

**AGREEMENT FOR ENGINEERING SERVICES
PER SOI#16526**

This AGREEMENT is entered into by and between Lake County (County) and CDM Smith Inc., 125 S Wacker Drive, Suite 700, Chicago, Illinois 60606 (hereafter "Engineer").

RECITALS

WHEREAS, Lake County is seeking an Engineer to provide Engineering services for PW#2016.102, Lake County Water Main and Sanitary Sewer Infrastructure Assessment, as described in Attachment A; and

WHEREAS, the Engineer is a professional provider of Engineering services; and

NOW, THEREFORE, Lake County and the Engineer AGREE AS FOLLOWS:

SECTION 1. AGREEMENT DOCUMENTS

This AGREEMENT constitutes the entire agreement between the County and the Engineer.

SECTION 2. SCOPE OF SERVICES

The Engineer shall provide engineering services described in Attachment A

SECTION 3. DURATION

The works shall be completed within 9 months after execution of this Agreement.

SECTION 4. INDEMNIFICATION

The Engineer agrees to indemnify, save harmless and defend the County, their agents, servants, and employees, and each of them against and hold it and them harmless from any and all lawsuits, claims, demands, liabilities, losses and expenses, including court costs and attorney's fees, for or on account of any injury to any person, or any death at any time resulting from such injury, or any damage to property, which may arise or which may be alleged to have arisen out of Engineer's negligent acts in connection with the services covered by this Agreement. The foregoing indemnity shall apply except if such injury, death or damage is caused directly by the willful and wanton conduct of the County, their agents, servants, or employees or any other person indemnified hereunder.

SECTION 5. INSURANCE

The Engineer must obtain, for the Contract term and any extension of it, insurance issued by a company or companies qualified to do business in the State of Illinois and provide the County with evidence of insurance. Insurance in the following types and amounts is necessary:

- **Worker's Compensation Insurance** covering all liability of the Engineer arising under the Worker's Compensation Act and Worker's Occupational Disease Act at statutory limits.

- **Professional Liability** to include, but not be limited to, coverage for Errors and Omissions to respond to claims for loss there from.
 - **General Aggregate Limit** **\$3,000,000**
 - **Each Occurrence Limit** **\$1,000,000**
- **Automobile Liability:**
 - **Bodily Injury, Property Damage (Each Occurrence Limit) \$1,000,000**

Engineer agrees that with respect to the above required Automobile Liability insurance, Lake County shall:

- Be named as additional insured by endorsement to the extent of the negligence of the Engineer;
- Be provided with thirty (30) days notice, in writing, of cancellation of material change;
- Be provided with Certificates of Insurance evidencing the above required insurance, prior to commencement of this Contract and thereafter with certificates evidencing renewals or replacements of said policies of insurance at least fifteen (15) days prior to the expiration of cancellation of any such policies. Forward Notices and Certificates of Insurance to: Lake County Central Services, 18 N. County St, Waukegan, IL 60085-4350.

SECTION 6. AGREEMENT PRICE

Lake County will pay to the Engineer the amount not to exceed \$249,860.

SECTION 7. INVOICES & PAYMENT

Invoices may be submitted for work performed on a monthly basis based upon the percent of work completed in the amount not-to-exceed in Section 6. Submit invoice(s) detailing the services provided. Payments shall be made in accordance with the Local Government Prompt Payment Act.

Engineer will address Invoices to:

Lake County Department of Public Works
 650 Winchester Road
 Libertyville, IL 60048-1391
 Attn: Heather Galan

County will make Payments to:

To pay by EFT/ACH:
 Account Name: CDM Smith Inc.
 Tax ID: 04-2473650
 Bank: Bank of America
 100 Federal St
 Boston, MA 02110
 Account: 000200418081
 ABA: 026009593 (Fed Wire)

ABA: 011000138 (ACH transactions)
SWIFT: BOFAUS3N
Chip: 0959

or

To pay by check:
CDM Smith Inc.
15050 Collections Center Drive
Chicago, IL 60693

SECTION 8. STATEMENT OF OWNERSHIP

The drawings, specifications and other documents prepared by the Engineer for this Project are the property of the County, and Engineer may not use the drawings and specifications for any purpose not relating to the Project without the County's consent, except for the Engineer's services related to this Project. All such documents shall be the property of the County who may use them without Engineer's permission for any current or future Lake County project; provided, however, any use except for the specific purpose intended by this Agreement will be at the County's sole risk and without liability or legal exposure to the Engineer.

