



Interoffice Memorandum

AGENDA ITEM

September 25, 2020

TO: Mayor Jerry L. Demings
-AND-
Board of County Commissioners

FROM: Jon V. Weiss, P.E., Director
Planning, Environmental, and Development
Services Department

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SUBJECT: October 13, 2020 — Consent Item
Submission of Comprehensive Structural Inventory Plan for
Stormwater Infrastructure to the Florida Department of
Environmental Protection

The National Pollutant Discharge Elimination Systems (NPDES) permit for the County's Municipal Separate Storm Sewer System (MS4) is issued and overseen by the Florida Department of Environmental Protection (FDEP). The permit is ultimately focused on protecting surface waters of the County by preventing pollution from entering the MS4. The MS4 includes a significant number of structural control types such as major outfalls, stormwater ponds, primary and secondary canals, ditches, pipes, swales, pollution control structures, etc. The permit, last issued in May 2016, requires an inventory of all the components of the County's stormwater system and a means to track and report inspection and maintenance activities. These activities, along with other information related to permit compliance, are then summarized in an annual report that is submitted to FDEP.

The Environmental Protection Division (EPD) is responsible for gathering all the required data from approximately 30 different entities within the County, producing the annual report, and submitting it to FDEP. The vast majority of the County's MS4 infrastructure is maintained by Stormwater Management Division and Roads and Drainage Division within the Public Works Department (PW). However, some infrastructure is maintained by Facilities Management Division, Parks and Recreation Division, and EPD.

A substantial amount of work has been completed in developing a GIS layer of the County's MS4 infrastructure. However, significant gaps still remain which need to be addressed. In addition, the current database used by PW for capturing inspection and maintenance activities does not allow for reporting of all information in the form required by FDEP. As part of their assessment of prior annual reports, FDEP is now requiring the County to submit a plan for completing the MS4 inventory and ensuring that tracking and reporting procedures meet FDEP criteria.

A term contractor, Geosyntec Consultants, Inc., was hired to assist in developing a Comprehensive Structural Inventory Plan (CSIP) that analyzes the gaps in the current

Submission of Comprehensive Structural Inventory Plan for Stormwater Infrastructure to the Florida Department of Environmental Protection

inventory and the estimated level of effort needed to complete it. A framework for development of a Stormwater Inventory and Maintenance Data Management System (SIMMS) that would meet FDEP requirements was also prepared. Staff from the Planning, Environmental, and Development Services Department, PW, Information Systems and Services Division, and other stakeholders provided input and review for development of the CSIP.

The CSIP calls for completing the MS4 inventory and establishing the SIMMS over a five-year period. The funding needed to complete the inventory is estimated to be \$6.4 million. A study to determine the best SIMMS solution for PW is estimated to cost an additional \$200,000, in addition to implementation costs that will be determined as part of a study. A five-year period corresponds with an NPDES permit cycle and was considered to be likely the longest period that FDEP would consider reasonable for completing the inventory requirements. The CSIP notes that the County is committed to accomplishing the work within five years, but the actual amount of work accomplished in any given year will be based on reasonable tasks, functions being addressed, and available budget.

Because of the significant funding commitments, the CSIP is being brought to the Board for approval prior to submission to FDEP. The level of funding called for in the CSIP in FY 20/21 is \$1.0M. PW will be reallocating some funding in its FY 2021 budget to begin the inventory efforts. However, it is anticipated that additional funding will be requested as part of the re-budget associated with the Annual Budget Amendment in January 2021. PW will request the resources needed to complete the CSIP and develop the SIMMS in future annual budget submittals.

The County will not be able to attain compliance with the NPDES permit requirements until the inventory is completed and inspection and maintenance activities are tracked and reported in accordance with FDEP criteria. Failure to submit the CSIP in a timely manner would likely lead to FDEP unilaterally establishing the timeframes for compliance through a consent order. The CSIP being submitted to FDEP reflects an abbreviated plan, with a more comprehensive version developed to guide County staff in the completion of the required work.

