6 Operations and Maintenance

6.1 O&M Program Requirements

Any operation and maintenance (O&M) program for any purpose needs to be well defined, given proper management authority, and be properly funded to provide sufficient staffing and equipment. Because the City's SWMS relies heavily on open channels to capture and convey stormwater, significant O&M activities are required to ensure proper functionality. The flow capacity of open channels depends primarily on the cross section and bottom slope, and is affected by sedimentation, erosion, and vegetation. Accordingly, the primary focus of the Proposed O&M Plan, presented in Section 6.4 below, is directed at the maintenance of open channels. Currently, the City requires residents to mow and maintain the grades of roadside swales, swales in drainage easements, and stabilize the banks of waterways (i.e., bulkheads) on their property. The City's Stormwater Division maintains over 100 miles of side and rear drainage ditches and approximately 9.1 miles of canals and waterways. The Division also manages the water retention at the stormwater park, airport drainage system, and maintains eight nutrient baffle boxes.

The O&M Plan for the City's stormwater system needs to include the following activities to make the system function properly and operate at peak performance and efficiency:

- Mowing of detention/retention ponds, swales, and ditches
- Regular visual inspections of all SWMS components
- Coordination of the mowing and maintenance of right-of-way swales (aka front yard swales) and associated driveway culverts
- Removal of sediment and debris from inlets, conveyance pipes, culverts, outfall structures, Nutrient Separating Baffle Boxes, and other drainage structures
- Removal of sediment and aquatic weed control in retention/detention ponds
- Removal of sediment and regrading of side yard and back yard ditches
- Effecting minor repairs
- Coordination of canal side slope maintenance, aquatic weed control and periodic removal of sediment
- Coordination with SJRWMD for maintenance of drainage paths outside City boundaries

Stormwater Management facilities including conveyance and attenuation provide the means of removing stormwater from streets, parking areas, public parks, public and private areas subject to stormwater runoff. The Stormwater Management facilities not only address environmental water quality controls, erosion abatement and drainage, but are integral to public safety. Improper maintenance of a stormwater systems affects surrounding property and infrastructure.

When developing a budget for O&M, the costs associated with renewal and replacement (R&R) of failing infrastructure should also be considered. Using typical unit cost, the ratio of number of structures to be maintained per year, and assuming a return period of 30 to 50 years, allows an estimate of the amount of city-wide stormwater infrastructure that may require R&R in an orderly and periodic cycle. Periodic R&R retrofit will minimize the spending with future CIP projects and effectively reduce the problems associated with, or caused by, poor drainage in other structures.

6.2 Relevant City Ordinances and Codes

Code of Ordinances - Article V - Ordinance No. O-0-16

This ordinance, adopted on Sept. 26, 2001, enacted Article V of the City's Land Development regulations and is codified under Chapter 102 of the City Code. The ordinance created and established in the City, in accordance with Section 403.0893, F.S. a stormwater management utility entitled the Sebastian Stormwater Utility (SU). This SU was given the responsibility for the City's stormwater management, and has all powers necessary for the exercise of its responsibility for the drainage from all properties within the City, including, but not limited to, the following:

1. Preparation of plans for improvements and betterments to the stormwater management system.
2. Construction of improvements and betterments to the stormwater management system.
3. Promulgation of regulations for the use of the stormwater management system, including provisions for enforcement of such regulations.
4. Review and approval of all new development permits within the city for compliance with stormwater management regulations included in present city ordinances or ordinances later adopted.
5. Performance of routine maintenance and minor improvement to the stormwater management system.
6. Establishment of charges for connection and use of the stormwater management system.
7. Evaluation of water quality concerns for discharges to the stormwater management system.
8. Performance of all normal utility functions to include construction, operation, and maintenance of the city's stormwater management system, including, but not limited to, the hiring of staff, the selection of special consultants, the entering into contracts for services and construction of facilities, and the handling of purchase, lease, sale or other rights to property for the stormwater management system.
9. Issuance of revenue bonds or other debt instruments for the purpose of performing those duties as described herein.
10. Imposition of a stormwater fee. The stormwater fee is applied to all property within the city unless otherwise exempted, for services and facilities provided by the stormwater management system. The fee amount is a flat fee of one Equivalent Residential Unit (ERU) per month, but the ERU calculation depends on the classification of the property. Exempt property is not subject to a stormwater fee. The fee for one equivalent residential unit (ERU) is $10.00 for each month. The City Council may establish a different rate for any fiscal period following the 2018-2019 fiscal year.
11. Establishing procedures for the collection of SU fees.
12. Establishing a Sebastian Stormwater Utility Fund for the deposit of all fees collected. The stormwater utility fund shall be used exclusively to provide funding for the stormwater management program.
13. The city manager may promulgate reasonable regulations concerning the operation of the Sebastian Stormwater Utility, with said regulations subject to modification or nullification by resolution of the city council.

Code of Ordinances - Section 54-2-7.15(d)

Paragraphs (2) and (3) of this Code section establish that the property owner is responsible for the maintenance of all drainage features on a property, including front yard swales, driveway culverts, side yard swales, and back yard ditches to maintain the proper flow of surface water.

Code of Ordinances - Article VI - Urban Stormwater Quality Management and Discharge Control

Ordinance No. O-13-11 established Article VI, which is intended to ensure the health, safety, and general welfare of citizens, and protect and enhance the water quality of watercourses and water bodies in a manner pursuant to and consistent with the Federal Clean Water Act (33 U.S.C. § 1251 et seq.) by reducing pollutants in stormwater discharges to the maximum extent practicable and by prohibiting non-stormwater discharges to the storm drain system.

One important requirement in this Article relative to the O&M of the canals within the City's stormwater system is Section 102-145. - Watercourse protection, which makes owners of properties along the banks of watercourses responsible for maintaining existing privately owned structures within or adjacent to a watercourse and maintaining and stabilizing that portion of the watercourse that is within their property lines in order to protect against erosion and degradation of the watercourse originating or contributed from their property.

Code of Ordinances – Article XII – Surface Water Management

Article XII (Code Section 54-3-12) establishes the minimum standards for surface water management and flood protection set forth in this article shall be applicable to all new construction, development or redevelopment requiring updated code compliance. This section gives the Stormwater Department review and approval authority over development permits.

The sections that follow provide a summary of the City's current O&M practices and a proposed O&M program based on current and planned future funding levels to improve the level of O&M activity and the overall performance of the City's SWMS.

6.3 Existing Operations and Maintenance Program

6.3.1 Stormwater Management Organization

The size and complexity of the City's stormwater infrastructure and its many requirements and goals highlight the critical importance of proper planning and efficient use of resources for its successful operation. On Sept. 26, 2001, the City adopted Ordinance No. O-0-16, which created and established a stormwater management utility called the Sebastian Stormwater Utility (SU). The SU was given the responsibility for the City's stormwater management and has all powers necessary for the exercise of its responsibility for the drainage from all properties within the City. The City of Sebastian has placed the responsibility for the management of the SU with the Stormwater Department. Funding for the Stormwater Department's administration, O&M costs and capital budgets is generated primarily from Stormwater Utility Fee revenues, with additional revenues from the Discretionary Tax and other sources. A detailed description of the Department's funding is included in Section 8 – Funding Plan and Grant Management.

6.3.2 Current Resources

The Stormwater Department currently has a staff of ten, as shown in Table 6-1 below. City staff work an average of 249 days per year, eight hours per day.

Table 6-1. Stormwater Department Staffing

Position	Count*
Clerical Support – Citizen Request Line (Part Time)	0.5
Stormwater Superintendent	1
Stormwater Utility Inspector (Part Time)	0.5
Maintenance III	3
Maintenance II	1
Maintenance I	4
TOTAL	**10.0**

**Count is for Full Time Equivalent (FTE) staff*

The Stormwater Department currently maintains a fleet of 24 vehicles and heavy equipment, as shown in Table 6-2 below. The fleet represents a capital value of approximately $3 million, and fleet items are replaced based on expected operational life.

Table 6-2. O&M Equipment Summary

Vehicle/Equipment	Age (Years)	Expected Life (Years)
601 - 2016 CHEVROLET 2500 4WD	6	7
603 - 2015 FORD F250 4WD	7	7
604 - 2018 FREIGHTLINER DUMPTRUCK	4	10
605 - 2018 FREIGHTLINER DUMPTRUCK	4	10
606 - 2005 CHEVROLET 3500 UTILITY TRUCK	17	7
607 - 2007 STERLING BRUSH TRUCK	15	10
608 - 2015 FORD F550 DUMP TRUCK	7	7
614 - 2006 CHEVROLET SILVERADO 4WD	16	7
616 - 2001 CHEVROLET 1500	21	7
620 - 2016 INT. VAC-TRUCK	6	10
632 - 2013 CHEVROLET 3500	9	7
633 - 2019 FORD F 150 TRUCK 4WD	3	7
649 - 2022 FREIGHTLINER SEMI TRACTOR	<1	10
677 - 2014 FORD F350	8	7
621 - 2014 BOBCAT EXCAVATOR E42	8	10
622 - 2020 311 CAT EXCAVATOR	2	10
642 - 2020 KUBOTA TRACTOR	2	10
643 - FRT LOADER MOUNTED TO SW 642	NA	NA
678 - 2014 JOHN DEERE 410K BACKHOE	8	10
686 - 2013 CAT M313D EXCAVATOR	9	10
690 - 2015 JOHN DEERE 825I GATOR	7	7
691 - 2016 JOHN DEERE TRACTOR 6130	6	10
692 - 2016 DIAMOND BOOM MOWER/DITCHER	6	10
636 - 2021 FELLING 70 TON GOOSENECK TRLR	1	10

6.3.3 Operational Responsibilities and Maintenance Activities

The City's Stormwater Department currently operates and maintains the stormwater infrastructure through a combination of direct maintenance by Department staff, coordination with other City Departments, and City contractors to maintain City-owned drainage components, and through coordination with the SJRWMD, businesses and residents to maintain privately-owned components. Current operational responsibilities, descriptions of maintenance activities conducted within the SWMS, and status notes are shown in Table 6-3.

