of drainage system based on individual watershed needs determined in watershed management plans. Inspection of entire system after each 25 year /24 hour storm or equivalent over a 72 hour period.	Quarterly	Quarterly	Weekly June-December, quarterly January-May
B	"Proactive" Improved program, inspection of entire system after each 50 year/24 hour storm or equivalent over a 72 hour period.	Semi-annually	Critical structures semi-annually, all others annually and after each 50yr storm or larger.	Monthly June- Dec., Quarterly Jan.-May
C*	Meets minimum National Flood Insurance Program CRS standards and minimum NPDES requirements. Inspection of entire system after each hurricane or 100 year/24 hour storm or equivalent over a 72 hour period.	Twice a year	Every 18 months	Quarterly
D	"Reactive" maintenance, no scheduled inspection program.	On demand	On demand	On demand
E	"Failure"	Not expected	Not expected	Not expected

*Minimal target level of service

2.4 MAINTENANCE PROCEDURES

FINDING:

The Stormwater Maintenance Master Plan does include limited language concerning standard operating procedures for its system components. However, details of such are not presented for every component.

RECOMMENDATION:

A Stormwater Maintenance Manual should be formalized which can be used by internal staff to outline SOPs for maintenance of system components.

Development of a Stormwater Maintenance Manual aids in facilitating consistency in procedures for new staff members, as well as, having a written document that can be referenced by entities. The CITY should have written standard operation procedures for all components should problems or questions arise as to how the CITY is operating, maintaining, or installing stormwater facilities.

For each stormwater facility or activity, this manual could include:

- Brief description of the facility or activity
- List of the goals/outcomes for each facility or activity
- Lists the best management practices (BMPs), which outlines the SOPs to meet general maintenance requirements and water quality regulations including but not limited to: inspection, cleaning, materials handling, vegetation management, repairs, and replacements.

2.5 SYSTEM COMPONENTS

FINDING (GENERAL)

The current rating system does not appear to be an efficient means in placing prioritization for system components. Each component is part of the total stormwater system. For example, it is difficult to compare the safety, flooding, citizen, or water quality priority of stormpipe outfall replacement to that of catch basin inspections. The life expectancy of stormwater facilities has been established by the CITY.

Some components account for a considerable percentage of the total maintenance budget allocation; however a backup methodology is not clearly stated.

RECOMMENDATION:

The current rating language should be excluded from the SMMP with LOS being the focus of prioritization that drives maintenance needs. Allowing LOS standards establishes a defensible means to drive the prioritization of maintenance needs based on permitting regulations and required inspection intervals. A review of the CITY's life expectancy of stormwater facilities are consistent with published industry reports and our experience. The useful life cycle of a component in the stormwater system will allow for strategic planning and budgeting for

replacement. Some component replacements will be handled under an opportunistic approach and not just the life cycle consideration.

The CITY should consider determining a methodology in the allocation of the annual budget for the system components. Such methodology can be reviewed yearly to ensure each component's allocated budget is within reason. For example, although an important aspect of the entire stormwater system, swale grading might not need to consume 22 percent of the annual budget into perpetuity as the backlog of problem areas is reduced. Likewise, the primary goal in canal dredging is stormwater conveyance, with citizen recreational boating needs being a secondary benefit. Although this philosophy may receive numerous complaints, an allocation methodology can prove to be a defensible means to keep budget allocation within the primary goals of the CITY.

2.5.1 Road Crossing Drainpipe Replacement

FINDING:

The CITY has identified:

510 miles of drainage pipe overall:

- 129.41 miles of immediate need deteriorating corrugated metal pipe (CMP)
- Annual pipe replacement rate of 1.55 miles per CITY crew or 4.64 miles for three crews
- The immediate need to replace 129.41 miles of deteriorating pipe will take 27.9 years with three crews.

The SMMP proposes to add a fourth crew to reduce the number of years for replacement. Note, that one crew is held in reserve for emergencies. So the number of pipe crews proposed will be four plus one reserve crew equals a total of five crews. Other considerations include work performed under the (UEP) will aid in reducing the time frame, however, complications from pipe upsizing for increased flow capacity and dewatering issues will increase the time frame. These factors cannot be determined at this time. With the additional pipe crew, the replacement of deteriorating CMP is (129.41 miles/ 4 crews / 1.55 miles per crew =) 20.9 years. A significant reduction of seven years in overall time.