ACTION REQUESTED: Authorization for the Environmental Protection Division to submit the Comprehensive Structural Inventory Plan for Stormwater Infrastructure Orange County NPDES MS4 Permit to the Florida Department of Environmental Protection, recognizing that specific projects will be subject to available revenues and future budget appropriations as determined by the Board. All Districts.

DDJ/JWW: mg

Attachment



engineers | scientists | innovators



Comprehensive Structural Inventory Plan for Stormwater Infrastructure Orange County NPDES MS4 Permit

Summary for FDEP

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and

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Project Number: FW3787

September 28, 2020

County Contract Y18-900B

County PO# C18900B020

INTRODUCTION

In order to demonstrate compliance with the conditions of the Phase I Municipal Separate Storm Sewer System (MS4) National Pollutant Discharge Elimination System (NPDES) permit, Orange County (County) submits an Annual Report to the Florida Department of Environmental Protection (FDEP). Following review of the last two Annual Reports, FDEP provided Annual Assessment Packages (AAPs) which identified required improvements to the current reporting practices. The Cycle 4 Year 2 (C4Y2) AAP required the County to submit a comprehensive structural inventory plan (CSIP) that outlines the County's plan to complete the stormwater infrastructure related structural control inventory and implement processes and procedures that ensure inspections of structural controls are accomplished and reported per the frequency required by the MS4 NPDES permit.

Geosyntec Consultants, Inc. (Geosyntec) was tasked by the County to develop the CSIP. The specific objectives were to

1. Evaluate the existing stormwater structural inventory and inspection and maintenance tracking to identify data gaps in the context of the NPDES MS4 Annual Report.
2. Develop recommendations for completing the inventory and improving inspection and maintenance tracking and integration.
3. Estimate the cost and resources required to complete the inventory and provide a phased implementation schedule and milestones to measure progress.

Geosyntec was supported in this effort by subconsultant EPIC Engineering and Consulting Group, LLC (EPIC). The purpose of this document is to summarize the CSIP development process and recommendations directly relevant to the MS4 NPDES permit and of interest to FDEP.

EXISTING GAPS ANALYSIS

Data Collection

The County's current stormwater infrastructure inventory datasets were reviewed for geographic and attribute gaps in the context of the NPDES MS4 permit, specifically the Annual Report submitted to FDEP. A series of coordination meetings were held with County stakeholders in April 2020 to request data and discuss their stormwater infrastructure ownership, current inventory status, and current inspection and maintenance procedures. The Geosyntec team reviewed

- Annual Reports,
- Inventory exports (GIS, databases, Excel),
- Inspection forms,
- Work order samples,
- Standard operating procedures (SOPs) / workflows, and
- Inspection and maintenance record exports.

A total of eighteen (18) stormwater structural control types were identified:

- | | |
|---|--------------------------------|
| 1. Major outfalls | 10. Dry detention systems |
| 2. Detention with underdrain filter systems | 11. Wet detention systems |
| 3. Primary canals / Secondary canals | 12. Alum injection systems |
| 4. Pipes / Culverts | 13. Curb inlet baskets |
| 5. Ditches / Conveyance swales | 14. Pump stations |
| 6. Pollution control structures | 15. Drain wells |
| 7. Underdrain filter systems | 16. Channel control structures |
| 8. Exfiltration / French drains | 17. Pond control structures |
| 9. Dry retention systems | 18. Inlets / Catch Basin |

Geographical Data Gaps

The County's inventory of the following structure types they are responsible for maintaining is essentially geographically complete based on institutional knowledge shared by the stakeholders: primary canals, drainage wells, pump stations, ponds (dry retention and wet detention and retention), and structural BMPs (pollution control boxes, curb inlet baskets, and alum injection systems). There is no geographical inventory of exfiltration/French drains and data for underdrain filter systems is likely incomplete. However, these stormwater structures are not as common as pipes and inlets so allowances can be made so that they may be added to the inventory as they are encountered during inventory efforts. The remaining structure types are at various stages of inventory completion. The structures with the majority of the gaps can be aggregated into four groups which can then be used as surrogates for estimating overall inventory completion status gaps: structures (inlets, pond/channel control structures), pipes, secondary canals/ditches/swales, and outfalls.