The SWMS is currently divided into six management zones, as shown in Figure 6-1 below. In each zone, maintenance responsibility has been established for the many SWMS components (i.e., roadside swales, side swales, backyard ditches, culverts, baffle boxes, etc.) present. Due to limitations of funding and resources, the management of the SWMS is generally reactive, with inspections and maintenance performed on an as-needed basis or when responding to Citizen Requests (CRs).

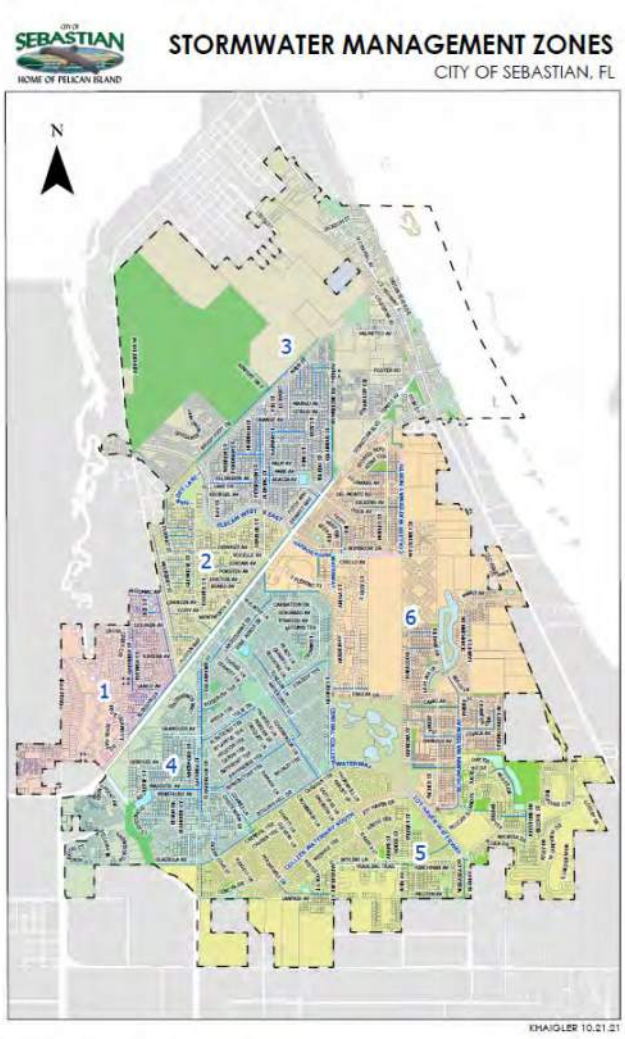

Figure 6-1. City of Sebastian Stormwater Management Zones

Table 6-3. Current Operational Responsibilities and Maintenance Activities

Activity No.	Activity or SWMS Component	Description	Responsibility	Maintenance Frequency	Maintenance Activities and Notes
1	Front Yard Swale and Driveway Culvert	Routine Visual Inspection and Maintenance	Property Owner	As Needed	There are approximately 14,000 of these components in the SWMS. Maintenance issues with front yard swales and driveway culverts are widespread and have been a historical problem for the City.
2	Front Yard Swale and Driveway Culvert	Citizen Request Response	City	As Needed or in response to CR	The City currently receives many citizen requests (CR) per month related to front yard swales, which are currently processed through Code Enforcement procedures.
3	Front Yard Swale	Quarter Round Cleaning	City	As Needed or in response to CR	Approximately 3,505 front yard swales are equipped with the "Quarter Round" system previously installed by the City. The City cleans approximately 500 of these systems each year in conjunction with roadway repairs or CRs, which is a labor-intensive and costly activity.
4	Inlet Structure	Visual Inspection	City	Once before hurricane season, and before and after large storm events, about 10x/year total.	
5	Inlet Structure (and associated conveyance pipe	Routine Inspection and Maintenance	City	As Needed or in response to CR	The City has approximately 320 inlet structures, City staff reported that on average one inlet structure and the surrounding components can be cleaned per day.
6	Road Crossing Culvert	Routine Inspection and Maintenance	City	As Needed or in response to CR	The SWMS has approximately 1,300 road crossing culverts. Inspections and maintenance are performed in conjunction with a Citizen Request. Approximately 50 are inspected and cleaned each year.

Table 6-3. Current Operational Responsibilities and Maintenance Activities

Activity No.	Activity or SWMS Component	Description	Responsibility	Maintenance Frequency	Maintenance Activities and Notes
7	Baffle Box	Routine Inspection and Maintenance	City	Quarterly	City has 9 of these, each takes approximately four hours to clean.
8	Side Yard Ditch	Mowing	City	Quarterly	City has a 10-foot easement area, mowed by City contractor.
9	Back Yard Ditch	Mowing	City	Quarterly	The City has a 20-foot drainage ROW from the back property line of each parcel abutting a back yard ditch for maintenance access. Back yard ditches are maintained by the City's contract mowing vendor.
10	Back Yard & Side Yard Ditch	Mowing Inspection	City	Quarterly	Verification of the City's contract mowing vendor's work, takes approximately one hour per month.
11	Driveway Culvert	Repair During Road Repaving	City	As Needed	The City removes and replaces a section of the driveway and the driveway culvert in conjunction with road paving. Approximately 30 are replaced per year.
12	Retention and Detention Ponds	Visual Inspection	City	Quarterly	The City has 30 ponds that are inspected each quarter.
13	Retention and Detention Ponds	Inspection and Maintenance	City & Private	Monthly	The SW Dept mows the Schumann Dr. retention pond, Parks Dept mows others. Private owners maintain private ponds.
14	Stormwater Park	Pump Operation	City	As Needed	SW Dept staff manually turn on the stormwater pumps for 1-2 hours per day if canal water levels are high enough.
15	Stormwater Park	Mowing	City	Monthly	SW Dept mows the Stormwater Park once per month. Parks Dept also mows it once per month.
16	Stormwater Park	Mowing	City	Annual	City contractor mows once per year, at the option of the City.
17	Public Works Compound	Mowing	City	Monthly	SW Dept mows once per month. Parks Dept also mows it once per month.

Table 6-3. Current Operational Responsibilities and Maintenance Activities

Activity No.	Activity or SWMS Component	Description	Responsibility	Maintenance Frequency	Maintenance Activities and Notes
18	Dams and Weirs	Inspection and Maintenance	City	As Needed	The SWMS has two dams (Concha and Hardee) controlling discharge from the canals and one weir (Stonecrop) regulating discharge from the SWMS. Inspections and maintenance are performed on an as-needed basis.
19	Canals	Inspection and Maintenance	City	Visual Inspection every 6 months, maintenance dredging every 10 years	The City has a drainage easement over the canals and performed maintenance dredging in the Collier Canal North area in 2006. No other maintenance dredging has been performed. Significant sediment loading and shoaling in some areas was observed during field inspections. Aquatic weed control is performed by a City contractor in accordance with the City's IPM Plan.
20	Canal Side Slopes		City & Private	Visual Inspection every 6 months, maintenance as needed.	There are 756 bulkheads along the banks of City's canals. 20 are within the City ROW and City owned and maintained. Bulkheads located outside the drainage easement on private property are not maintained by the City. Physical inspections were performed in 2022 and many of the bulkheads were in fair or poor condition. More than 200 are structurally failing and in need of immediate replacement.
21	Offsite Drainage Areas		Private	5 Years	This includes drainage paths from the City's system that are privately owned and the City does not have a drainage easement. Maintenance of these areas in enforced by the SJRWMD via ERP permit requirements for the private developments.
22	Hurricane Preparation	Securing Buildings,	City	As Needed	

Table 6-3. Current Operational Responsibilities and Maintenance Activities

Activity No.	Activity or SWMS Component	Description	Responsibility	Maintenance Frequency	Maintenance Activities and Notes
		Moving Equipment, Etc.			
23	Pre- and Post-Storm Inspection	System-Wide Visual Inspection	City	10x/Year	Before and after hurricanes and large storm events
24	Hurricane Recovery	Debris Cleanup	City	As Needed	Approximately 2 weeks after hurricane
25	Sidewalk Repair	Assist Public Works	City	As Needed	

6.3.4 Problem Areas

There are many problem areas affecting the operation, maintenance, and performance of the City's SWMS, including, but not limited to, the following:

- Physical Challenges
  - Topography - as discussed previously in Section 2, the majority of the City consists of very flat topography, with typical grades of 0.1%.
  - Geology – soils, confining layers
  - Groundwater – high surficial aquifer levels, low infiltration rates
- Environmental Challenges
  - Climate Change – more intense rainfall events in recent years, higher king tides, sea level rise
  - St. Sebastian River Watershed drainage patterns and offsite pollution loading
  - Water Quality issues
    - Low Dissolved Oxygen concentrations
    - High BOD/COD concentrations
    - Aquatic Weed Growth
    - Septic system dependence, lack of WWTP capacity.
- Regulatory Challenges
  - TMDL load reduction requirements for TN and TP
  - NPDES MS4 permit documentation
  - Development standards/permit reviews
  - No legal control over offsite discharge areas – dependent on SJRWMD
  - Issues related to City codes and operations (i.e., City maintenance of side and back yard ditches)

