Applied Science, Inc.

Memorandum

To: Karen Nickols, Project Manager
Michigan Department of Environmental Quality (MDEQ)
Revolving Loan Section

From: John Michalski, P.E.; Eric Wahrman, E.I.T

CC: Oakland County Water Resource Commission

Date: November 28, 2018

Subject: Evergreen-Farmington Sewage Disposal System
MDEQ Stormwater, Asset Management and Wastewater (SAW) Grant #1297-01
Summary of Wastewater Asset Management Plan

The following is a summary of the work completed under the MDEQ SAW Grant work performed by ASI. It includes a summary of the project scope, results and findings of activities covered by the grant, grant amount spent and match amount, and contact information. It has been prepared as required under Section 603 of Public Act 84 of 2015, and follows recent MDEQ guidance.

GRANTEE INFORMATION

Evergreen-Farmington Sewage Disposal System, SAW Grant Project #1297-01

Project Grant Amount: $1,929,167

Applicant Match Amount $420,833

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EXECUTIVE SUMMARY

The Evergreen-Farmington Sewage Disposal System (EFSDS) applied for and received a grant to further develop an Asset Management Plan (AMP) for its sanitary system through the Michigan Department of Environmental Quality's (MDEQ) Stormwater, Wastewater and Asset Management (SAW) program.

Because the SAW program was funded through monies appropriated for water quality, other related infrastructure systems, such as drinking water, were not eligible for funding through the grant, but are considered in analysis and recommendations where appropriate.

The EFSDS is owned, operated, and maintained by the Oakland County Water Resources Commissioner (WRC) under the jurisdiction of the Michigan Public Act 342. The WRC has various tools used to manage the assets it owns or operates and maintains, including a GIS geodatabase, collaborative asset management system, hydraulic models, condition assessment methods, risk and prioritization models, capacity studies, asset deterioration models, and an operating and capital improvement project prioritization model. These tools are used to guide the short and long-term strategies for WRC to operate the various systems in a sustainable manner that meets the desired level of service, with a focus on prioritizing assets that are most critical and being cost-effective. The funding strategy for each fund is also evaluated annually through WRC's "Long Range Plan" (LRP) process that includes a review of the current rate structure, fund balances and anticipated future funding needs.

The WRC "Common to All" approach was generally followed with in development of the asset management plan for this system. The following is a summary of the AMP, as required by the grant, which includes a brief discussion of the five major AMP components, a list of the plan's major identified assets, and contact information for the grant.

WASTEWATER INVENTORY

WRC uses its existing Geographic Information System (GIS) geodatabase as the primary means to inventory and map the assets in the system. The geodatabase includes key attributes associated with each asset, such as installation date (age), size, material, along with other information as needed for a given asset type.

WRC currently uses the Cityworks software package for its Computer Maintenance Management System (CMMS,) which then collaborates with the GIS to present a single interface to the user via the Collaborative Asset Management System (CAMS.) CAMS assists in managing inspections and maintenance work by generating and tracking work orders, collecting inspection and condition data, and compiling costs and hours spent on each asset. Maintenance history and costs can be tracked on an asset and/or fund level.

Condition assessment tools and protocols were developed by WRC to allow for efficient and consistent recording of asset condition. For sanitary assets, a National Association of Sewer Service Companies (NASSCO) compliant software program stores data collected during sewer televising. The data stored can be shared with the existing CAMS system. Inspection work orders in the CAMS system are used for evaluation of other types of assets, such as manholes and other collection system structures, and for most vertical asset types, such as pumps, valves, structures, etc.

As part of the grant for EFSDS, the GIS geodatabase inventory was reviewed for completeness and to ensure critical attributes were populated. Approximately 795,056 lineal feet of sanitary sewer underwent condition assessment via cleaning and televising. Approximately 946 manholes and other related structures were evaluated and documented using the CAMS inspection work orders. Vertical assets, including pump stations, flow regulators, and flow level monitors, were inventoried using a WRC hierarchy template and condition assessment data was collected and input into the CAMS system.

CRITICALITY OF ASSETS

WRC implemented PowerPlan Asset Optimization software as part of the "Common to All" Program. Baseline Probability of Failure (POF) and Consequence of Failure (COF) factors were configured into the software as part of that Program, and were used to estimate the overall risk of the horizontal assets (sewers and associated structures.) For pump stations and storage and treatment facilities, individual assets were reviewed by staff as part of the grant work, and POF and COF factors determined and input into the software.