In order to identify potential geographic gaps in these four categories, the total number of each stormwater structure type was estimated based on the density of inventoried assets in subdivision and roadway areas completed by the County GIS Unit's digitization efforts. This approach considered land use-specific stormwater structure density and accounted for large undeveloped areas (e.g., agriculture, forests, water, and wetlands). The estimated inventory gaps are tabulated by stormwater structure type and watershed in **Table 1**. The gaps are broken down by watershed since this is the geographical unit that will be used to incrementally complete the inventory.

Specific inventory gap locations may include

- County parks and facilities,
- Older subdivisions and roads, and
- County maintained roads within city limits.

Table 1: Estimated Stormwater Infrastructure Gaps by Watershed

Type	Count Category ^{1,2}	Watershed											TOTAL	
		Big Econ	Boggy Creek	Cypress Creek	Howell Branch	Lake Apopka	Lake Hart	Little Econ	Little Wekiva	Reedy Creek	Shingle Creek	St. Johns River		Wekiva River
Structures ³	Estimated	23,860	27,613	10,892	1,814	12,998	5,220	36,636	11,105	12,015	39,690	1,616	24,902	208,361
	Inventoried	14,871	12,975	6,574	339	2,657	3,115	17,447	3,645	9,056	19,447	506	9,264	99,896
	Remaining ⁴	8,989	14,638	4,318	1,475	10,341	2,105	19,189	7,460	2,959	20,243	1,110	15,638	108,465
	% Complete	62%	47%	60%	19%	20%	60%	48%	33%	75%	49%	31%	37%	48%
Pipes ³	Estimated	19,748	23,940	8,953	1,564	10,685	4,358	31,375	9,536	10,462	34,566	1,294	20,696	177,177
	Inventoried	11,147	10,826	5,619	259	2,203	2,648	14,312	3,017	7,916	16,715	268	7,940	82,870
	Remaining ⁴	8,601	13,114	3,334	1,305	8,482	1,710	17,063	6,519	2,546	17,851	1,026	12,756	94,307
	% Complete	56%	45%	63%	17%	21%	61%	46%	32%	76%	48%	21%	38%	47%
Secondary Canals, Ditches, Swales (miles)	Estimated	149	33	35	3	77	28	60	14	30	48	126	96	699
	Inventoried	111	17	7	0	12	4	24	6	3	24	13	8	230
	Remaining ⁴	38	16	28		65	24	36	8	27	24	11	88	469
	% Complete	75%	52%	20%	16%	16%	13%	40%	42%	9%	50%	11%	9%	33%
Outfalls ⁵	Estimated	1,091	300	411	30	196	339	571	91	463	462	147	676	4,777
	Inventoried ⁶	365	226	150	22	87	44	380	78	261	213	41	201	2,068
	Remaining ⁴	726	74	261		109	295	191	1	202	249	106	475	2,709
	% Complete	33%	75%	36%	73%	44%	13%	67%	86%	56%	46%	28%	30%	43%

1 – Estimates are for planning purposes and include stormwater structures within unincorporated Orange County. While a full inventory of NPDES required attributes is needed for County-maintained infrastructure, a minimal inventory (location/alignment, type, maintenance responsibility) is needed for infrastructure maintained by municipalities, private facilities, or FDOT in order to identify drainage continuity in contributing areas for outfall classification purposes.

2 – Land use (FLUCCS level 2) specific average structure density was determined based on takeoffs within completed subdivisions and roadway polygons identified by OC GIS. Estimates were extrapolated based on the land use distribution within the watershed. Exceptions are noted in the following notes.