The Engineer shall retain its copyright and ownership rights in its design, drawing details, specifications, data bases, computer software, and other proprietary property. Intellectual property developed, utilized, or modified in the performance of the services shall remain the property of the Engineer.

SECTION 9. TERMINATION

The County reserves the right to terminate this Agreement, or any part of this Agreement, upon thirty(30) days written notice. In case of such termination, the Engineer shall be entitled to receive payment from the County for work completed to date in accordance with terms and conditions of this Agreement. In the event that this Agreement is terminated due to Engineer's default, the County shall be entitled to contract for consulting services elsewhere and charge the Engineer with any or all losses incurred, including attorney's fees and expenses.

SECTION 10. JURISDICTION, VENUE, CHOICE OF LAW

This Agreement shall be governed by and construed according to the laws of the State of Illinois. Jurisdiction and venue shall be exclusively found in the 19th Judicial Circuit Court, State of Illinois.

SECTION 11. INDEPENDENT CONTRACTOR

The Engineer is an independent contractor and no employee or agent of the Engineer shall be deemed for any reason to be an employee or agent of the County.

SECTION 12. WARRANTS

The Engineer represents and warrants to the County that none of the work included in this contract will in any way infringe upon the property rights of others. The Engineer shall defend all suits or claims for Engineer's infringement of any patent, copyright or trademark rights and shall hold the County harmless from loss on account thereof.

SECTION 13. ASSIGNMENT

Neither the Engineer nor the County shall assign any duties of performance under this Agreement without the express prior written consent of the other.

SECTION 14. MODIFICATION

This Agreement may be amended or supplemented only by an instrument in writing executed by the party against whom enforcement is sought.

SECTION 15. DISPUTE RESOLUTION

All issues, claims, or disputes arising out of this Agreement shall be resolved in accordance with the Appeals and Remedies Provisions in Article 9 of the Lake County Purchasing Ordinance.

SECTION 16. NO IMPLIED WAIVERS

The failure of either party at any time to require performance by the other party of any provision of this Agreement shall not affect in any way the full right to require such performance at any time thereafter. Nor shall the waiver by either party of a breach of any provision of this Agreement be taken or held to be a waiver of the provision itself.

SECTION 17. SEVERABILITY

If any part of this Agreement shall be held to be invalid for any reason, the remainder of this Agreement shall be valid to the fullest extent permitted by law.

SECTION 18. CHANGE IN STATUS

The Engineer shall notify the County promptly of any change in its status resulting from any of the following: (a) vendor is acquired by another party; (b) vendor becomes insolvent; (c) vendor, voluntary or by operation law, becomes subject to the provisions of any chapter of the Bankruptcy Act; (d) vendor ceases to conduct its operations in normal course of business. The County shall have the option to terminate this Agreement with the Engineer immediately on written notice based on any such change in status.

SECTION 19. DELIVERABLES

The Engineer shall provide deliverables as identified in Attachment A.

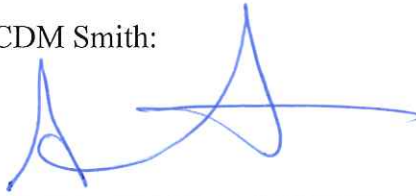
IN WITNESS HEREOF, the undersigned have caused this Agreement to be executed in their respective names on the dates hereinafter enumerated.