In the future, after drain pipes have been replaced with more durable pipe materials having a 100 year useful life, pipe replacement on a yearly basis would require 3.3 crews (510 miles / 100 years / 1.55 miles per crew =3.3) plus one reserve crew assigned to emergency action, yields a total of five crews. This number of crews matches the proposed increase in crews for replacing the deteriorating CMP.

The crew efficiency was evaluated by considering that one crew lays 1.55 miles of pipe per year which equates to 33 feet per day (1.55 miles x 5,280 / 250 working days in a year = 33) or approximately one road crossing every day rain or shine or equipment breakdown. This amount of pipe on average showed high efficiency and proficiency when considering pipe removal time, working around existing utilities, excavation, backfilling, connections to structures and

restoration. The cost for this activity is reported at $1,373,919 for 4.64 miles of pipe replacement. Since one crew handles only emergencies, the operating budget per length of pipe is calculated as (($1,373,919 x (3 crews / 4 crews) / (4.64 miles x 5,280 =)) $42/LF which is very competitive with or below the private sector market. Having the work performed by CITY staff results in a knowledgeable and practiced pipe crew with expected superior results.

The proposed addition of another pipe crew is reasonable for current needs to catch up on CMP replacement and for the future needs to constantly replace drain pipe at the end of its useful life. Increasing the number of pipe crews from four to five may result in a 25 percent increase in the budget for this operation.

RECOMMENDATION:

- Pipe replacement production records show that work is performed at high efficiency and proficiency.
- Calculated cost of $42/LF (regardless of pipe diameter) is very competitive with or below private sector market.
- The proposed addition of another pipe crew is reasonable for current needs to catch up on CMP replacement and for the future needs to constantly replace drain pipe at the end of its useful life.
- The CITY staff has selected HDPE drainage pipe as the most practical drain pipe material having an extended useful life cycle approaching 100 years. An extended life cycle minimizes replacement costs. HDPE drainage pipe being lighter than concrete pipe allows for simpler installation, inexpensive repairs and may have slight deflections to avoid conflicts. When cover is insufficient, aluminum pipe is preferred by the CITY.
- The pipe replacement date should be continually recorded in the GIS database, and the date should dictate future inspections (2 years from date of installation).
- Continue to monitor work progress on this operation for proficiency and cost effectiveness.
- The anticipated life expectancy of stormwater drainage pipe can be considered below for handling normal stormwater runoff without harsh chemicals and abrasive particles in flow:

Materials:	Estimated Life:	
o Concrete Reinforced Pipe	100 Years	(Non-low pH soils)
o Aluminum Spiral Corrugated Pipe	50 Years	(Non-salt Environment)
o Galvanized Corrugated Pipe	25 Years	(Non-salt Environment)
o Bituminous Coated Corrugated Pipe	50 Years	
o Polyethylene Drainage Pipe	100 Years	

2.5.2 Stormpipe Outfall Replacement

FINDING:

The CITY has identified:

61 miles of drainage outfall pipe overall:

- Number of Outfall Pipes 5,713

The desired goal is to replace 61 miles of outfall pipe in the 75-year estimated useful life or to replace 0.813 miles per year. This work is handled by and budgeted with the Road Crossing Drainage Pipe Crews.

RECOMMENDATION:

- Restoration costs will continue to escalate as more properties are developed. Therefore, the CITY should consider making steel outfall pipes a priority and redirect funds to replacing as many steel outfall pipes as possible while access is possible from vacant lots located on either one side or both sides of the outfall pipe.
- Continue the process of using sumps on catch basins immediately upstream of outfall pipes to collect sediment as required by the Comprehensive Plan. This has multiple benefits such as improving water quality and reducing sedimentation in the downstream canal.
- Analyzing the outfall pipe replacement and last inspection dates, as well as the date of catch basin vacuum truck sump pump-out in the GIS database provides needed data for future inspections and outfall pipe replacement. Scheduling steel outfall pipe inspections at two-year time intervals, as well as determining effective vacuum truck service trip intervals will provide for a properly maintained critical feature of the storm water system.
- Continue to monitor work progress on this task for proficiency and cost effectiveness.