3 – Infrastructure within agriculture (2), upland nonforested (3), upland forests (4), water (5), and wetlands (6) classes were accounted for as a percentage of the infrastructure estimated for urban and built up (1), barren lands (7), and transportation, communication & utilities (8) to avoid overestimating counts in large undeveloped areas. This percentage was based on the proportion of structures contained within these areas in the takeoff areas (12% structures and 7% pipes).

4 – Cell shading indicates how the number of structures remaining to be inventoried in a given category compared across watersheds. Values increase from blue to red. The other rows are unhighlighted since they do not represent the data gaps.

5 – An additional wetland-based density was determined by dividing the number of stormwater structures in the take off areas by the wetland acreage only. The estimate was taken as the average of the land use and wetlands-based estimates. The purpose was to better capture the relationship between outfall and surface water count without inflating large the count for large waterbodies.

6 – These values are based on the relevant structures currently inventoried. There is currently no constant GIS inventory of outfalls. Outfalls need to be mapped and have their drainage area evaluated to classify.

Additional areas outside County jurisdiction (e.g., private subdivisions/facilities, municipalities, and FDOT right-of-way) may contribute to waterbodies within unincorporated areas. In such cases, stormwater infrastructure not maintained by the County would need to be inventoried on a limited basis (i.e., just geographical location/alignment, type, and maintenance responsibility) in order to identify drainage continuity for delineating overall contributing areas needed for outfall classification. Such instances would not be required to be accounted for in the NPDES Annual Reports nor need inspection and maintenance attributes captured.

Attribute Data Gaps

Missing attributes relevant to the Annual Report are listed in **Table 2**. The major attribute gap was the lack of unique identification numbers to relate inspection and maintenance records to the inventory. Other attribute issues included scattered data sources, lack of division data owner resources to QC stormwater infrastructure digitization, missing attributes that would facilitate querying information into the format required for the NPDES Annual Report, and general inspection/maintenance records that are not tracked to unique structures.

Table 2: Attribute Gaps Summary

Applicable Infrastructure Type	Attribute Gap	Purpose
All Structure Types	Unique Identification Number ¹	Link the inventory with inspection/maintenance records.
	Minimum Inspection Frequency	Compare with number of inspection records returned from query to determine whether structure is in compliance. Can be used to document where inspection frequency can deviate from default.
Ponds ¹ , Ditches ² , Exfiltration ³ , and Underdrain Filter Systems	Installation Date or Age	Determine minimum inspection frequency.
	Chronic Problem Flag	
Major Outfalls	Contributing Drainage Area	Classify outfall as Major or Minor.
	Industrial Land Use Flag	

1-Includes dry retention systems, dry detention systems, wet detention systems, detention with underdrain filter systems

2-Includes conveyance swales

3-Includes French drains

Inspection and Maintenance Tracking Gaps

Assets identified from the GIS layers were compared with the corresponding inspection/maintenance record files using a corresponding unique identifier if one existed. The following asset types lacked a unique identifier, so the inventory and inspection/maintenance data could not be readily associated:

- Major Outfalls
- Detention with underdrain filter systems
- Pipes/Culverts
- Ditches/Conveyance swales
- Pollution control structures
- Underdrain filter systems
- Exfiltration/French drains
- Alum Injection systems
- Channel Control Structures
- Pond Control Structures
- Inlets/catch basins

In several cases, inspections were reactionary instead of pre-scheduled and tracked using general location descriptions (e.g., road segment name, address, County facility or park name). Having a unique asset identifier is a critical requirement for effective asset management, tracking the inspection activities associated with each asset, and achieving compliance with the NPDES reporting requirements.

Additionally, reports exported from the County's enterprise asset management software (Dataworks and Maximo) are not directly compatible with the format needed for the Annual Report. This is attributed to a combination of the attribute gaps (i.e., missing information), discrepancies in the units used for inventory and inspections (e.g., primary canals and ditches/conveyance swales inventory tracked in linear units but inspections tracked in areal units, pipe inventory tracked in linear units but inspection requirements based on count of pipes inspected), and absence of query logic to pull the necessary information together.