- Engineering and Construction Deficiencies
  - SWMS fundamental design deficiencies – roadside swales in residential areas apparently designed for 1-year, 3-hour storm event.
  - Current Drainage Issues
    - Localized flooding as discussed in Section 3.7.
    - Undersized culverts in many drainage paths
    - Negatively sloped pipes and culverts (negatively sloped stormwater pipes included in the H&H model are provided in the Appendix K Stormwater Network Summary Tables for reference).
    - Apparent incorrect culvert and control structure installations
- Funding Issues
  - SW Dept revenue. staffing and equipment needs
  - Capital Projects – several capital projects identified during previous master planning efforts have not been completed by the City, apparently due to funding limitations.
- Maintenance Issues
  - Front Yard Swales and Driveway Culverts
    - The City does not currently conduct routine inspections of the front yard swales and driveway culverts, only performing them after a CR is filed. If found deficient, the City goes through Code Enforcement procedures to address the deficiency with the property owner. If not corrected, the City can impose punitive fines until the deficiency is corrected. This current method of management consumes personnel time from several City departments and has not resulted in consistent or timely restoration of the drainage components. The City is currently evaluating options to improve compliance.
  - Side Yard Swales and Back Yard Ditches – regrading needs, raised foundation pads, septic fields, etc.
  - Inlet and Pipe Systems – cleaning frequencies, efforts, etc.
  - Culverts – inspection and cleaning frequencies
  - Canals
    - Capacity – Water elevations, dredging needs
    - Maintenance of canal banks – ownership/responsibility for existing bulkheads

6.3.5 O&M Plan Development

Based on information gathered, discussions with City staff, and our experience with municipal stormwater systems, we have developed a proposed Operations and Maintenance Plan for the Stormwater Department. As part of that effort, an operations model was developed to estimate the labor, equipment, and materials needed to operate and maintain the City's SWMS based on the proposed maintenance activities. The model includes staffing and equipment resources, and 22 maintenance activities. Estimated costs and resources needed for each activity were reviewed with City staff to ensure they are as accurate as possible. Based on the inputs provided, the model projects both the staffing levels and equipment needs of the Stormwater Department for the proposed O&M Plan that is detailed in the next section.

6.4 Proposed Operation and Maintenance Plan

This section provides a detailed Operations and Maintenance Plan (Plan) for the City of Sebastian's stormwater infrastructure, and is organized into seven sections and a series of appendices as follows:

Section	How to Use
Section 6.4.1 – Purpose and Goals	Statement of the purpose of the Plan and an overview of the City's goals and objectives from regulatory, environmental, and practical operations perspectives.
Section 6.4.2 – Stormwater Management Organization	Overview of the City's organizational structure, operational responsibilities and funding mechanisms for management of the SWMS.
Section 6.4.3 – Asset Management	Scope and workflow for an asset management system.
Section 6.4.4 – Standard Inspection and Maintenance Protocols	Standard inspection and maintenance protocols, tasks, frequencies, equipment, and materials. Detailed Standard Operating Procedures (SOPs) for common maintenance tasks are included in Appendix H.
Section 6.4.5 - O&M Forms, Logs, and Reporting	Contains the forms and reports necessary to implement asset management strategy. This chapter also includes protocols for data tracking, notifications, and reporting.
Section 6.4.6 – O&M Maintenance Scheduling	Documents the frequencies for inspection and maintenance tasks for several types of BMPs (Best Management Practices) and describes the scheduling for maintenance, both routine and otherwise. This chapter also outlines an adaptive management approach for evaluating and modifying maintenance schedules based on field observations. Where noted, management options are provided for the City's consideration.
Section 6.4.7 – Personnel, Equipment, and Budget Requirements	Budget estimates for the inspection and maintenance of the City's portfolio of BMPs. Budgets include requirements and costs for staffing, equipment, labor, and materials.

6.4.1 Purpose and Goals

This Plan has been developed for the City of Sebastian's consideration for the operation and maintenance of the City's stormwater infrastructure moving forward. The Plan has been carefully designed to fit within the City's budget, address existing problem areas, and provide a reasonable and workable regime for inspection, maintenance, data management, and reporting as well as staffing and budget allocations necessary to operate and maintain the City's SWMS successfully, sustainably, and comply with applicable Federal, State, and local permits and regulations. The Plan is meant to formalize operations and maintenance protocols for the SWMS and is intended for use primarily by the City's Stormwater Department staff tasked with operating the SWMS, but also incorporates support from other City Departments and funding sources. The Plan also serves as a reference for City officials, other City agencies and partners, the development community, and interested members of the public.

The City has many important goals for the operation and management of its stormwater infrastructure, including the following:

- Maintain compliance with all applicable Federal, State, and local permits and regulations.
- Meet all applicable policy goals in the City's Comprehensive Plan.
- Make the stormwater system more resilient and improve performance during larger storm events.

- Improve drainage and reduce recovery times.
- Improve the quality of discharged water, which can improve the water quality of receiving waters and help protect the environment.
- Maintain stormwater fees as low as possible and reduce economic burdens on the City's residents.
- Adjust City codes to complement and support stormwater management goals.
- Improve public education and outreach programs related to stormwater management.

As mentioned previously, the City's SWMS is a complex system of conventional drainage structures, green infrastructure, and a multitude of processes (e.g., pretreatment, conveyance, vegetation control, erosion, dredging, sediment removal, etc.) functioning in a dynamic urban environment that experiences approximately 58 inches of rain per year and occasional intense storm events. These factors place significant stresses on SWMS components, and the performance demands and maintenance requirements on the SWMS are high. Consequently, maintaining the SWMS presents many challenges and must be carefully planned and efficiently executed.

The operation and maintenance of the City's SWMS is further complicated by the fact that a significant portion of the City's roadside swales, critical components of the SWMS conveyance system, are maintained by individual residents. The large number of open channels and other SWMS components that are maintenance-intensive and the limited resources of the City require a carefully planned and executed operations and maintenance program. To that end, this O&M Plan was created to improve the SWMS performance, make the best use of the City's current resources, and provide the City with real options for continued improvement of the management of the City's stormwater infrastructure.

The Plan establishes protocols to ensure the proper function and long-term sustainability of the SWMS. Using an adaptive management approach, the Plan outlines inspection-driven protocols and recurring maintenance tasks, as well as data collection processes and format needed to continually evaluate the costs and needs of the program.

In addition, the Plan defines tasks, processes, equipment, staffing, and budgets, and includes Standard Operating Procedures (SOPs) that can be used by staff to communicate and implement its protocols. Due to the scale and complexity of the SWMS and the need for prompt response to issues, managing the flow of information between the Stormwater Department's field and office staff is essential. The Stormwater Department does not currently have an established asset management system. However, other City departments (i.e. Building Dept) use an asset management program for work order management and record keeping, and the City is considering expanding that program licensing to include the SWMS assets and Stormwater Department records. The Plan establishes forms that can be used in the field (for data collection) and in the office (for reporting, budgeting, and planning) via a software platform that is consistent with other City agencies. This approach allows the City to use data that is continuously collected through the O&M program to inform future decision-making with respect to maintenance strategies and target its investments to optimize performance.

It is important to note that this O&M Plan is not part of the City's NPDES MS4 permit. The standard inspection and maintenance protocols included in this Plan are only recommendations, and deviations from the Plan procedures do not necessarily constitute a violation of the City's NPDES MS4 permit.

6.4.2 Stormwater Management Organization

6.4.2.1 Organizational Structure

As mentioned previously, the City created the Sebastian Stormwater Utility (SU) and gave it the responsibility for the City's stormwater management, with all powers necessary for the exercise of its responsibility for the drainage

from all properties within the City. The City of Sebastian has placed the responsibility for the management of the SU with the Stormwater Department. Funding for the Stormwater Department's administration, O&M costs and capital budgets is generated primarily from Stormwater Utility Fee revenues, with additional revenues from the Discretionary Sales Tax and other sources. The management and funding structure for the SWMS appears very well planned, efficiently organized and with the necessary authority to meet the operational and maintenance challenges. This Plan does not propose any changes to the SU or Stormwater Department organizational structure. However, funding is a significant issue affecting the Stormwater Department, and a detailed analysis and other information related to funding levels necessary for the proper operation and management of the SWMS is included in Section 8 – Funding Plan and Grant Management.

6.4.2.2 Operational Responsibilities

The Stormwater Department is responsible for the maintenance of the SWMS, and currently is assisted by other City departments. There are no proposed changes to the operational responsibilities of the City with respect to SWMS maintenance. Note that the funding analysis in Section 8 assumes that activities currently conducted by other City departments will continue to do so. If the Stormwater Department were to assume all stormwater maintenance activities, the funding analysis would need to be revised accordingly.

6.4.3 Asset Management

6.4.3.1 Scope of Maintenance Asset Management

To ensure a robust, efficient, and cost-effective O&M Plan, various asset data must be stored, collected, and updated as the maintenance of BMPs takes place. During the development of the GIS map for the City's stormwater system, more than 8,500 SWMS assets were identified, located, and applicable data (i.e., asset type, materials of construction, dimensions, invert elevations, etc.) were compiled in the GIS database. This database of assets, including their respective features and any associated inspection and maintenance events, will play a crucial role in determining the life-cycle performance of each individual asset. These assets represent the major conveyance systems within the City's SWMS, but many more may be added in the future as the City's SWMS management efforts expand as the City continues to grow. Due to the sheer number of SWMS assets and the significant amount of data associated with them, a Computerized Maintenance Management System (CMMS) is needed to establish a system of regularly scheduled inspections and maintenance data updates.

The Stormwater Department does not currently have a CMMS but is evaluating available software systems and costs. Due to funding and staffing limitations many inspection and maintenance tasks are scheduled and performed on an as-needed basis, and documentation retrieval processes need improvement. As an interim measure, an MS-Excel based CMMS system is being developed based on the data collected for the GIS map. Proper use and organization of a CMMS will be essential in assuring that information is organized and utilized during the continued growth of the program.