2.5.3 Drainpipe Re-lining

FINDING:

The CITY has identified:

3,050 LF as the average amount of outfall pipe relining performed in a year

This work is handled by and budgeted with the Road Crossing Drainage Pipe activity as a contracted outsourced activity. This work is very specialized.

RECOMMENDATION:

- This work is specialized and is a contracted outsourced activity.
- Before re-lining a pipe, the CITY currently ensures that the current pipe size does not create a known restriction to flow. This hydraulic analysis will be increasingly important as neighborhoods build out.
- The pipe re-lining date was not found in the GIS database and may be recorded in another CITY document. The date should dictate future inspections at two-year intervals.
- Continue to pursue and monitor competitive bidding prices for this work.

2.5.4 Canal Dredging

FINDING:

The CITY has identified:

409 miles of waterways for stormwater storage and flow:

- 222 miles are saltwater accessible waterways
- 156 miles are freshwater waterways
- 31 miles are shoreline

The desired goal is to maintain the waterways at a depth of five feet below mean low water which is a standard permit depth limit and provides for siltation collection and maintenance access. The width is dredged to within 20 feet of the platted water's edge. The CITY has one dredge crew, three dredges and outsources some of the work to a marine contractor. The CITY plans to sell one of the dredges and maintain a dredge to use during breakdown periods. The current budget for this activity is $1,904,909 of which $1,600,000 is outsourced. The production rate is between 34.83 CY/day and 44.18 CY/day. Using an average rate of 40 CY/day x 250 days/year yields 10,000 CY a year. The cost per cubic yard is ($1,904,909 / 10,000 CY per year =) $190 per cubic yard. At first review, the cost per cubic yard for dredging appears very high compared to private sector costs. Dredging within the CITY presents many challenges for access, locating and constructing suitable temporary areas for discharging dredged material, dewatering, trucking and restoration costs.

A large percentage of the overall stormwater utility fund is currently spent on canal dredging being $2 million of the $12 million budget or 17 percent of the budget.

RECOMMENDATION:

- Changing dredging techniques in some areas from hydraulic to mechanical dredging was discussed with CITY staff and found not to be allowed within the permit conditions issued for dredging. Mechanical dredging reduces the overall dredged volume as less water is removed with spoil material and special handling efforts are eliminated, which may result in significantly reduced dredging costs.
- The CITY staff maintains multiple dredges, so that one dredge is operational while the other dredge is being overhauled. In addition, one dredge is designated for fresh water use and the other for salt water. After discussion with CITY staff, this practice appears to be justified.
- Although FDEP has denied nutrient credit for canal dredging, an analysis should be performed of the material being removed to confirm that nutrient levels in the sediment should qualify to receive water quality improvement credit with regulatory programs.
- The need for future dredging activities should be addressed by staff to establish new access points and spoil holding areas while lands may be available.
- Currently the CITY maintains temporary boat ramps to access the waterways for hyacinth aquatic spraying and control. Upgrading these temporary boat ramps for permanent dredging access (Not Public Use) should be evaluated. These areas may also provide temporary spoil storage and transfer to trucks.
- The CITY should consider a cost/benefit analysis for allocation of funding to this activity to determine whether waterway dredging should take precedence over other high priority efforts to solve public safety and street flooding issues.
- The frequency of required dredging is estimated at 5 to 2-year intervals for very select canals depending on original depth, flushing action and siltation from runoff in the area. Routine hydrographic surveys will identify canals requiring more or less frequent dredging.

2.5.5 Vac Truck Crews

FINDING:

The CITY has identified:

510 miles of drainage pipe overall:

- 11.5 miles per year of pipe cleaning by Vacuum Truck crew

The purpose of the vacuum truck is to maintain the existing stormwater drainage system through debris removal, as well as to assist in dewatering activities during drainpipe replacement and with swale re-grading. This work is included in the Catch Basin Operations budget.

The calculated length of time to clean all the pipes is 44 years (510 miles / 11.54 miles per year = 44). Not all drain pipes will require cleaning on a regular basis. Regular inspections will determine which drain pipes will need to be cleaned. As part of the Comprehensive Plan Water Quality Treatment proposal, structures just upstream of the outfall drain pipes are to have a sump area to catch sediment prior to flowing into the waterway. These structures may require frequent pump-out to remove sediment from the sump.