Lake County:

Ruth Anne Hall
Purchasing Agent
Lake County Purchasing Division

Date: _____

CDM Smith:



Amrou Atassi
Associate
CDM Smith

Date: 3/3/17



February 27, 2017

Mr. Phil Perna
Acting Director of Lake County Public Works
Department of Public Works
650 W. Winchester Road
Libertyville, IL 60048

Subject: SOI # 16526
Water Main and Sanitary Sewer Infrastructure Assessment

Dear Mr. Perna:

Thank you for providing CDM Smith/ATI Team (Team) the opportunity to assist Lake County Department of Public Works (County) in developing the Water Main and Sanitary Sewer Infrastructure Assessment Study (Study). Based on our experience from developing water main and sanitary sewer replacement programs, we have developed a Scope of Services tailored to meet the County's objectives and requirements. Below is a detailed breakdown of each task and the associated deliverables under this Scope of Services.

Scope of Services

This Scope of Services includes the following major tasks and are discussed below in detail:

- Task 1. Kickoff Meeting, Existing Data Collection and Review
- Task 2. Identify Probability and Consequence of Failure Factors
- Task 3. Development of Risk of Failure Scores
- Task 4. Water Main and Sanitary Sewer Replacement Programs
- Task 5. Water Main and Sanitary Sewer Replacement Programs Reports

Task 1. Kickoff Meeting, Existing Data Collection and Review

Prior to initiating work on this Study, the Team will facilitate a kickoff meeting with the County to review Study objectives and to collect data needed for development of the replacement programs. The Team met with the County before developing the scope to understand the available data and formats of the data. From the meeting the following data and formats were identified:

- Age of water main and sanitary sewer – ArcGIS format
- Diameter and material of water main and sanitary sewer – ArcGIS format
- PACP-compliant inspections and QR ratings (2013 through 2016) – ArcGIS format
- MACP QR ratings (2013 through 2016) – Data available in PipeTech Database. Assumed each manhole has a QR rating and Asset ID's in the PipeTech database matches the manhole ID's in County's GIS database.



- Water main break and force main failure history – Historical data prior to 2015 in ArcGIS and after 2015 in oracle database
- Information regarding water main valves and vaults – Only location and ID number information is available in ArcGIS format, sizing is not available
- Difficult to repair locations (depth) – Depth of manhole in ArcGIS format
- Other ArcGIS layers – Soils, critical facilities, railway crossings, major roadways, bus routes and zoning classifications

Our Team will collect all the above data and other ArcGIS layers during this task. Data will be reviewed and formatted for the Study in ArcGIS. Any data gaps will be identified and resolved using the County's atlases, plans and reports. From the brief review of County's GIS data, we have identified some data gaps, for example the water main and sanitary sewer age of installation information. These data gaps will be populated using the atlases or zoning data sources. Similarly, non-ArcGIS data will also be reviewed and brought into ArcGIS, for example 2 years of CCTV data, main break history from Oracle database, etc.

The County maintains Pipe Assessment Certification Program (PACP) compliant gravity sewer inspections data for years 2013, 2014, 2015 and 2016 and is integrated with the County's sanitary sewer GIS layer. As part of this scope, the Team will only use these inspections for assessing the condition of the gravity sewers. For the remaining sewers, the Team will use other factors as discussed in Task 2 for assessing the condition.

Available gravity sewer, manhole, force main and interceptor sewer reports will also be reviewed and the condition assessment results will be summarized in ArcGIS. Past reports may include enhanced inspection studies (e.g., ultrasonic testing of force mains), access studies, odor control assessments and hydraulic evaluations.

During this task the Team will also conduct several working sessions with the County. Prior to the working sessions, our Team will submit questions to the County's Project Manager. Work session topics will include strategic priorities for the County, current capital programming practices, service delivery mechanisms (i.e., work done in-house vs. contracted), inspection practices, maintenance practices, customer complaints, water quality problems, pressure problems, fire flow deficiencies, basement backups, odor complaints and access concerns. Once draft work session questions are submitted, the County's Project Manager can distribute the questions and identify appropriate staff for each session. Our Team will conduct work sessions with the County staff. Work sessions will be conducted with the three major stakeholders who implement water main and sanitary sewer projects. Work sessions are proposed to include management, engineering and operations/maintenance staff. After work sessions are complete, the Team will prepare a work session summary technical memorandum and distribute to County for review and feedback.