RECOMMENDATIONS

A Comprehensive Structural Inventory Plan (CSIP) was developed to outline a holistic solution approach to rectify the current NPDES MS4 inventory and inspection and maintenance tracking deficiencies. The CSIP identified the need for a centralized, integrated Stormwater Inventory and Maintenance Data Management System (SIMMS) and provided recommendations on an inventory database framework and data capture, governance, maintenance, and update processes.

Completing the stormwater structural inventory will include the following general tasks:

- Scanning and digitizing plans currently stored on microfiche in the County's Public Works Department archives.
- Rectifying the County's current GIS inventory with data already collected by Public Works – Stormwater Management Division's watershed consultants as part of the Stormwater Management Watershed Master Plan Update Projects (another ongoing stormwater infrastructure digitization process covering additional areas such as cities, FDOT roads, etc.)

- Verifying attributes of infrastructure already inventoried
- Digitizing new infrastructure from available plans and aerial imagery
- Field verification to confirm uncertain or unknown details
- Limited survey to collect elevations of critical structures

A phased implementation was proposed to systematically complete the inventory with the County’s watersheds as the geographic unit of phases. The County’s twelve (12) watersheds were selected as the implementation unit since they are relevant, pre-defined geographical units. This approach was recommended to help ensure that a systematic, thorough inventory is completed moving one area to the next.

BUDGET AND RESOURCE ANALYSIS

In order to project the cost to complete the inventory, a pilot evaluation was completed to develop average unit effort (stormwater structures/hour). The pilot evaluation was essentially a simulation of completing the inventory on three separate square mile sections within the Little Econ Watershed. The average unit effort was then multiplied by the estimated number of stormwater structures to be inventoried (**Table 1**) to determine the estimated total effort for desktop and field verification. Factoring in additional staff for field safety, project management (~15% of staffing cost), quality control (~10% of staffing cost), and contingency (~20% of overall project cost), the staffing requirements were converted to a cost based on County pay grades for appropriate positions (**Table 3**) and assuming 2,080 hours/year. General positions were listed since it is understood that the County may be unable to hire staff under current circumstances and that consultants will likely complete the inventory initially. Additional costs were assumed for survey (20%) and scanning of plans stored on microfiche (3%).

Table 3: CSIP Roles and Pay Grades

CSIP Role	Staff Position (County Description)	Pay Grade	Max Rate ¹	Loaded Rate ²	Rounded Rate	Time Devotion ³
Project Manager	Senior Engineer or Project Manager	023	\$55.38	\$166.14	\$170.00	25%
Desktop Data Capture	GIS Analyst	017	\$38.18	\$114.54	\$115.00	100%
	GIS Specialist	015	\$32.48	\$97.44	\$100.00	100%
Field Inspection	Engineer II	018	\$40.20	\$120.60	\$125.00	100%
	Engineering Technician II	110	\$27.20	\$81.60	\$85.00	100%
QA/QC	Senior GIS Analyst	019	\$42.10	\$126.30	\$130.00	25%

1 – Cost based on unburdened labor rate

<https://www.orangecountyfl.net/EmploymentVolunteerism/CompensationandJobDescriptions.aspx>

2 – Loaded rate calculated from the max unburdened rate assuming a multiplier of three (3).

3 – Assumes a five-year inventory completion time.

Based on these assumptions and additional cost factors added on, the total cost to reasonably complete the inventory was estimated at \$6.4M. This translates to approximately \$1.3M annually over a five-year planning period, which was deemed reasonable as it mirrors the NPDES permit cycle period. The cost per watershed was then estimated based on their portion of the overall effort from **Table 1**. The estimated cost to complete the inventory in each watershed is summarized in **Table 4**. The cost per watershed was used to determine a schedule with consistent funding. The budget and resource analysis should be re-evaluated annually based on the inventory completed.