Both the POF and COF were scored on a scale of 1 to 5, with 1 being the lowest probability or consequence of failure, and 5 corresponding to the highest probability or consequence of failure. The Business Risk Evaluation (BRE or Risk) score is the product of the POF score and the COF score (POF times COF equals Risk,) and has a scale of 1 to 25. Higher BRE scores identify the assets with the greatest overall risk.

The POF and COF for horizontal assets are determined using scoring values developed uniquely for each asset type, such as gravity main, non-gravity main, manhole, etc. The POF and COF scores for each asset type are calculated using attribute data from the GIS geodatabase, inspection data from the CAMS system, and NASSCO Pipeline and Manhole Assessment and Certification Program ratings. The primary attribute for determining the POF of gravity mains (sanitary and storm sewers) was the PACP Structural Quick Score. The PACP Maintenance Quick Score and age are also incorporated into the POF rating. Where PACP scores were not available, the POF score was based on the age-based assumed condition.

For force mains, the POF was based on age, normal operating pressure, quantity of repairs tracked in the CMMS, and velocity. For manholes and other access structures, the POF is based primarily on the MACP fields cover condition, frame condition, chimney condition, cone condition, wall condition, bench condition, and channel condition along with age. If the MACP data was not available, the score was based on only age-based assumed condition.

The COF for mains and access points (sanitary sewers, force mains, siphons and related structures) was determined based on asset depth, size, proximity to groundwater and flood zones, and proximity to roads and intersections.

The POF and COF of vertical assets were calculated using a scoring matrix. The POF for vertical assets was calculated using a combination of age and physical condition collected from inspections performed using work orders through the CAMS system. O&M protocol and performance factors were also scored and used in the calculation. In the absence of any other data, age was used to estimate POF. The COF for vertical assets was scored using a matrix of factors including: safety of public and employees, financial impact, public confidence, regulatory compliance, and firm capacity.

LEVEL OF SERVICE DETERMINATION

At the strategic level, the Level of Service (LOS) identifies the long-term goals and strategies of the organization. An overall LOS guiding matrix was developed to document the goals and strategies of the WRC organization. The WRC Mission Statement and the annual LRP rate process form additional elements of the LOS.

The WRC's current Mission Statement is:

The Oakland County Water Resources Commissioner's Office is dedicated to the preservation and protection of our water environments, public health, welfare, convenience and the citizen's right to quality water. We are committed to acting with integrity and professionalism and will always seek collaboration among our Oakland County communities and regional partners.

We commit ourselves to providing our customers with high value services that are fairly priced, environmentally sound and sustainable in the long term. We are committed to an open dialogue with our communities and promise to keep lines of communication open.

In our pursuit of excellence and continuous improvement, every member of our staff will respond to issues of the public promptly, safely, respectfully and with sensitivity to their individual needs. Our office will always endeavor to provide an appropriate resource when an issue is not within our authority.

We will install a culture that perpetuates an environment promoting trust, respect and teamwork, both within our organization and among our communities and region.

Table 1: Common to All Level of Service Goals

	WRC Base Level of Service Goals	Measurables
Financial Viability and Impact	Emergency repairs can be performed within Utility Reserve Budgets of the system	Exceedances of reserve budgets
Public Confidence / System Service Impact	Minimal to some loss of service or impact on other services for less than four hours. No sewer system or basement backups. Minor disruption (e.g., traffic, dust, noise).	Number of service interruptions, complaints, and backups
Regulatory Compliance	No state permit violations. Comply with All MDEQ policies.	Number of violations
Safety of Public and Employees	Non-reportable injuries. No lost-time injuries or medical attention required. No impact to public health	Number of injuries and any public health advisories
Redundancy	Comply with 10 State Standards	Number of violations
BRE score	Critical assets will have the goal of a probability of failure score below 3.2 and non-critical assets have the goal of a probability of failure below 4.0	System risk score
Staffing	Staffing levels and training maintained to meet level of service	Number of open positions, annual training hours

At the tactical level, the LOS focuses on the prioritization in the medium-term and identification of factors and indicators related to performance, cost, risk, and failure probability. The POF and COF scoring matrices used in the criticality and risk analysis were developed using the strategic LOS guidance. Progress toward the goals are measured through the CAMS analytic data, and is reviewed as part of the LRP process with internal staff and customers.