Information collected from the work sessions will be applied to the respective pipe segments in the ArcGIS. At the end of this task the Team will develop an ArcGIS database that is complete and accurate and will support the analysis for the water main and sanitary sewer replacement programs.

Deliverables

The deliverables from the existing data collection and review task are:

- Kickoff meeting and Study objectives;
- Data collection, coordination and review;
- Work sessions with County staff and technical memorandum;
- ArcGIS databases for water main and sanitary sewer systems; and
- Report(s) section of the existing data collection and review task.

Task 2. Identify Probability and Consequence of Failure Factors

The probability of failure factor for a given asset defines the physical condition of the asset and can be estimated using a number of factors that potentially affect pipe condition and therefore its lifespan. The consequence of failure factor for a given asset is the magnitude of the impact that an asset causes to the surroundings when the asset fails. The goal of our approach and this process is to accurately rank a single asset against the other assets within the water main and sanitary sewer systems to confidently rank the pipe assets in the systems for action in correct order of risk they pose in the event of a failure.

The first step in defining the risk of failure score for each asset is to identify the probability of failure and consequence of failure factors. The risk of failure score for each asset is determined by multiplying the sum of probability of failure factors times the sum of the consequence of failure factors. There are several probabilities of failure and consequence of failure factors that can be considered in the process of evaluating the risk of failure score. However, the factors are limited to quality and quantity of data availability.

The Team will schedule a workshop with the County once the review of data and development of ArcGIS databases task is completed. During this workshop the Team will review the probability of failure and consequence of failure factors with the County. The Team with assistance from the County will identify and customize the factors applicable to the County's water main and sanitary sewer systems.

Two sets of factors will be developed, one for water mains and one for sanitary sewer systems, since some of the factors will not be applicable to sanitary sewer systems or vice versa. The output from the workshop will be a list of potential factors and weights of importance or influence that the County and Team agree to represent pipe condition. Industry guidelines and experience from past studies will also influence the assignment of weights to the selected factors.

Based on brief review of available data, the Team has come up with a preliminary list of probability of failure and consequence of failure factors to be used in the Study:

Combined List of Probability of Failure Factors - Preliminary

Factor ID	Factor Name	Factor Description
P1	Breaks	Water or force main breaks provides indication of weaker pipe, including sections of pipe that are immediately downstream and upstream of previous breaks
P2	Age	Age of water main or sanitary sewer contributes, in general, to condition of water main or sanitary sewer. Older water main or sanitary sewer generally is in a worse condition than newer pipe, with exceptions for known vintages of poor quality
P3	Soil Corrosion	Different soils have different rates of corrosion on metallic pipes
P4	Railway Crossings	Railway vibration causes pipe joint failure
P5	PACP QR Ratings	Sewer condition assessment ratings
P6	Material	Some material of the pipes is more prone to failure than others

Combined List of Consequence of Failure Factors - Preliminary

Factor ID	Factor Name	Factor Description
	Damage or Disruption to	
C1	Sensitive Locations	Some locations are more sensitive to flooding damage or disruption with potential for loss of life, or disruption to important areas such as hospitals, schools, police, fire, government buildings and hotels
C2	Roadways and Highways	Disruption to roadways that are critical (evacuation routes, emergency service routes or highways, etc.) due to a water main failure
C3	Railway Crossings	Damage to railway bed due to washing it out or causing slowdown in service due to flooding
C4	Interceptor Sewers/transmission mains	Damage to interceptor sewers or transmission mains due to washing out the bedding
	Service Outage	
C5	Number of Customers/Demand	Number of customers out of service due to a water main or force main failure. The amount of user demand affected by an asset outage and isolation
	Duration of Outage	
C6	Duration of Outage due to hard to repair locations	Harder to reach asset will cost more to repair
	General Disruption	
C7	Flooding Potential – Diameter	Larger mains, sewers or force mains will release more water/wastewater during a failure
C8	Highly Consequential Assets	Assets that if they fail have overwhelming consequence to human life or system operation (like assets coming out of the WTP and going into WWTP)

The above listed factors are preliminary and will be finalized after review of available data and input from the County.