6.4.3.2 Computerized Maintenance Management System (CMMS) Protocols

All inspection and maintenance tasks being performed will be recorded within the CMMS, along with attribute data updates from field surveys or reconstruction/modification of any assets. Inspections and maintenance activities will be scheduled based on preset intervals depending on the asset type and priority level. At the beginning of each workday City staff will generate reports from the CMMS for inspection and maintenance crews for planning daily work schedules. The CMMS report will show all scheduled activities, along with a cross reference to SOP forms that contain the appropriate data for each activity. During mobilization, the crew will review all assigned activities and

SOPs to assess if any specialized equipment or materials will be required. By performing this review, the crew will increase their preparedness and reduce the number of surprises they experience during the workday.

Completion of SOP forms should occur onsite during or immediately following completion of the inspection or maintenance work. By abiding by this practice, the crew can use the SOP form as a checklist to confirm that all requested maintenance tasks were performed and documented. Upon completion of work for the day, the crew will review the CMMS report and all SOP forms for activities that were completed and turn in the completed forms. The data from the forms will then be input into the CMMS system. Non-completed work will be carried out the next day. Significant discrepancies between work completed and work scheduled should be communicated to the City Engineer so that scheduling delays do not compound.

6.4.4 Standard Inspection and Maintenance Protocols

Guidance for standard inspection and maintenance protocols are detailed in this section. Recommended tasks, frequencies, equipment, materials, and other applicable protocols based on SWMS asset type are defined here.

6.4.4.1 Overview of Inspection and Maintenance Protocols

For inspection and maintenance tasks to be carried out efficiently and consistently, protocols have been developed for the most commonly occurring tasks. This section includes a detailed description of those tasks, and the required tools and equipment needed to conduct each of them. This section does not include all potential maintenance protocols. If the need to enact a maintenance protocol not detailed within this chapter arises, proper communication of the task goals and procedures will be required. SOPs have been developed for the most common tasks and are included in Appendix H.

6.4.4.2 List of BMP Asset Categories and Technologies

Detailed descriptions of BMP assets were discussed in Section 4.2. Brief descriptions of each type of BMP asset categories within the City are provided below in Table 6-4. Maintenance protocols for individual assets are typically prescribed based on the asset category.

Table 6-4. BMP Asset Categories

Category	Description
Non-Structural BMPs	These are regulatory or system-wide BMPs that focus on preserving open space, protecting natural systems, and incorporating existing landscape features into a site plan to manage stormwater at its source. Examples of non-structural (not fixed or specific to one location) BMPs include land use planning and public information programs.
Structural BMPs	These are constructed BMPs that help to prevent pollutants in stormwater runoff from leaving a property, entering storm drains, and impacting local waterways. There are thousands of structural BMPs across the City's stormwater system, and include such assets as weirs, dams, catch basins, baffle boxes, and culverts.
Canals	Stormwater assets classified as "canals" include the entire interconnected system of large open channel waterways that run through the City. Altogether, the City maintains over 9 miles of canals, including the Elkcam Waterway, Collier Waterway, Schumann Lake, Hardee Lake, Harbor Pt. Waterway, and Joy Haven Waterway.
Ponds	There are 30 stormwater ponds throughout the City. These include all the ponds located within City parks, as well as the interconnected ponds of the Stormwater Park, and the multiple ponds of the Day Drive Retention Area. Ponds can be retention or detention ponds, and may be part of a larger treatment train with wetland areas or canal systems.
Ditches and Swales	The majority of the stormwater conveyance system is an expansive network of ditches and swales running through back yard, side yard, and along roadways. Control of vegetation and sediment buildup within these BMPs is a constant maintenance task.
Dry Retention	Dry retention areas are located throughout the City and they are areas of lower elevation, which only hold water during periods of heavy rainfall. They are designed to overflow excess water into nearby water features through catch basins and pipes. Keeping dry retention areas vegetated is important to prevent compaction and increasing water infiltration. Too much vegetation can decrease the storage capacity and block the flow of stormwater towards other features.

6.4.4.3 Inspection Protocols for SWMS Assets

It is essential that inspections be conducted consistently and communication between inspectors and other team members be upheld. Inspections can be classified as one of five types: Visual Inspection, Routine Inspection, Post Storm Inspection, Compliance Evaluation Inspection, and State Regulatory Agency Inspection. These types of inspections are explained in Table 6-5.

Table 6-5. Inspection Types

Inspection Type	Description	Applicable BMPs
Visual Inspection	Visual inspection to verify physical and operational condition using a portable camera or vehicle-mounted GPS-enabled digital video camera. Photos and camera footage reviewed by Stormwater Department staff to determine compliance status. Non-compliance issues will be documented and processed according to current City code enforcement procedures.	Grassed swales, culverts, structures.

Table 6-5. Inspection Types

Inspection Type	Description	Applicable BMPs
Routine Inspection	Visual inspections and maintenance of stormwater management devices shall be conducted on a regular basis to discover conditions that could cause drainage issues resulting in localized flooding or discharges of potential pollutants to surface waters, and to ensure that appropriate stormwater control measures are in place (housekeeping, BMPs, structural controls, etc.). City staff will inspect SWMS components, document all inspections on appropriate forms, and track results of inspections to ensure that appropriate actions are taken. Inspection records will note all observations (color, odor, clarity, floating solids, settled solids, suspended solids, foam, oil sheen, and other obvious pollution indicators), including SWMS component ID, inspection date/time, inspector name, problems found, and steps to correct any problems, including who has been notified.	All BMP Types.
Post Storm (Supplemental) Inspection	City staff will conduct a visual post-rain inspection within 24 hours of a rain event of one inch or greater. The purpose of the inspection is to identify areas of standing water or other drainage issues due to the storm.	All BMP Types.
Compliance Evaluation Inspection	Annual inspection led by City Engineer to review documentation of training performed, inspections completed, maintenance activities performed, CMMS data completeness, and annual outfall evaluation for unauthorized discharges. This inspection will also confirm that all records required to be maintained as a condition of the NPDES MS4 Permit are being correctly completed, recorded, and are available for inspection.	All BMP Types.
State Regulatory Agency Inspection	FDEP representative may enter during normal business hours, or when stormwater discharges are occurring, to review all records maintained as a condition of the NPDES MS4 Permit; Inspect the facility, equipment, practices, or operations related to the Permit; or Monitor stormwater to ensure compliance with this Permit. A City representative will always escort the FDEP representative during the inspection. If at any time the FDEP representative takes photographs, the City representative will take a photograph as well.	All BMP Types.

6.4.4.4 Inspection Frequencies and Protocols

Inspection frequency is dependent on BMP ownership, maturation level, and inspection type as described in the following subsections. As sites mature, required inspection frequencies may be reduced per the adaptive management plan.

BMPs within Public ROW or Drainage Easements

BMPs located within the public right-of-way are typically subjected to a significant amount of stormwater loading, resulting in the need for continued inspection and maintenance to assure its function. Routine inspections of these SWMS components are typically recommended to be conducted monthly regardless of BMP type. However, the City considers the front yard swales and driveway culverts privately-owned BMPs and do not currently conduct regular inspections of them. This results in a significant portion of the drainage infrastructure within the City being highly susceptible to failure due to lack of maintenance, which has been a documented historical problem. The City is evaluating options for improving code compliance related to these BMPs, and in conjunction with that compliance effort, and because of the critical nature of these BMPs, it is recommended that the City implement a minimal visual inspection program for them. Due to the seasonal rain patterns and the City's limitations of funding and resources, these inspections are recommended twice per year, in May before the rainy season begins and in November after it ends. Additional inspections would also be made upon a resident complaint.

For public BMPs within public right-of-way or drainage easements, routine inspections and maintenance will be performed as shown in Table 6-6 below.

Private BMPs

Privately owned BMPs not in a public right-of-way generally experience less disturbance than their publicly owned counterparts. For this reason, expected inspection and maintenance frequencies are lower by comparison. Routine inspections are typically recommended to be conducted seasonally at a minimum, but the City only inspects privately-owned BMPs if there is a permit enforcement issue. However, ensuring that privately-owned BMPs are properly operated and maintained is very important, as they typically discharge into the City's SWMS. For this reason, it is recommended that the City establish a program for certification of all privately-owned stormwater systems. Such a program may include:

- A certification fee, additional revenue to the City's Stormwater Department to offset processing costs.
- An annual inspection report by a Florida-licensed professional engineer and accompanying digital time-stamped photographs.
- A certification form, signed and sealed by a Florida-licensed professional engineer documenting that the system is properly maintained and operating as designed and permitted.
- The City has a certification program in its existing Stormwater Fee Credit program for private systems exceeding SJRWMD standards, which could easily be incorporated.

Post-Storm Inspections

A post storm inspection is recommended to be done after a storm greater or equal to one inch of precipitation.

Other Inspections

Site Compliance Evaluation and State Regulatory Agency inspections are performed as needed.

Routine Maintenance Activities for SWMS Assets

Table 6-3 in Section 6.3.3 described the current SWMS maintenance activities, who is responsible for them and how often they are performed. This information was compared to published sources (i.e., USEPA, etc.), industry standards, and our experience with Florida stormwater systems to determine the appropriate activities, schedule, and resources needed to effectively maintain the City's SWMS and, where possible, to address identified problem areas.

The City's Stormwater Department is conducting most of the maintenance activities needed for the SWMS and appears to be doing a good job with the resources they have available. Unfortunately, the City's SWMS is very

challenging to operate and maintain, and the funding, staffing, and equipment resources will have to increase from current levels in order to properly maintain the system, document maintenance activities, and shift from a reactive to a proactive style of management. Addressing the many challenges presented has been a long and complex process; Arcadis has expended much time and effort carefully analyzing and modeling the SWMS, the Stormwater Department operations, funding sources, capital projects, reviewing hundreds of previous reports, plans, and documents, and conducting many meetings and discussions with City staff to generate the proposed Plan.