Table 4: Estimated Costs to Complete Stormwater Structural Inventory

Watershed	Estimated Cost ¹
Big Econ	\$794,116
Boggy Creek	\$814,222
Cypress Creek	\$345,916
Howell Branch	\$52,250
Lake Apopka	\$381,828
Lake Hart	\$179,282
Little Econ	\$1,091,315
Little Wekiva	\$318,186
Reedy Creek	\$395,483
Shingle Creek	\$1,178,856
St. Johns River	\$86,898
Wekiva River	\$757,648
TOTAL	\$6,396,000

¹ – The product of the overall estimated cost (including survey, microfiche scanning, and contingency) and the proportional effort Table 1.

SCHEDULE

Inventory Completion Schedule

The stormwater structure inventory will be implemented in phases on a watershed basis. The order of implementation was determined by ranking the watersheds (**Figure 1**) based on the approximate number of assets estimated to be missing from the inventory (**Table 1**) weighed by the relative area of the watershed draining to impaired waters where FDEP has established strategies to reduce pollutants (Basin Management Action Plans or BMAPs). While not influencing the number of stormwater structures to be inventoried, the presence of impaired waters was factored into the final ranking because the ultimate goal of the NPDES MS4 permit is to regulate pollutant loads from point sources.

After ranking the watersheds, the proposed schedule (**Table 5**) was developed. Note that the first year of implementation is limited to \$1M (15.6% of effort). Since the CSIP was completed after the FY21 budget was submitted, resources were not specifically earmarked in the budget for CSIP implementation. However, Orange County will seek to reallocate some funding for CSIP implementation and seek additional funding as part of the annual budget amendment process in January 2021 in order to reach the \$1M level for the first year. Implementation will scale up to \$1.35M (21.1% of effort) annually starting in Year 2 and continue through Year 5. Due to the implementation scale up and overlap between watersheds, the exact staffing requirements may fluctuate and differ from **Table 3** at a given time.