Deliverables

The deliverables from this task are:

- List of consequence and probability of failure factors based on available data;
- Workshop to review and finalize factors and weights, and develop meeting notes; and
- Report(s) section of the probability and consequence of failure factors selection.

Task 3. Development of Risk of Failure Scores

Once the probability and consequence of failure factors are identified and quantified, these factors will be used to quantify a risk of failure score for each asset using a risk based approach. A risk of failure score will be determined for each asset by evaluating the physical conditions of the water main or sanitary sewer and the impact of water main or sanitary sewer failure on the nearby surroundings. This risk of failure score signifies the precedence of the water main or sanitary sewer over other water mains or sanitary sewers that require rehabilitation or replacement. A risk of failure score is quantified as the product of probability of failure score and consequence of failure score for a given asset.

Probability of failure score for each selected factor will be calculated for each water main and sanitary sewer segment using ArcGIS spatial analysis tools and customized Python scripts. There are approximately 15,200 water main segments, out of which 12,300 water main segments are owned by the County. Similarly, there are approximately 11,300 gravity and interceptor sewer segments, out of which 8,500 sewer segments are owned by the County. Probability of failure scores for each factor will be quantified for the 12,300 water main segments and 8,500 sanitary sewer segments. Scores will also be assessed for approximately 500 force main segments. A cumulative probability of failure score for each water main and sanitary sewer segment will be calculated from the sum of all factor scores as shown below.

Cumulative Probability Factor Score (CPFS) = $P_1 + P_2 + P_3 + P_4 + P_5 + P_6 + \text{etc.}$

Similarly, consequence of failure score for each selected factor will be calculated for the 12,300 water main segments and 9,000 sewer segments. A cumulative consequence of failure score for each water main and sanitary sewer segment will be calculated from the sum of all factor scores as shown below.

Cumulative Consequence Factor Score (CCFS) = $C_1 + C_2 + C_3 + C_4 + C_5 + C_6 + C_7 + C_8 + \text{etc.}$

Using the CPFS and CCFS for each water main and sanitary sewer segment, a risk of failure score will be calculated for the 12,300 water main segments and 9,000 sanitary sewer segments. The higher the risk score, the higher the risk of failure of the asset. These risk of failure scores allows for easy identification and classification of water main and sanitary sewer segments that have a greater degree of urgency for rehabilitation or replacement compared to other pipe assets in the County's water and sewer systems.

The results from this task will be presented to the County at a workshop setting. This exercise will provide a validation to the quantified risk scores for water main and sanitary sewer systems.

As part of this task, the Team will identify the required level of service improvements for Vernon Hills water distribution system. Team will use the County's existing hydraulic model of Vernon Hills to evaluate fire flow deficiencies in the Vernon Hills water distribution system. Capital improvement projects will be identified to address fire flow deficiencies and provide adequate fire flows in the system. Planning level costs estimates will also be developed for the identified capital improvement projects. These capital improvements projects will then be integrated with the 5-Year water main replacement program as discussed in Task 4. Team will not perform any calibration of hydraulic model or field investigation as part of this subtask.

Deliverables

The deliverables from this task are:

- Probability of failure score for the selected factors for 12,300 water main segments and 9,000 sanitary sewer segments;
- Consequence of failure score for the selected factors for 12,300 water main segments and 9,000 sanitary sewer segments;
- Cumulative scores for probability and consequence of failure factors for 12,300 water main segments and 9,000 sanitary sewer segments;
- Risk scores for 12,300 water main segments and 9,000 sanitary sewer segments;
- Level of service capital improvement projects for Vernon Hills water distribution system;
- Workshop to review and validate risk scores; and
- Report(s) section of the development of risk scores.