RECOMMENDATION:

- As part of the Catch Basin Inspection group duties, any siltation or debris problem should be reported directly to the Vacuum Truck Operations Staff for correction. Problem locations could be logged into the GIS database to trigger a follow up inspection to see if additional corrective action is needed (i.e. upstream problem). The CITY staff has found excessive siltation to be a very limited occurrence usually located in Utility Expansion Project (UEP) construction areas and due to utility line breaks.
- Continue to monitor work progress on this division for proficiency and cost effectiveness. Many pipes will never need vacuuming.

2.5.6 Street Sweeping

FINDING:

The CITY budgets $333,000 for outsourced street sweeping activities. Curb and gutter roadways are swept on a monthly basis, and the CRA and the Industrial Park areas are swept on a weekly basis.

The goal for this work is to remove sediment and debris from the roadway prior to entering the waterways. This provides a water quality treatment enhancement and eliminates some of the siltation before it can reach waterways.

RECOMMENDATION:

- Consider the use of a vacuum type street sweeper that would be more effective than the mechanical sweeper for removing finer particulates. However, the CITY has indicated that

the performance of mechanical sweepers is preferred due to higher production rate and versatility.

- Continue to incorporate the street sweeping circuit into the GIS database and update if additional curb and gutter areas are added. The CITY has indicated that this is being done but was not apparent in review of the GIS database.
- Continue to pursue and monitor competitive bidding prices for this work.

2.5.7 Catch Basin Inspections

FINDING:

The CITY has identified:

22,695 Catch Basins overall:

- 1,595 Junction Boxes that are not accessible
- 16,212 Catch Basin are inspected per year

The CITYs DEP permit requires each catch basin to be inspected once every 10 years. At the production rate of 16,212 catch basins per year, each inlet is actually being inspected every 1.4 years (22,695 CBs / 16,212 CBs = 1.4). The 16,212 CB inspections with light maintenance attention is equivalent to 65 inlets per day (16,202 CBs / 250 working days in a year = 65). This appears to be a very high production rate at 7.5 minutes per catch basin, including travel time. This work is budgeted with the Drainage Pipe Management, Survey, Layout Inspections, TV Pipes operation.

RECOMMENDATION:

- The DEP permit for the stormwater management system requires inspections every ten years. The CITY staff is currently performing inspections of catch basins approximately at two year intervals, which is more in line with other municipalities. The CITY should continue the more frequent interval of inspecting drainage facilities every two (2) years.
- Adjust the current inspection rate, which appears to be too high, in order to fully evaluate the structure, intersecting pipes and sedimentation. An inspection interval of once every 2 years yields 10+ minutes for each catch basin.
- Confirm that inspections are rating condition of structures to guide subsequent inspection, but also for future planned replacements and not just immediately needed repairs. Pipes are currently not being rated during inspections. Due to the current level of backlogged complaints, work is planned on a complaint driven basis. The catch basin and pipe inspection results should be added to the GIS database.
- The condition and inspection data information of the Catch Basin and intersecting pipes should be added to the CITY GIS database.
- This activity should serve as the primary inspection process for the CITY's pipe and catch basin network to schedule future inspections, repairs, and cleanings.
- Staff should continue to utilize a small, versatile zoom type camera (with lighting) for inspections, in lieu of light/mirrors.

- The published life cycle for drainage structures is 50 years, but may last to 100 years. Regular inspections of drainage structures will note cracks, spalling concrete and deterioration of reinforcing steel that indicates repair and replacement in the near future. Damage from heavy vehicles running over structures may cause immediate failure or lead to a reduced useful life period. The newer precast catch basins will have a longer lifecycle than the older concrete block GAC type inlets.

2.5.8 Catch Basin Lid Replacement/Repair

FINDING:

The CITY has identified:

68 Catch Basin Lid Replacements are completed on a monthly average

The current goal is to replace catch basin lids on an "as needed" basis. Lid replacements are required due to damage from mowers or traffic. This work category involves repair of catch basin bases and curbed inlets. As drain pipe improvements progress in the CITY, the older type catch basins with concrete slab lids are being replaced by catch basins with grated inlets (and weep holes) that are less likely to be damaged by mowers and traffic. Eventually, after inlets have been upgraded, lid replacements should no longer be needed. The CITY salvages usable catch basin lids, from UEP areas that are installing the new style of catch basins with grates, for later use to replace broken and damaged lids in older areas of the CITY.