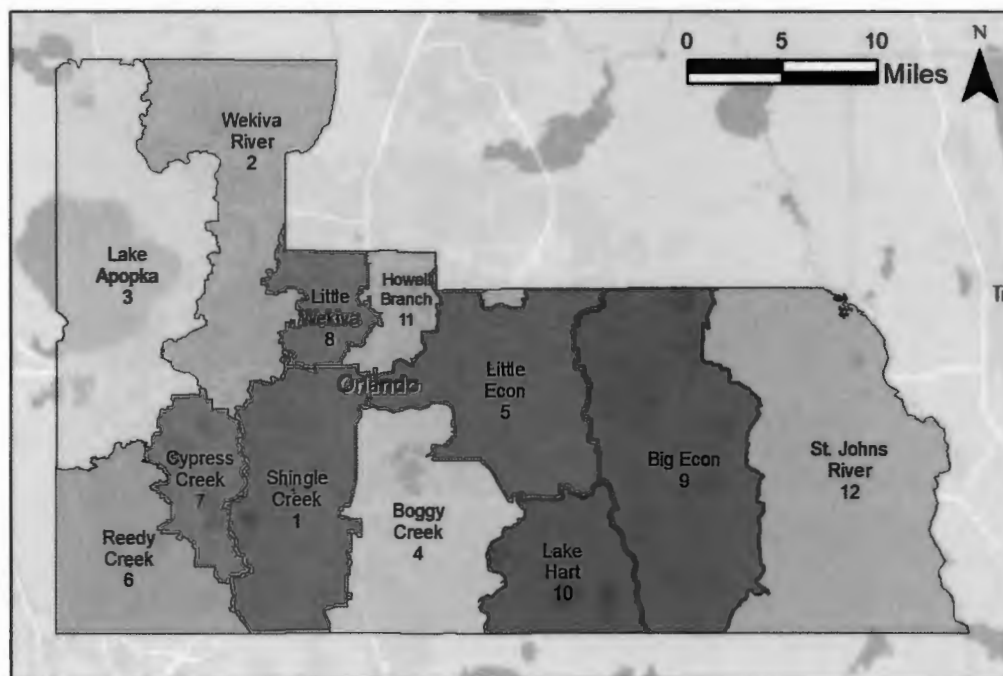


Figure 1: CSIP Implementation Order of Orange County Watersheds

Table 5: Phased Inventory Completion Schedule

Watershed	FY 21				FY 22				FY 23				FY 24				FY25			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Shingle Creek	■	■	■	■	■															
Wekiva River				■	■	■	■													
Lake Apopka						■	■	■												
Boggy Creek							■	■	■	■	■									
Little Econ									■	■	■	■	■	■						
Reedy Creek													■	■	■					
Cypress Creek														■	■	■				
Little Wekiva															■	■	■			
Big Econ																■	■	■	■	■
Lake Hart																			■	■
Howell Branch																			■	■
St. Johns River																			■	■

If budget limitations are a concern for a specific inventory completion project, the geographic investigation areas should be reduced in favor of addressing all of the structure types. The intent of this approach is to avoid a partial inventory covering the entire county which could obscure gaps in the inventory. Due to the range in size, some watersheds may need to be completed in sub-phases on a sub-watershed (sub-basin) basis. Previously identified sub-watershed delineations may be used where available (e.g., Shingle Creek → Westside Manor, Big Sand Lake, Catherine-Buchanan, etc.). Watersheds without previously delineated sub-watersheds may be divided geographically (e.g., north/south, east/west) immediately prior to implementation. These details are deferred to the respective project manager's discretion during the project planning stage.

MILESTONES

The County is taking a bifurcated approach to meet the NPDES MS4 permit obligations: 1) completion of the stormwater structure inventory and 2) asset management analysis and selection of a SIMMS. While both processes can be worked on simultaneously, during the initial period prior to SIMMS rollout the County will continue to struggle to report stormwater asset data in the format required by the NPDES MS4 permit. Therefore, inventory completion status is recommended as more reliable for tracking progress.

Measurable milestone goals for documenting progress were developed based on the predicted incremental increases in the number of stormwater structures inventoried in completed watersheds at the end of each year. The proposed milestones are presented in **Table 6**. The four infrastructure categories contain virtually all of the data gaps, and so serve as surrogates for tracking the overall inventory progress. Note that these estimates should be updated after completing the inventory within a watershed since the actual number of stormwater structures is expected to differ from the land-use specific stormwater structure density-based, projections provided in this report.

It should be reiterated that these progress numbers were developed with various approximations and should be considered as such. As the inventory efforts progress, these projections will be revisited on an annual basis and become refined and more accurate. While the County is committed to accomplish the work over a 5-year period, the specific effort accomplished in any given year will be task driven based on reasonable tasks, functions being addressed, and available budget. In order to provide flexibility, the County will report annually on the progress as an attachment to the Annual Report beginning in 2021 (C4Y5) and adjustments to the completion rates and milestones may be granted by FDEP if needed and adequately justified. Updates to progress assumptions and completion schedule are covered under the Project Management allowance in the cost projections.

Table 6: CSIP Inventory Completion Milestones

Implementation Year	FY	Structures ²		Pipes		Ditch/Swale (miles)		Outfalls	
		Count	%	Count	%	Count	%	Count	%
0 (current inventory ¹)	20	99,896	48%	82,870	47%	230	33%	0	0%
1	21	117,068	56%	98,013	55%	250	36%	392	8%
2	22	146,669	70%	122,453	69%	407	58%	1,345	28%
3	23	170,698	82%	143,914	81%	618	88%	1,930	40%
4	24	189,138	91%	159,691	90%	516	74%	3,102	65%
5 (completion)	25	208,361	100%	177,177	100%	699	100%	4,777	100%

1 – Within unincorporated Orange County.

2 – Inlets/catch basins and channel/pond control structures.