The Plan provides a roadmap to a more proactive method of managing the SWMS now, while also planning for additional resources in the future to improve operations and maintenance and optimize its performance. The routine maintenance activities included in the Plan are included in Table 6-6 below and represent the minimum maintenance activities that should be performed to keep the SWMS in proper physical and operational condition. The table presents the activity, a brief description, the responsible entity (RE), recommended frequency, and notes. SOPs with more detailed procedures that are intended for use by City staff during these maintenance activities are included in Appendix G.

In accordance with the City's IPM Plan, all City employees who, within the scope of their duties, direct maintenance activities on the stormwater system will be trained in the City's IPM Policies. A certification course on Green Business Best Management Practices will be provided through partnership with the University of Florida Indian River County Extension Office as needed. Stormwater and Public Works staff also receive certification training on Sediment and Erosion Control. The training sessions are coordinated by the Human Resources Director, who will track employees' attendance and ensure that City field staff holds an active certification. Licensed Applicators. At this time, City staff will not be applying any herbicides on the surface of, or within ten feet of aquatic areas. All aquatic herbicide applications will be performed by a State licensed contractor.

Where planned management methods need to change from existing ones and to address identified problem areas, management options are provided for the City's consideration.

(this section intentionally left bank)

Table 6-6. Routine SWMS Maintenance Activities

Activity No.	Activity or SWMS Component	Description	Responsible Entity	Frequency	Maintenance Activities and Notes
1	Clerical Support	Support Staff	City	NA	Included in 2023 SW Dept. budget. Additional SW Dept staff to increase administrative and documentation effort, especially CMMS data management.
2	Front Yard Swale and Driveway Culvert	Drive-By Visual Inspection	City	Semiannual	The City does not currently conduct routine inspections of the front yard swales and driveway culverts. This inspection would be a simple drive-by visual inspection with a GPS-enabled camera to allow City staff to identify problem areas and begin the correction process early. Would be done in May and November, before and after hurricane season.
3	Front Yard Swale and Driveway Culvert and Citizen Request Response	Routine Visual Inspection and Maintenance	Property Owner	As Needed or by CR	Maintenance issues with front yard swales and driveway culverts are widespread and have been a historical problem area in the management of the SWMS. The current management method has not resulted in the correction of drainage issues quickly or consistently. Resident compliance with City codes associated with the maintenance of the front yard swales is a difficult issue, and one common to municipal stormwater systems. The level and methods of compliance enforcement is a policy decision for the City to make. The City is currently evaluating potential policy changes to improve code compliance. No official changes have yet been adopted, therefore, this report assumes no change from current practices. The SW Dept spends an estimated $51,000 per year on labor addressing CRs, about 24 hours of staff time per week.
4	Front Yard Swale	Quarter Round Cleaning	City		As a pilot program several years ago, the City installed “quarter round” (PVC pipe quarters) in the bottom of approximately 3,505 roadside swales in many areas to improve the drainage characteristics of the swales. The program was discontinued in 2019, but the quarter round sections were not removed. The City continues to perform regular cleaning (weedeating, edging and removal of all debris) of the installed quarter rounds on approximately 490 lots. This activity costs the City an estimated $132,000 per year, is very labor intensive, and is of marginal value to the operation of the SWMS. Consider removing the Quarter Round systems during future activities to reduce maintenance costs.

Table 6-6. Routine SWMS Maintenance Activities

Activity No.	Activity or SWMS Component	Description	Responsible Entity	Frequency	Maintenance Activities and Notes
5	Inlet Structure	Visual Inspection	City	10/year	No change
6	Inlet Structure and Conveyance Piping	Routine Inspection and Maintenance	City	Annual	Increase frequency to annual - current frequency is As Needed or in response to CR. Inlet structures and associated conveyance piping should be cleaned annually in Florida. There are approximately 320 inlets in the SWMS, City staff reported that typically only one can be cleaned per day. Increasing the maintenance frequency should reduce the average sediment loadings in these structures and increase the cleaning rate and work efficiency.
7	Road Crossing Culvert	Visual Inspection	City	Annual	Increase frequency to annual - visual inspection to identify and prioritize culverts for routine maintenance.
8	Road Crossing Culvert	Routine Inspection and Maintenance	City	20% per year	Change maintenance frequency so all culverts are cleaned every 5 years. The SWMS has approximately 1,300 road crossing culverts. The City currently cleans about 50 per year, this would increase to about 260 per year.
9	Road Crossing Culvert	Slip Lining	City	As Needed	City contractor performs sliplining of existing culverts rather than the City replacing them to minimize cost and disturbance. About $60k per year budgeted.
10	Baffle Box	Routine Inspection and Maintenance	City	Quarterly	No change proposed. City has 8 of these, each takes approximately four hours to clean.
11	Side Yard Ditch	Mowing	City	Quarterly	No change proposed. City has a 10’ easement area, mowed by City contractor. See Section 9.2 for discussion of adjustment of City codes.
12	Side Yard Ditch	Sediment Removal and Regrading	City	10% per year	Grassed swales and open channels should be on a 10-year regrading schedule.
13	Back Yard Ditch	Mowing	City	Quarterly	No change proposed. The City has a 20-foot drainage ROW from the back property line of each parcel abutting a back yard ditch for maintenance access. Back yard ditches are maintained by the City’s contract mowing vendor.

Table 6-6. Routine SWMS Maintenance Activities

Activity No.	Activity or SWMS Component	Description	Responsible Entity	Frequency	Maintenance Activities and Notes
14	Back Yard Ditch	Sediment Removal and Regrading	City	10% per year	Approximately 1,400 LF/day currently. Grassed swales and open channels should be on a 10-year regrading schedule.
15	Back Yard & Side Yard Ditch	Visual and Mowing Inspection	City	Quarterly	Expand existing inspection to be a visual inspection with documentation of back yard and side yard ditch conditions and verification of the City's contract mowing vendor's work.
16	Driveway Culvert	Repair During Road Repaving	City	As Needed	The City removes and replaces a section of the driveway and the driveway culvert in conjunction with road paving. Approximately 30 per year.
17	Retention and Detention Ponds	Visual Inspection	City	Quarterly	The City has 30 ponds that are inspected each quarter.
18	Retention and Detention Ponds	Inspection and Maintenance	City & Private	Monthly	No change proposed. The SW Dept mows the Schumann Dr. retention pond, Parks Dept mows others. Private owners maintain private ponds.
19	Stormwater Park	Pump Operation	City	Automatic	Optimize pump controls and operation to minimize SW Dept labor for this activity. Consider adding a smaller pump (perhaps solar powered) that will circulate a constant flow of water through the Stormwater Park and a shift to automatic control of the existing large pumps. The automatic control of the existing large pumps would need to be reviewed and optimized to operate only during large wet weather events based on the water levels in the Collier Central Waterway. Additional monthly electrical costs are not included in cost estimates for this item.
20	Stormwater Park	Mowing	City	Monthly	SW Dept mows the Stormwater Park once per month. Parks Dept also mows it once per month.
21	Stormwater Park	Mowing	City	Annual	City contractor mows once per year, as requested by the City.
22	Public Works Compound	Mowing	City	Monthly	SW Dept mows once per month. Parks Dept also mows it once per month.

Table 6-6. Routine SWMS Maintenance Activities

Activity No.	Activity or SWMS Component	Description	Responsible Entity	Frequency	Maintenance Activities and Notes
23	Dams and Weirs	Inspection and Maintenance	City	Semiannual	Change frequency to semiannual. The SWMS has two dams (Concha and Hardee) controlling discharge from the canals and one weir (Stonecrop) regulating discharge from the SWMS.
24	Canals	Inspection and Maintenance	City	Semiannual	The City has a 100' drainage ROW over the canals and performed maintenance dredging in the Collier Canal area in 2006. No other maintenance dredging has been performed. Significant sediment loading and shoaling in some areas was observed during field inspections. Aquatic weed control is performed by a City contractor in accordance with the City's IPM Plan.
25	Canal Side Slopes	Visual Inspection	City	Semiannual	Conduct semiannual visual inspections (in May and November) of canal banks and only those bulkheads that the City maintains to identify erosion or structural damage that needs to be addressed. Approximately 35% of parcels abutting canals have no seawall or other slope protection. There are 756 bulkheads along the banks of City's canals. 20 are within the City ROW and City owned and maintained. Bulkheads located outside the drainage easement on private property are not maintained by the City. Physical inspections were performed in 2022 and many of the bulkheads were in fair or poor condition. More than 200 are structurally failing and in need of immediate replacement.
26	Offsite Drainage Areas	Visual Inspections and Coordination with SJRWMD	City/SJRWMD and Private	Semiannual	Change to SW Dept staff conducting semiannual inspections of offsite drainage areas (in May and November) and document conditions of drainage paths from the City's system that are privately owned and the City does not have a drainage easement. Lack of maintenance in offsite drainage paths reduces discharge capacity from the City's system, resulting in elevated water surface elevations and localized flooding conditions during larger storm events. Maintenance of these areas in enforced by the SJRWMD via ERP permit requirements for the private developments. Coordinate with SJRWMD staff as needed to enforce maintenance requirements.

Table 6-6. Routine SWMS Maintenance Activities

Activity No.	Activity or SWMS Component	Description	Responsible Entity	Frequency	Maintenance Activities and Notes
27	Hurricane Preparation	Securing Buildings, Moving Equipment, Etc.	City	As Needed	No change proposed.
28	Post-Storm Inspection	System-Wide Visual Inspection	City	10x/Year	No change proposed. Inspection occurs only after hurricanes and large storm events.
29	Hurricane Recovery	Debris Cleanup	City	As Needed	No change proposed. Approximately 2 weeks after hurricane
30	Sidewalk Repair	Assist Public Works	City	As Needed	This activity is not related to the SWMS and does not appear to be a good use of very limited SW Dept. staff labor and should be removed. One option would be for the City to have an on-call contract for sidewalk repair/replacement rather than using City labor.
31	Side Yard and Back Yard Ditch	Plan Review	City	As Needed	Side slopes for septic system mounds and house foundations are sometimes extending into side yard swales. For developed properties, evaluate side slopes and shift swale within easement area if possible to restore original swale cross section and flow capacity. Obtain additional easement area, if necessary. For new construction, strictly enforce City Codes and deny all construction permits where septic mound or foundation pad side slopes interfere with side yard swale side slopes or longitudinal grades.