At the average lid replacement rate of 68 catch basins per month, the annual rate is 816 lids replaced per year (68 CB lids x 12 months = 816), and the daily rate is 3 lid replacements per day (68 CB lids / 22 days / month = 3). The budget for this unit is $540,095, and includes catch basin inspections and vacuum truck tasks. The catch basin repairs and cleaning cost is $660 per catch basin ($540,095 / 816 CB lid replacements = 600). Considering the time for travel and inspections, the catch basin cleaning, repair catch basin bases, the casting of new concrete lids and the disposal of damaged materials/debris, the work appears to be cost effective.

RECOMMENDATION:

- If a broken catch basin lid is reported outside of normal inspection (i.e. civic call), the entire catch basin and pipes should be inspected during the repair. The inspection results and date should be updated in the GIS database.
- When this group is not actively performing a catch basin repair, they should supplement the normal Catch Basin inspection staff to enhance production rate.
- The CITY casts (in-house) concrete lids when needed. The in-house demand for poured concrete lids is only three pours in five to six months. If demand increases, a cost analysis should be performed to evaluate the cost of using precast concrete lids, timely delivered to the CITY by a local supplier, compared to cost for materials and manpower for in-house casting of concrete lids.
- Further study by CITY staff should be conducted for solutions to reduce travel time between catch basin repair sites.

2.5.9 Swale Grading

FINDING:

The CITY has identified:

105,182 SF per month of swale grading accomplished by five crews

- 694 Civic calls were received (annually) by the CITY regarding swale grading

The goal of this activity is to restore swale elevations to alleviate flooding issues and to allow proper movement and treatment of stormwater. Five CITY work crews respond to CITY resident civic calls regarding swale concerns. The CITY crew maintains some swales on an annual basis and some swales never need re-grading. The swale function is affected by soil permeability, underlying rock layers, septic tank dysfunction, steep yard grades adjoining the swale, excessive irrigation, vacant lots that do not have finish grading established, and original swales that may have been poorly graded during home construction. Southwest Florida typically has nearly flat terrain and the related swales slopes are minimal. Minor standing water in the swale is common during the rainy season, and can be difficult to alleviate.

The Swale Grading operation has a budget of $2,686,687 with 27 employees and plans to increase employees to 32 full time employees. The cost of swale re-grading is ($2,686,687 / (105,182 SF per month x 12 months =)) $2 per SF, including sod replacement. As an example, 500 LF of swale re-grading that is 10 feet wide at $2 per square foot would cost $10,000 or $20 per linear foot. With five crews responding to 694 swale grading civic calls per year. Each of the five work crews must respond to (694 civic call per year / 250 working days / five crews =) 0.5 civic calls per days or one civic call every two days. With the majority of the civic calls being received in the rainy season, a backlog is expected. The increase in full time staff from 27 to 32 would result in an 18 percent increase in the Swale Grading budget or $498,000 in additional funding. The civic calls from CITY residents can become a public outreach issue and CITY staff has developed a methodology using the length of time after a storm event that water remains in the swale for determining when swale re-grading is warranted. The CITY also grades swales in association with multilane paving, so that they do not rely sole on citizen complaints.

A significant portion of the Stormwater Utility budget is committed to swale re-grading at ($2,686,687 / $12,000,000 =) 22 percent.

RECOMMENDATION:

- The CITY performs swale grading at an apparent cost of $2 per square foot, which is in line with the private sector market.
- The CITY staff records swale grading activities on separate hard copy files which has proven more practical and efficient for their use. Using the GIS system for recording swale grading activities was found to be difficult for very minor swale work. The recording of swale grading dates in the GIS database for longer grading sections is suggested to assist in future inspections and the planning of grading improvements.
- If possible, the GIS database should be updated when roadways have curb and gutter installed to remove them from future grading.