At the operational level, the LOS is related to procedures and information related to the short-term, day-to-day operation. Performance is measured at the asset level using work orders to collect data, and annual reporting of measurables and progress toward goals with operational staff.

REVENUE STRUCTURE

The annual operation and maintenance budget includes the typical costs spent each year to operate the system and to perform normal maintenance activities. This baseline O&M budget does not include major capital improvements that are required to increase capacity, meet new regulatory requirements, or replace items that have failed or reached the end of their useful service life.

The asset optimization software assisted WRC staff by developing recommended strategies for inspection, rehabilitation and replacement needs over the long-term for each system based on condition and risk. WRC project management staff then reviewed the recommendations generated by the software and rationalized the recommendations to "real world" needs, including any improvements required due to capacity or regulation changes. The WRC uses this information as part of its existing LRP rate process to prioritize projects and ensure adequate funding is available.

The LRP rate methodology is a tool to determine utility rates and charges to provide sufficient revenues to cover the anticipated operation, maintenance, replacement, capital improvement projects, and debt costs associated with a given system, as well as to maintain a reserve balance for emergencies or a significant one-time charge. It ensures adequate revenues are collected for budgeted needs in the current year, and over the long term.

The LRP includes multiple reserve accounts that are used to fund activities above and beyond the normal annual operation and maintenance costs. The reserve accounts include:

- Emergency Repair Reserve for unexpected repairs due to system failure or catastrophic events.
- Capital Improvement Plan (CIP) Reserve for replacement of equipment or facilities in kind or with alternate technology.
- Major Maintenance Reserve which is used to minimize fluctuations of expenses not accounted for in annual operating budgets.

WRC worked with its internal fiscal staff to determine if the system's current rate structures were sufficient to meet the current needs for the management of the wastewater system, and to plan for any adjustments that may be required to meet anticipated future expenses. A demonstration of sufficiency of the system's current rate structure was made, as required by the SAW Grant Program, and submitted to the MDEQ six months prior to the SAW grant end date.

CAPITAL IMPROVEMENT PLAN

The asset optimization software forecasts and prioritizes assets that require replacement in the planning period. The individual replacements can be combined into projects and scheduled with budget amounts established. This information is then used in the LRP process to determine rate needs for funding the project established. A list of capital projects was developed for EFSDS, using recommendations from the asset optimization software, and consideration of other system needs.

The recommended projects are summarized below. Projects listed for implementation in the 0 to 5 year range include cost estimates prepared on data available at the study/feasibility level. Projects in the 5 to 20 year range are based on broad concepts only and costs are based on cost curves and other general tools. All projects are listed for financial and resource planning purposes only. Changes to project inclusion, scope, cost and/or timing are expected as resources are allocated and changes occur in prioritization, regulations, technology, cost and other data becomes available.

Capital Projects, 0 to 5 years:

- Horizontal Asset Repairs, $7,965,083.60, 2018
- Vertical Asset Repairs, $2,911,000.00, 2018
- Manhole Repairs, $5,033,000.00, 2018

Capital Projects, 6 to 10 years:

- Horizontal Asset and Manhole Repairs, $8,246,000.00, 2023
- Vertical Asset Repairs, $1,754,000.00, 2023

Capital Projects, 10 to 20 years:

- Horizontal Asset and Manhole Repairs, $15,624,000.00, 2028
- Vertical Asset Repairs, $4,376,000.00, 2028

RECOMMENDATIONS

In order to keep this AMP sustainable into the future, the LRP process will be undertaken annually to review existing recommendations, status of current projects, and forecasted needs against available reserves and anticipated funding. The asset optimization tool will be regularly synced with CAMS to incorporate any new GIS and operational and condition data. The software will then automatically update recommended events, treatment and replacement strategies, and capital projects. The updated recommendations will be reviewed quarterly and as part of the annual LRP to ensure the availability of required funds for the projects.