Table 6-6. Routine SWMS Maintenance Activities

Activity No.	Activity or SWMS Component	Description	Responsible Entity	Frequency	Maintenance Activities and Notes
32	Private stormwater systems discharging into City SWMS	Private System Certification Program	City & Property Owner	Annual	The City performs no maintenance or inspections of private systems. As part of the existing Stormwater Fee credit program the City has a certification program to ensure private systems are maintained, but it only applies to private systems that exceed SJRWMD design standards. Private systems that do not exceed SJRWMD design standards do not provide inspection or maintenance information to the City. This makes them susceptible to failure if not properly maintained and could also adversely affect the City's SWMS. Consider establishing a certification program (an expansion of the existing program) requiring all owners of private systems to submit a certification form signed and sealed by a Florida PE or Architect stating that its system is being properly maintained and operated, along with date stamped digital photographs. The City can charge a fee for the certification to generate additional revenue and the program would effectively leverage private entities to perform required maintenance and provide visual inspection information that can be entered into the City's CMMS system.

6.4.4.5 Non-Routine and Corrective Maintenance Protocols for SWMS Assets

Inspectors and maintenance crews should remain vigilant in diagnosing maintenance deficiencies and SWMS needs. If these types of items are identified, the inspector must make a judgement call to determine the proper course of action. If at any time the inspector is unsure of how to classify an identified issue not outlined within the O&M Plan, the City Engineer should be contacted for direction. These issues can be classified as either a non-routine maintenance task or corrective maintenance depending on their severity and the amount of work and coordination required to perform the task.

6.4.4.5.1 Non-Routine Tasks

Non-routine tasks are items that are not explicitly defined in the previous section but can be carried out during routine maintenance events without requiring specialized labor or equipment. Sufficient lead time should be provided to the maintenance crew to allow for proper preparation and procurement of materials. As with any maintenance activity, all work should be properly documented so that the attribute data in the CMMS is updated correctly and accurately.

6.4.4.5.2 Corrective Maintenance Actions

Corrective maintenance is defined as maintenance tasks that require significant effort or specialized labor or equipment to address. All members of the maintenance team, or even community members, can identify potential corrective maintenance tasks, whether through notes in work orders, or direct communication with City staff. Inspection work orders contain issue identification built into the work order. This is done to encourage inspectors to think about what types of issues may result in corrective maintenance action.

Regardless of its source, once issues that require corrective maintenance are identified, they will be elevated to the City Engineer who will decide how to address the issue. Corrective maintenance varies widely in cost and complexity. Less intensive corrective maintenance may require minor coordination between maintenance crews and other members of the maintenance team. More involved corrective maintenance may need to be added to the City's Capital Improvement Program. A well-defined project scope, schedule and estimated cost should be determined by the City Engineer as part of the corrective maintenance planning process.

Examples of corrective maintenance may include, but are not limited to, structural damage to SWMP components, grading issues, major reconstruction or repair work, or design issues affecting performance that are not correctable through routine maintenance. It is important that recurring issues are reported to the City Engineer rather than repeatedly deferred to corrective maintenance. Recurring issues may be indicative of other issues that cannot be fixed through corrective maintenance and may require a more thorough analysis.

Prioritizing Corrective Maintenance

Upon identifying a corrective maintenance need, the project priority should be discussed and decided upon by the City Engineer. Issues that without corrective maintenance pose a safety hazard or create a condition that prohibits the proper function of the SWMS should be prioritized over aesthetic or preventative tasks. The amount of time required to address corrective maintenance issues ranges from a few days to months depending on the severity, complexity, and priority of the issue. In certain more complex emergency cases, temporary resolutions should be presented as a stop-gap measure to address public safety or functional issues while a more permanent resolution is determined.

Priority ranking uses a simple calculation to weight the importance of a proposed corrective maintenance action based on multiple criteria. For each criteria, a weight (%) and importance score (1-5) is selected and a weighted ranking is calculated to determine its priority. For example, if a 40 foot long, 15-inch diameter culvert collapsed

and was backing up water into a grassed swale becoming a nuisance for 20 houses, the priority ranking calculation might be as follows:

Criteria	Weight (%)	Importance (1-5)	Weighted Score (A x B)	Notes/Examples
Public Safety/ Damage Hazard	30	3	0.3	1= No Hazard 5= Localized road flooding creating hazardous driving conditions
Area Affected	20	2	0.4	1= <10 properties 5= >100 properties
Correction Scope	20	3	0.6	1= Simple 5= Requires Engineering
Correction Cost	20	3	0.6	1= <$5,000 5= >$1M
Correction Schedule	10	3	0.3	1= <30 days to correct 5= >180 days to correct
Totals	**100**	**Priority Score**	**2.2**	

The priority ranking score can be interpreted as follows:

- Score of 1 = No impact - not a significant issue.
- Score of 2 = Minimal impact – issue easily addressed.
- Score of 3 = Moderate impact - causes some issues but can be addressed.
- Score of 4 = High impact – safety hazard and/or potential damage, difficult to address
- Score of 5 = Catastrophic impact – significant safety hazard and/or property damage.

For the example above, a priority ranking score of 2.2 would be Minimal Impact, issue easily addressed. Typical responses based on the priority ranking are presented below.

Priority Ranking	Response
1-1.99	Issue should be addressed during the next Routine Inspection.
2-2.99	Issue should be addressed before the next rainfall event.
3-3.99	Issue should be addressed as soon as possible before the next rainfall event.
4-5.00	Safety/Damage Issue - Immediate Repair or Action is required.

6.4.4.6 Recommended Maintenance Frequency Based on Service Level

Recommended maintenance frequency represents a balance between providing enough maintenance to encourage proper functioning of SWMS components and available funding. This plan provides an adaptive approach to maintenance frequency, focusing expenditures based on those SWMS components that have the largest performance effects on the City's system. The inspection and maintenance frequencies presented in this

Plan should be regularly reviewed and changed to fit current system priorities and funding levels. Recommended frequencies for specific maintenance tasks are presented in Table 6-6.

6.4.4.7 Preventative Functional Maintenance

During inspections and maintenance activities, City employees are expected to not only determine what issues are currently affecting a SWMS component, but also to look for and report signs of future issues. By identifying these issues early, the City Engineer can plan and execute preventative measures to prevent functional issues or reduce the cost required to remedy them. Depending on the severity and type of issues identified, preventative functional maintenance tasks may be included in future routine maintenance work orders as notes or may result in the creation of a corrective maintenance work order.

6.4.4.8 Aesthetic Maintenance

The City of Sebastian is a tourist destination, and as such proper aesthetic maintenance of SWMS components is one of the primary goals of the O&M Plan. By maintaining the proper aesthetics, the surrounding community will be more likely to have a positive perception of the SWMS and the City as a whole. Overgrown vegetation, defaced surfaces, and damaged components should be reported as aesthetic issues and handled by maintenance staff. Work orders specific to addressing aesthetic concerns, outside of the recurring schedule may be generated by the City at any time or upon receiving community feedback. However, the priority for addressing aesthetic issues must be carefully considered due to Stormwater Department staff availability and funding limitations.

6.4.5 O&M Forms, Logs, and Reporting

This section explains the template inspection forms, maintenance forms, and reports necessary to implement the asset management strategy. This section also includes protocols for data tracking, notifications, coordination with other agencies, and reporting safety hazards.

6.4.5.1 Requirements for Tracking and Reporting Inspections and Maintenance

The City is required to provide a semiannual report for the preceding six-month period to FDEP on January 30 and July 30 of each year. This report is required to include the status of any construction or compliance measures, completion of milestones, and problems encountered (or anticipated) - along with implemented (or proposed) solutions. The report also must include the status of permit applications, O&M information, and additional reports provided to other state agencies. Most of these items are beyond the scope of the Plan and are not discussed in detail in this document. This section focuses on reporting requirements related to proper O&M of built SWMS assets, typical problems encountered, and potential solutions.

Section 6.3.4 describes corrective maintenance as maintenance tasks that require significant effort or specialized labor or equipment to address. The status of corrective maintenance projects will be provided as part of the City's Semi-annual Report. For the purposes of reporting, corrective maintenance will be placed into one of three categories:

- Need for corrective maintenance identified,
- Corrective maintenance solution proposed, and
- Corrective action taken.

Reporting will include the status of the project and, depending on that status, a brief written summary of the observed issue and any recommended or performed corrections. Once a resolution has been reached and documented in CMMS further reporting related to the issue will not be provided unless the issue resurfaces.

6.4.5.2 Overview of Inspection and Maintenance Reporting, Data Management, and Forms

Maintenance Reporting and Data Management

Most data used to support the performance of O&M tasks is collected through a CMMS. The use of a CMMS system allows all pertinent O&M data to be stored within a single centralized repository. As mentioned previously, the City does not currently have a CMMS but is evaluating available software systems and costs. As an interim measure, an MS-Excel based CMMS system is being developed based on the data collected for the GIS map.

The interim CMMS will generate a daily work order report, which will show a list of all SWMS activities that are due for completion based on the established schedule. The CMMS will limit the number of activities assigned on the daily work order report to what can be reasonably accomplished in a normal workday by available maintenance personnel. In addition, the CMMS will have the capability to generate an emergency work order for a single activity independent of schedule or priority.