- CITY staff should re-evaluate the methodology for determining when swale re-grading is warranted, such as if street or home flooding is not occurring. The CITY responds to complaints and usually finds obvious blockages to correct. The CITY staff noted that they try and correct blockages holding water in driveways as best as possible. These blockages can create a safety concern if slick algae forms on the driveway surface.
- The CITY should perform a cost/benefit analysis for allocating funds to the swale re-grading task. Higher priority efforts to solve public safety and street flooding issues should take precedence over maintenance swale grading. The CITY staff prioritizes hazards to be addressed first.
- Use a public outreach program to educate residents on swale issues and to handle civic calls regarding swale re-grading. The CITY is currently using an online electronic survey method for feedback on swale issues and hands out brochures to homeowners where work has been performed.
- Alternative methods should be pursued for solving minor standing water in the swales, especially when annual swale re-grading is being performed. The CITY has found that swale re-grading is the most cost effective approach to correct swale function. Soil replacement and other alternative methods have not proven effective. Alternative methods may be warranted for especially difficult situations. Although expensive, replacing known swale flooding problem areas with curb and gutter can be an effective alternative.

2.5.10 Floats, Weirs, Long Reach

FINDING:

The CITY has identified:

86 Civic calls regarding the activities of the Floating Debris, Weirs & Long Reach Operations.

- 273 Outfalls cleared on an annual basis

This unit handles varied duties from clearing weirs (26) of floating debris, cleaning carp grates (21) to removing dead fish following a fish kill, to emptying trash barrels at select bridges, repairing boat ramps (32), to using long reach excavators for drainage ditch maintenance, clearing outfalls, and other items associated with general waterway maintenance. This work is performed on an “as needed” basis

The budget is $884,893. Due to the many various tasks performed on an as needed basis, a breakdown analysis of the activities is not practical.

RECOMMENDATION:

- This unit handles a variety of duties in performing a necessary service to maintain unimpeded flow in the canals. The work is necessary, but a production rate cannot be accurately calculated given the random nature. The CITY has determined through experience that the current crew size is adequate to handle regular duties, with the exception of major storm events. Therefore, the dedicated resources are deemed adequate.

- Continue to monitor work progress on this operation for proficiency and cost effectiveness.
- Facilities such as gates, screens, air bag lift risers may have a much shorter life cycle than the reinforced concrete structures due to metal and mechanical components in an aquatic environment.

2.5.11 Drainpipe Management, Survey, Layout Inspections, TV Pipes

FINDING:

This unit handles varied inspections in response to civic calls concerning drainage issues. When corrective action is necessary, a survey team stakes the project for swale re-grading. Also, select pipes are inspected and examined by a robot camera for blockages, pipe failures or pipes clogged with an obstruction.

This unit has a budget of $914,672 with 12 employees and is considering reducing the staff to 10 employees. Due to the many various tasks performed on an "as needed" basis, a breakdown analysis of the activities is not practical.

RECOMMENDATION:

- This group is response-based to inspect and recommend remediation of a drainage problem.
- The results of any inspections performed by this group should be updated in the GIS database to maximize the usefulness of this time & staff investment, and to schedule future inspections and anticipated replacement.
- When this group is not actively responding to a problem, they should supplement the normal Catch Basin inspection staff to enhance production rate and overall detail of catch basin and pipe inspections.
- Continue to monitor work progress on this operation for proficiency and cost effectiveness.

2.5.12 Stormwater Administration/ Ancillary Positions

FINDING:

The Stormwater Administration currently consists of two supervisors, an accounts coordinator, an administrative secretary and a customer service representitive. The administrative staff oversees 71 full time employees in the various units. Each supervisor manages more than 30 employees, and has the responsibility to manage all 71 employees when the other supervisor is out. The employees work different schedules being either four 10-hour days or five 8-hour days. The accounts coordinator handles the financial operations of the stormwater section of the Maintenance Division.

This administration budget is $914,672 with five employees. Due to the many various tasks performed on an as needed basis, a breakdown analysis of the activities is not practical. The administration unit operates on ($914,672 / $12,000,000 =) 7.6 percent of the total stormwater utilities budget. The administrative budget of 7.6 percent of the total is less than 10 percent which is a common goal for business operations.

RECOMMENDATION:

- The administrative unit operates on 7.6 percent of the total stormwater utilities budget. This is less than 10 percent which is a common goal for business operations.
- Continue to monitor work progress on this operation for proficiency and cost effectiveness..