LIST OF MAJOR ASSETS

The EFSDS major assets include:

Table 1 – Asset Summary

WRC WATER RESOURCES COMMISSIONER

ASSET SUMMARY

Evergreen Farmington S.D.S. - 58410

Structures

Type	Count
Sewer Access Point	45
Sewer Cleanout	16
Sewer Manhole	3,250
Sewer System Valve	39

Sites

Type	Count
Sewage Lift Station	12
Sewer Flow Meter	115
Sewer Flow Regulator	10
Sewer Level Monitoring Site	11

Line Assets Summary

	Total Length (FT)	Total Segments
Gravity	824,178	3,378
Non-Gravity	50,821	114
Totals:	**874,999**	**3,492**

Line Assets by Type

Material	Length (FT)	Segment Count
Gravity		
Cast Iron	62	1
Clay or VCP	21,697	93
Concrete	27,961	135
Corrugated Metal	2,709	15
Ductile Iron	1,148	13
Non-reinforced Concrete	14,319	64
PVC	20,054	101
Reinforced Concrete	527,566	2,021
Truss	17,727	101
Unknown	190,934	834
Non-Gravity		
Cast Iron	882	1
Concrete	95	2
Ductile Iron	8,710	25
HDPE	22,185	22
Reinforced Concrete	6,537	8
Unknown	12,411	56

Report Date: 09/05/2018

Table 1 – Asset Summary (continued)

WRC WATER RESOURCES COMMISSIONER

ASSET SUMMARY

Evergreen Farmington S.D.S. - 58410

Line Assets by Diameter

Diameter	Length (FT)	Segment Count
Gravity		
Unknown	449	3
<=8	4,053	29
>8 and <= 12	157,879	726
>12 and <=16	148,368	657
>16 and <=24	278,457	1,177
>24 and <=36	130,491	516
>36	104,480	270
Non-Gravity		
<=8	6,077	18
>8 and <= 12	1,626	37
>12 and <=16	1,335	6
>16 and <=24	34,311	40
>24 and <=36	7,452	12
>36	21	1

PROJECT HIGHLIGHTS

The development of this Asset Management Program for the EFSDS was led by ASI with assistance from HRC and WRC. The following highlights some of the more tangible outcomes from the Program development:

- An updated PowerPlan inventory of the system
- Over the past 15 years 795,056ft (97.8%) of the system has been cleaned and televised
- Inspected 946 manholes
- Inspected 11 pump station, 5 flow regulators, 7 flow level monitors, and an overflow chamber
- Reviewed FOG ordinance
- Made recommendations for project planning

Department of Environmental Quality (DEQ)
Stormwater, Asset Management, and Wastewater (SAW) Grant
Wastewater Asset Management Plan
Certification of Project Completeness

Completion Date November 30, 2018
(no later than 3 years from executed grant date)

The Evergreen-Farmington Sewage Disposal System (EFSDS) certifies that all wastewater asset management plan (AMP) activities specified in SAW Grant No. 1297-01 have been completed and the implementation requirements, per Part 52 of the Natural Resources and Environmental Protection Act, 1994, PA 451, as amended, are being met. Section 5204e(3) requires implementation of the AMP and that significant progress toward achieving the funding structure necessary to implement the AMP be made within 3 years of the executed grant.

Please answer the following questions. If the answer to Question 1 is No, fill in the date of the rate methodology approval letter and skip Questions 2-4:

1) Funding Gap Identified: No

   If No - Date of the rate methodology approval letter: May 16, 2018.

2) Significant Progress Made: Yes or No

   (The DEQ defines significant progress to mean the adoption of an initial rate increase to meet a minimum of 10 percent of any gain in revenue needed to meet expenses, as identified in a 5-year plan to eliminate the gap. A copy of the 5-year plan to eliminate the gap must be submitted with this certification.)

3) Date of rate methodology review letter identifying the gap: _____.

4) An initial rate increase to meet a minimum of 10 percent of the funding gap identified was adopted on _____.

Attached to this certification is a brief summary of the AMP that includes a list of major assets. Copies of the AMP and/or other materials prepared through SAW Grant funding will be made available to the DEQ or the public upon request by contacting:

Carrie Ricker Cox	at	248-470-1314	or	coxc@oakgov.com
Name		Phone Number		Email

Signature of Authorized Representative (Original Signature Required) — Date: 11/27/18

Jim Nash, Water Resource Commissioner, Oakland County Water Resources Commission
Print Name and Title of Authorized Representative