The work order report fields will be specifically designed to provide field crews with a concise listing of work needed, with all necessary information (i.e., SWMS component type, location, and cross-referenced SOPs). The work order reports and associated SOP forms can then be combined into a daily work order package, which will then be turned in at the end of each workday and the data entered into the CMMS.

Inspection and Maintenance SOP Forms

Standard forms for inspection of SWMS assets and routine and corrective maintenance SOPs for each asset type are included in Appendix G. The SOPs contain inspection details, checklists, and background information about the asset necessary to perform and document the work. The last page of each SOP is a Record of Service Form that contains the data fields that the City field crews will complete during an activity.

6.4.5.3 Notifications

The City Engineer or designated City staff member will provide the Stormwater Superintendent with the Work Order Report (along with applicable SOPs), who will in turn notify work crews and individual team members about upcoming maintenance and inspection activities. Work orders for inspections are generated based on recurrence intervals dictated by the adaptive management status of the asset, which can be easily changed as needed in the CMMS. Work orders for maintenance can be generated based on the result of routine inspections or minimum recurrence intervals as noted in the adaptive management plan.

Work Order Reports are not only used to assign work to crews as discussed above. Completed reports and SOP documentation will be provided to the City Engineer daily for input into the CMMS and to summarize work completed during the previous workday and flag any issues identified by the inspection and maintenance crews.

6.4.5.4 Coordination with Other Agencies

Coordination with other agencies such as the FDEP, SJRWMD, and others is critical to the success of the O&M program. Encouraging lasting relationships between agencies will create a sense of community and stewardship centered around the BMP assets. The City can champion this stewardship by remaining responsive to requests set forth by other agencies and community members and through the implementation of a proactive O&M program.

Throughout the life of the program, opportunities for partnership with other agencies may arise to accomplish program goals. As part of these partnerships, a memorandum of understanding between all associated agencies should be developed detailing the O&M responsibilities of each party.

6.4.5.5 Reporting Safety Hazards

Safety of workers and the public is a key element of the program. Promoting a safe environment is the duty of everyone – from City maintenance crews to individual community members. If a safety issue related to a SWMS asset is observed by an inspector or maintenance crew, it should be reported immediately to the City Engineer. The reporting person or crew should remain on site while the issue is resolved so long as there is no immediate danger. Identification of safety issues by inspection and maintenance personnel should not be limited to SWMS assets. If unsafe site conditions are identified or public safety issues are observed related to other City assets, they should be reported to the City Engineer or designated City staff member.

Safety issues with a SWMS asset reported by community members should be communicated to the City Engineer or designated City staff member. Once identified, the City Engineer should create emergency inspection or maintenance work orders or take other measures as appropriate.

6.4.5.6 Completion of Standard Inspection and Maintenance Forms

The final step required for any work activity is the completion of the hard copy SOP data collection form. The SOP form is then turned in to the City Engineer or designated City staff member so the CMMS database can be updated. When the CMMS asset data is updated with the completion date on the SOP form, then the activity is considered complete and will not appear on subsequent CMMS pending activity reports. Completed SOP forms are considered data points for the purpose of reporting and are to be kept on file with the City for a minimum of three years in accordance with USEPA recordkeeping requirements and City document storage policy.

6.4.6 O&M Schedules

Recurring maintenance frequencies for inspection and maintenance tasks for several types of BMPs, as well as workflows for inspection-driven maintenance activities are documented in this section. This chapter also outlines an adaptive management approach for evaluating and modifying maintenance schedules based on field observations. On occasion, sites will require maintenance outside of the recurring schedule. This need is facilitated by a site requiring emergency, corrective, or reactive maintenance.

6.4.6.1 Scheduling Routine Inspection and Maintenance

Keeping a well-organized schedule will allow the City to assure that their SWMS assets are maintained frequently and that crew members maintain a consistent workload. The schedule consists of two major elements, which are explained in detail below.

6.4.6.2 Recurring Schedule

The recurring schedule encompasses all routine inspection and maintenance tasks. Upon establishing a recurring schedule, assets will be visited in the same order over a set time interval. The recurrence interval for maintenance activities varies depending on both the activity and the asset type. Therefore, the CMMS will be set up to allow for up to four recurring maintenance activities to be schedule for each asset. The specific routine tasks that are carried out during each recurring activity will be defined by the activity and its associated SOP form.

6.4.6.3 Adjustments to Recurring Schedule and Adaptive Management

The activity types and recurrence intervals for each asset are established when the asset is added into the CMMS database. Tasks performed during these scheduled activities are based on asset-specific requirements, which are detailed in the SOPs. Both the frequency of routine visits and what tasks are performed during these visits can be changed based on operational experience, staff or funding limitations, or other reasons, which can result in

adjustments to the recurring schedule and possibly the SOP. However, such schedule adjustments cannot result in a recurrence interval that is below required minimum inspection or maintenance intervals for the asset type.

6.4.6.4 Scheduling Inspection-Driven Maintenance

Depending on the extent of the work, inspection-driven maintenance can occasionally be incorporated into a previously scheduled routine event without disrupting the remaining recurring schedule. Such additional inspection-driven work performed can be easily documented in the SOP forms and the CMMS activity notes. Certain inspection-driven events may include work that will require immediate action, additional time spent on site, or the use of specialized materials or equipment. In these cases, an additional event will be required and will be scheduled by the City Engineer.

6.4.6.5 Weather and Other Conflicts

If weather conditions do not allow for work or other conflicts arise resulting in the inability to perform work, the recurring schedule will need to be adjusted accordingly. If weather conditions do not allow for work or other conflicts arise resulting in the inability to perform work, the maintenance activity schedule will need to be adjusted accordingly. Cancellation of work for the day for whatever circumstance will be at the discretion of the City Engineer. Typically, if the delay is only a day or two the schedule can be shifted, and all work can still be completed within the month. However, if there are significant delays, the City Engineer may want to consider cancelling the lowest priority work orders to allow the crew to catch up to the original schedule.

6.4.6.6 Unscheduled Maintenance

Unscheduled maintenance is typically classified as either emergency maintenance or corrective maintenance. Both types of maintenance are outside of the recurring maintenance schedule, but the CMMS allows for unscheduled activities to be initiated by individual work orders and recorded when completed without affecting the recurring activities schedule. Since emergency maintenance often occurs as the result of an unsafe condition or a malfunctioning SWMS component, some recurring scheduled activities may need to be delayed to accommodate the higher priority emergency work, if sufficient float in the daily work schedule is not available. Corrective maintenance, which is often not as high of a priority as emergency maintenance, can be scheduled at the end of the month between recurring schedule cycles. The individual work orders for these activities will simply remain open until the activity is completed and recorded in the CMMS. In this way, the City can accrue a backlog of corrective maintenance work orders which can be performed during the dry season, or when workload permits.

6.4.6.7 Inspection Follow-up Protocols

Inspections sometimes result in the identification of additional maintenance tasks to be performed during upcoming routine maintenance events. Any additional work needed for an asset in an upcoming scheduled activity can be added as a note on the particular asset record in the CMMS asset database. Individual work orders will include such notes and other specific instructions relating to these identified issues or maintenance tasks. It is crucial that CMMS administration and inspection/maintenance personnel are in communication with each other consistently. This applies to verbal communication, communication written within work orders, and communication about schedule.

6.4.6.8 Documenting and Reporting Problems

One of the primary goals of inspectors is to identify issues with the BMPs they are inspecting and suggest potential solutions to these issues. When an inspector identifies an issue, they should first consider the safety implications of the issue both in terms of completing the inspection as well as others who may be interacting with

the BMP once the inspector is offsite. If a safety issue is identified, the inspector should immediately report it to the City Engineer. Safety issues should always be noted as high priority on a work order to allow for the rapid resolution of the issue and minimization of the safety risk. Inspectors should use the work order documentation as a tool for disseminating information to the rest of the Stormwater Department. Inspectors should not overly rely on work order documentation as their only line of communication, especially for issues that may pose safety risks, result in major repairs, or require specialized tools. Inspectors should strive to make sure issues they are identifying are being resolved in the most effective and efficient way.

Any inspector notes on a maintenance activity for a particular asset will be inherited by the upcoming maintenance work order for that asset. On the asset SOP documentation, the inspector can request a new individual work order be created for corrective or emergency maintenance. If either of these options are selected, the inspector should notify the City Engineer that an individual work order for a follow-up activity is needed. If for any reason the inspector is unsure if a new work order should be generated, the City Engineer should be contacted.

6.4.6.9 Initiating Corrective Maintenance

Corrective maintenance is initiated through the issuance of an individual work order in CMMS. A work order will be generated upon identification of the need for corrective maintenance; however, it will remain unassigned to a crew until additional details are provided and it is manually assigned. The City Engineer and Stormwater Superintendent should discuss the corrective maintenance request and define a plan for completing the work. Certain corrective maintenance tasks that do not require additional coordination may be assigned immediately by the Stormwater Superintendent. Other types of corrective maintenance actions may require additional visits to the site or consultation with design engineers or other experts. Once a plan has been defined, the work order can then be assigned, and the work completed with the necessary oversight. It is not common for some larger corrective maintenance tasks to take several maintenance cycles to plan for and mobilize, making it especially important for the inspector to identify and communicate the issue quickly and effectively.

6.4.6.10 Adding New Assets to the Schedule

As the City's SWMS grows, new assets will be entered into the maintenance program, and will therefore need to be added to the CMMS asset database and the recurring activity schedule established. New assets should be added to the CMMS asset database as soon as possible after they are installed or accepted for maintenance by the City, and then it will begin appearing on the Work Order Report as soon as it is due for a maintenance activity. During future schedule cycles, the City Engineer may adjust asset maintenance schedules to accommodate new assets most effectively. Periodically reordering the asset maintenance schedules may result in an increase in program efficiency.