2.6 SMMP COMPARISON TO OTHER MUNICIPALITIES

2.6.1 Summary of Findings

In reviewing the SMMP, AIM has acquired and reviewed several Maintenance Planning Documents prepared by other Municipalities. In comparison to others, the CITY has prepared its SMMP with greater detail regarding specifics such as manpower, production rate, and long range forecasting to consider the life expectancy of system components. This detail allowed AIM to evaluate the CITY's production rate, efficiency, and cost comparison to the private sector market, which can be considered the most pertinent evaluation of service being provided to the public by the CITY.

Most other Municipalities prepared their maintenance planning documents without a detailed review of existing staff or equipment. Plans that do include future staffing projections utilize current staff numbers without apparent justification of their current workload or production rate. Many Municipalities approach their maintenance programs with an accepted, fixed number of staff and equipment that have been acquired over time, and attempt to provide a stated Level of Service. Significant increases in staffing are not generally presented as a typical option.

Other Planning Documents have various derivatives of text sections covering Level of Service, responsibilities, system components, and descriptions of maintenance activities. Therefore, it is somewhat difficult to provide direct comparisons between maintenance master plans from one Municipality to another as much of the difference is subjective. However, these sections can help to clarify the maintenance plan/program for the uninformed.

The CITY may benefit from reviewing some of the Plans from other Municipalities, and enhancing the narrative sections to provide a complete, clear, and concise SMMP. For example, the CITY could look to include historical and institutional knowledge of performing maintenance activities, and experimenting with various methodologies, that have been acquired over the years. This information should be added into SMMP, not only as additional justification, but also as valuable historical archives for the use by future employees.

Additionally the CITYs SMMP could be enhanced with the inclusion of (or reference to) more detailed activity descriptions for each maintenance component. This could be in the form of a Maintenance Manual (i.e. SOPs) which details how specific work is to be performed by CITY Staff. This would promote consistency for new employees, and to document practices to outside observers.

The use of a GIS database to inventory facilities, rate condition, schedule inspections and future replacements, and log maintenance activities is an increasing initiative is use among

Municipalities. The value of using GIS as a tool to increase efficiency, productivity, and overall service level is becoming commonplace across the Country. Several Maintenance Planning Documents, from other Municipalities, include references or general description of their GIS efforts. The CITY has made substantial progress in developing a robust database, and should continue these efforts as discussed in previous sections of this report.

Overviews of some Maintenance Plans from other Municipalities are given in the following:

2.6.2 East County Water Control District (ECWCD)

The ECWCD is a Florida Statutes Chapter 298 Special District to provide surface water control and drainage for approximately 50,000 acres of land in eastern Lee County (Lehigh Acres) and a small portion of Hendry County. The ECWCD is similar to Cape Coral in that it was originally created by a large development corporation. The primary stormwater management system includes miles of man-made canals and water control structures. Runoff is delivered to the canals via a secondary system of swales, inlets, and culverts.

The ECWCD has developed a "Facilities Inventory" for all of the canals, culverts, structures, and facilities that are maintained by the ECWCD. Facilities are grouped by Section-Township-Range, and the Inventory includes an information sheet(s) and pictures for each entry. Every 5 years, all facilities are inspected and a rating is given to each ranging from 1 (new) to 5 (some stage of failure). The facilities that are ranked Condition 5 are typically added to the "Capital Improvement Plan" (CIP) for scheduled replacement.

The CIP list projects of what will be performed (by year) over the next 5-year period and includes project information, including estimates for design/permitting/construction costs and duration. The CIP and projects included therein are used by the ECWCD in the budgetary process for each fiscal year. However, the ability to increase Staff or equipment purchases based on projected work load is generally not considered on an annual basis (excluding planned equipment replacements).

2.6.3 City of North Port

The City of North Port is also similar to Cape Coral in that it was originally created by a large development corporation. The primary stormwater management system includes miles of man-made canals and water control structures. Runoff is delivered to the canals via a secondary system of swales, inlets, and culverts.

The City of North Port has developed a "Standard Operating Procedure" (SOP) for its drainage system maintenance and inspection activities/responsibilities. The Document provides a stated Purpose and Level of Service (LOS) Commitment, and also includes very general descriptions for maintenance and inspection responsibilities, practices, and procedures. Emphasis is placed on addressing Customer complaints through use of a Software Program to log and track complaints, follow-up actions, and inspection activities.

Included as an Appendix of the overall SOP Document, North Port has also developed SOPs for Right-of-Way mowing, Road Pipe Replacement, and Drainage Swale Re-grading. These SOPs state general LOS commitments, responsibilities, and an ordered list of activities for the performance of the work.

North Port does not have an apparent evaluation of staffing or equipment analysis/justification in the SOP.

2.6.4 Hillsborough County

Hillsborough County Public Works Department developed a "Stormwater Facility Maintenance Manual". The Manual begins with an Introduction, Purpose, and a section discussing why they inspect and maintain storm sewer facilities. A descriptive Level of Service Table was developed for the inspection of each system component, and ranges from Level 'A' to Level 'D'. The County states that 'C' is the current target level of service.

The remaining sections of the Manual consist of operation and maintenance activities for the different components. Each component (such as swales) includes a brief description, outcomes/goals/benefits, and O & M practices. Inspection intervals are given based on the established Level of Service; however a breakdown of staff is not included.

Hillsborough County does not have an apparent evaluation of staffing or equipment analysis/justification in the manual.

2.6.5 Alachua County

Alachua County is an example of a Municipality that has expended substantial resources in the development of a comprehensive Stormwater Management Program (SMP). This began in 2005 when the County included specific guidelines in their 2005 Comprehensive Plan to better manage stormwater, which ultimately required the initiation of a SMP to protect natural drainage features and the quality of waters. Work on the initial SMP initiated in 2006 and attempted to project annual program costs. The work culminated in an Engineering Memorandum which summarized projected annual program costs for administration, operations, and maintenance. In addition, preliminary capital costs for some flood remediation and water quality projects were included. At the same time, a Needs Assessment was performed to summarize existing and future stormwater management problems, concerns, and issues that Alachua County would need to address.

A follow up analysis was conducted around 2010, that built upon the 2006 work, and incorporated additional program components identified in the initial Needs Assessment. The end result was a summary of projected costs to implement and sustain a stormwater program that adequately addresses the County's needs (both through an increase in LOS and addressing regulatory mandates). The cost analyses are based on a 10 year SMP planning period.

This work by Alachua County goes beyond operation and maintenance, and includes additional program components and future improvement projects. This work has resulted in an extensive SMP, which includes a detailed analysis of maintenance requirements and needs. The CITY can

consider the Alachua County SMP in guiding future planning efforts, however an understanding of the driving purpose as well as the time, effort, and resources that were committed to the SMP should be fully understood.

3 APPENDIXES

A) STORMWATER MAINTENANCE ACTIVITIES PER MS4 PERMIT

Major Stormwater Outfalls:

- Remove debris, litter, and sediments as needed to assure proper operations.
- Properly dispose of the litter and debris collected. Properly dispose of sediment collected.
- Repair any structural damage to assure proper operation.
- Maintain healthy vegetative cover to prevent erosion of banks or areas near outfalls.
- Assure that discharges from outfalls are not causing erosion and sedimentation.

Weirs, risers, or Other Control Structures Associated with Stormwater Structural Controls

- Repair any damages to weirs / control structures as needed to assure proper flow conditions and operation.
- Remove accumulated sediments to restore permitted storage volume and dispose of properly.
- Remove litter / debris as needed to assure proper flow conditions and operation and dispose of properly.

Canals that are part of the MS4 system and not Waters of the State

- Mow grass along Canal
- Repair any erosion
- Schedule and perform maintenance as needed

Pipes / Culverts

- Repair any damages to pipes or culverts as needed to assure proper flow conditions and operation.
- Remove accumulated sediments as needed to assure proper flow conditions and operation.
- Dispose of collected sediments properly.
- Remove vegetation and litter / debris as needed to assure proper flow conditions and operation and dispose of properly.

Storm Sewer Inlets, Catch Basins, Grates, Ditches, Conveyance Swales, and Other Stormwater Conveyances

- Repair any damages to weirs / control structures as needed to assure proper flow conditions and operation.
- Remove accumulated sediments to restore permitted storage volume and dispose of properly.
- Remove litter / debris as needed to assure proper flow conditions and operation and dispose of properly.
- Maintain healthy vegetative cover to prevent erosion of the conveyance bottom or side slopes.

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