6.4.6.11 Scheduling Capital Replacements

As SWMS assets near the end of their design life or system issues develop beyond the scope of corrective maintenance, these systems will be identified as needing replacement or major reconstruction and will be added to the Capital Improvement Program (CIP). CIP projects associated with end of design life will be scheduled as part of a long-term asset replacement plan by the City Engineer based on system life cycles and scheduled accordingly to minimize system downtime. As assets are replaced or reconstructed, their attribute data in the CMMS asset database will be updated, which will in turn be used to update the City's SWMS GIS database.

6.4.7 Personnel, Equipment, and Budget Needs

This section includes budget estimates for the inspection and maintenance of the City's current portfolio of SWMS assets. Budgets include staffing requirements (for operations as well as management), and a breakdown of equipment, labor, and materials costs.

6.4.7.1 O&M Cost Model

An MS Excel spreadsheet model was developed to estimate the total annual cost (i.e., labor, equipment, fuel, materials, etc.) of each activity required to maintain the City's SWMS and the number of employees needed at each grade for proper staffing. Based on discussions with City staff, 22 SWMS maintenance activities were identified with the typical labor and equipment used to perform each activity. Hourly cost rates for personnel, actual cost rates for materials, and hourly costs for equipment operation was calculated to provide an annual per activity cost. The model also compared the total available staffing hours to calculated annual totals to determine minimum staffing levels to complete the proposed annual activities.

6.4.7.2 Personnel and Equipment Requirements

Based on the O&M Cost Model calculations, the minimum labor effort required by City personnel (not including City administrative personnel) to maintain the current portfolio of BMPs in the SWMS is estimated at 36,778 hours. A summary of the labor hours by position is provided in Table 6-7 below. A breakdown of the equipment needs for the current portfolio of BMPs is provided in Table 6-8.

Table 6-7. O&M Cost Model Staffing Summary

Labor Positions	No. FTE on SWD Staff	No. FTE on RD Staff	Total Current Staff	Total Available Hours	Total Planned Hours	Difference	FTE Staff Adjustments	Total Planned Staff
Stormwater Superintendent	1		1	1,992	1,853	139	0.0	1.00
Asst. Superintendent		0	0	0	0	0	0.0	0.00
Stormwater Utility Inspector	0.25		0.25	498	179	319	0.0	0.25
Maintenance III	3	0	3	5,976	10,727	-4,751	3.0	6.00
Maintenance II	1	0	1	1,992	9,660	-7,668	4.0	5.00
Maintenance I	4	0	4	7,968	13,363	-5,395	3.0	7.00
Clerical Support P/T	0.5		0.5	996	996	0	0.0	0.50
TOTALS	**10**	**0**	**10**	**19,422**	**36,778**	**-17,356**	**10.0**	**19.75**

Table 6-8. O&M Equipment Summary

Activity	Estimated Cost Per Hour	Annual Usage Hours	Annual Cost
601 - 2016 CHEVROLET 2500 4WD	$2.68	210	$563.18
603 - 2015 FORD F250 4WD	$2.58	1,424	$3,675.09
604 - 2018 FREIGHTLINER DUMPTRUCK	$12.51	330	$4,127.07
605 - 2018 FREIGHTLINER DUMPTRUCK	$12.95	1,992	$25,790.00
606 - 2005 CHEVROLET 3500 UTILITY TRUCK	$2.49	996	$2,483.69
607 - 2007 STERLING BRUSH TRUCK	$13.83	996	$13,775.00
608 - 2015 FORD F550 DUMP TRUCK	$2.88	1,513	$4,358.58
614 - 2006 CHEVROLET SILVERADO 4WD	$2.44	1,494	$3,641.06
616 - 2001 CHEVROLET 1500	$1.87	843	$1,572.81
620 - 2016 INT. VAC-TRUCK	$12.62	2,637	$33,276.90
632 - 2013 CHEVROLET 3500	$2.67	1,248	$3,337.21
633 - 2019 FORD F 150 TRUCK 4WD	$1.92	960	$1,838.93
649 - 2022 FREIGHTLINER SEMI TRACTOR	$12.22	2,088	$25,523.49
677 - 2014 FORD F350	$2.36	360	$850.30
621 - 2014 BOBCAT EXCAVATOR E42	$21.81	330	$7,196.36
622 - 2020 311 CAT EXCAVATOR	$42.74	1,992	$85,146.28
642 - 2020 KUBOTA TRACTOR	$21.29	960	$20,435.64
643 - FRT LOADER MOUNTED TO SW 642	$10.00	0	$0.00
678 - 2014 JOHN DEERE 410K BACKHOE	$12.03	4,592	$55,238.49
686 - 2013 CAT M313D EXCAVATOR	$41.92	1,297	$54,367.65
690 - 2015 JOHN DEERE 825I GATOR	$8.01	0	$0.00
691 - 2016 JOHN DEERE TRACTOR 6130	$14.81	0	$0.00
692 - 2016 DIAMOND BOOM MOWER/DITCHER	$35.00	960	$33,600.00
636 - 2021 FELLING 70 TON GOOSENECK TRLR	$2.23	2,418	$5,391.86
	TOTALS	**29,640**	**$386,189.62**

6.4.7.3 Budget Requirements

Total budget requirements for the first full year of maintenance activities under the plan is estimated to be $2.2 million, with the total Stormwater Department budget projected to be $2.97 million. A summary of the budgeting requirements for maintenance activities is provided in Table 6-9. All budgetary estimates are based on the current portfolio of SWMP assets within the City. As more assets enter the program, additional budget and resources will need to be allocated accordingly.

Table 6-9. O&M Annual Budget Summary

BMP/SWMS Activity	Activity	Labor Hours	Estimated Annual Cost	Summary
Clerical Support	Office Support	996	$17,499.72	Annually, this work is estimated to generate 0.5 FTE positions.
Residential Road ROW Swale & Driveway Culvert	Drive-By Visual Inspection	105	$4,577.14	Annually, this visual inspection is estimated to generate 0.05 FTE positions. It is assumed that each of the 14,000 SWMS components is inspected twice per year and that an inspection crew working a full day can inspect about 2,400 per day on average using GPS-enabled vehicle-mounted cameras.
Residential Road ROW Swale & Driveway Culvert	Drive-By Visual Inspection Review and Citizen Request Response	1,248	$54,402.55	Annually, this activity is estimated to generate 0.63 FTE positions. It is assumed that the work will be reviewing visual inspections (approximately 32 hours per year) and responding to citizen complaints, approximately 24 hours per week.
Residential Road ROW Swale	Quarter Round Cleaning	8,342	140,562.82	This activity is estimated to generate 4.19 FTE positions annually. 30 of these activities are assumed to be completed each year. Estimate assumes a crew of four, and most of the work is required to be performed by hand.
Inlet Structure	Visual Inspection	165	$7,165.83	This activity is estimated to generate 0.08 FTE positions annually.
Inlet Structure	Routine Inspection w/ Cleaning	7,097	182,393.59	This activity is estimated to generate 3.56 FTE positions annually. Estimate assumes eight hours per cleaning, labor time may be significantly reduced if cleaning frequency is increased to once per year.
Road Crossing Culvert	Visual Inspection	129	$2,555.87	This activity is estimated to generate 0.06 FTE positions annually.
Road Crossing Culvert	Routine Cleaning	1,909	$61,042.79	This activity is estimated to generate 0.96 FTE positions annually.
Baffle Box	Routine Inspection w/ Cleaning	984	$19,782.01	This activity is estimated to generate 0.49 FTE positions annually. City has 8 baffle boxes, each is inspected and cleaned quarterly and each takes a crew of four approximately 4 hours to complete.
Side Yard Ditch	Mowing Verification Inspection	120	$5,177.38	This activity is estimated to generate 0.06 FTE positions annually.
Side Yard Ditch	Remove Sediment, Regrade 10' Width	1,408	$47,577.68	This activity is estimated to generate 0.71 FTE positions annually. Estimate assumes 10-year recurrence interval.
Back Yard Ditch	Mowing Verification Inspection	120	$5,177.38	This activity is estimated to generate 0.06 FTE positions annually.

Table 6-9. O&M Annual Budget Summary

BMP/SWMS Activity	Activity	Labor Hours	Estimated Annual Cost	Summary
Back Yard Ditch	Remove Sediment, Regrade 30' Width	9,338	386,702.95	This activity is estimated to generate 4.69 FTE positions annually. Estimate assumes 10-year recurrence interval.
Driveway Culvert Repair	Repair During Road Repaving	651	$75,794.52	This activity is estimated to generate 0.33 FTE positions annually. This work is only performed in conjunction with roadway repaving.
Retention/Detention Pond	Routine Visual Inspection	143	$3,202.58	This activity is estimated to generate 0.07 FTE positions annually.
Stormwater Park	Mowing - Assist Parks Dept	2,418	$90,365.31	This activity is estimated to generate 1.21 FTE positions annually.
Public Works Compound	Mowing - Assist Parks Dept	402	$13,163.89	This activity is estimated to generate 0.20 FTE positions annually.
Retention Pond	Mowing – Schumann Dr.	646	$18,390.69	
Hurricane Preparation	Securing Buildings, Moving Equipment, Etc.	34	$7,286.61	
Post-Storm Inspection	Visual Inspection	95	$4,100.99	
Hurricane Recovery	Debris Cleanup	322	$11,854.29	
Sidewalk Repair	Assist PW Staff	106	$8,612.13	
Contractor Activities	Mowing, Aquatic Weed Treatment, Equipment Leases, Etc.		$1,032,500.00	
	TOTALS	**36,778**	**$2,199,888.70**	

Note: The Residential Road ROW Swale and Driveway Culvert drive-by visual inspections would require the purchase of additional equipment.