Task 4. Water Main and Sanitary Sewer Replacement Programs

The risk scores developed in Task 3 will prioritize capital needs on an individual pipe segment basis, for 12,300 water main segments and 9,000 sewer segments. However, the pipeline projects should be contiguous and not by segments. Although the asset management software tools will provide convenient access to CCTV data, main break data, and spatial mapping, our Team will make determinations with the input from County about the extent and type of improvement project that would be necessary. This can include capital projects such as replacement, re-lining, point repairs, or just O&M changes such as increased cleaning, root removal, and inspections. Consequently, the capital needs identified through risk scores will be bundled together into discrete projects and programmed into the 5-year water main and sanitary sewer replacement programs. The capital project identification process is as follows:

- Group individual defective assets into capital projects with similar priority, location and capital need;

- Prepare rehabilitation and replacement costs for each project; and
- Identify and optimal year for implementing the capital project.

The Capital projects will be scheduled into the 5-year water main and sanitary sewer replacement programs which will include both engineering and construction costs for each project. Before developing the programs, the Team with the assistance from the County, will schedule one workshop with the other Lake County agencies (LCDOT, SMC, municipalities, townships, and other utilities) to identify and acquire the near-term capital projects information. This identified capital projects will then be considered into the timeline of water main and sanitary sewer replacement programs. Adjustments to the timeline of water main and sanitary sewer projects will only be made based on the risk score categories. For example, an asset with a low to moderate score will not be replaced even though there is a potential project from LCDOT agency in the next 5-years.

As part of this task, the Team will also identify required budget needs for the County's water main and sanitary sewer replacement programs. The Team will research the industry guidelines and available bench marks for budgeting yearly capital projects. The Team will also perform life cycle cost analysis of water main and sanitary sewer systems based on the material and remaining service life. This macro analysis will provide an approximate annual budget estimate for the next 30 years.

The County has an existing inspection plan to inspect 10% of the sanitary sewer miles each year. The inspections are performed according to PACP guidelines. Our Team will review the existing inspection plan and will update the plan based on the results from risk of failure score analysis. The proposed inspection plan will identify a series of inspection locations that can be programmed over the next 5-year planning horizon.

The Team will also develop planning level cost estimates for the water main and sanitary sewer replacement projects. These planning level cost estimates will only be based on per foot cost estimate and will not include any site-specific project cost estimates. The Team with assistance from the County will use cost estimates from recent bids to develop the per foot cost for replacement and rehabilitation.

Deliverables

The deliverables from this task are:

- Water main and sanitary sewer capital projects;
- One workshop with other agencies to identify and acquire potential capital projects information;
- Updated sanitary sewer inspection plan;
- 5-year water main and sanitary sewer replacement programs with planning level cost estimates for each project;
- Maps showing water main and sanitary sewer replacement projects;

- Workshop to review 5-year water main and sanitary sewer replacement programs; and
- Report(s) section of the 5-year water main and sanitary sewer replacement programs.

Task 5. Water Main and Sanitary Sewer Replacement Programs Reports

The Team will prepare draft and final reports for the water main and sanitary sewer replacement programs discussing the findings, methodology and recommendations for the work completed for Task 1 through 4. The reports will include a clear, concise executive summary outlining the results of the work performed as well as a task by task description of the conclusions and results of the work performed within each task. Maps of the resulting asset rankings and results will be provided for each factor as well as overall ranking results for both the water main and sanitary sewer systems. Three copies and one digital PDF copy of each final report will be submitted to the County. The draft reports will be submitted electronically.

Deliverables

The deliverables from this task are:

- Draft 5-year replacement program reports for the County's water main and sanitary sewer systems;
- Meeting with the County to review the draft reports; and
- Final 5-year replacement program reports for the County's water main and sanitary sewer systems.

If you have any questions regarding this submittal, please contact me at (312) 346-5000 or at AtassiA@cdmsmith.com.


Sincerely,

A handwritten signature in blue ink, appearing to read 'Amrou Atassi'.

Amrou Atassi, P.E., BCEE
Associate
CDM Smith Inc.

Copy: Peter Kolb, ATI; Kumar Gali, CDM Smith

LEVEL OF EFFORT FOR SOI # 16256
WATER MAIN AND SANITARY SEWER INFRASTRUCTURE ASSESSMENT
LAKE COUNTY, IL

	CDM Smith Team	
	Total Hours	Total Cost
2/27/17		
Task 1. Kickoff Meeting, Existing Data Collection and Review	486	\$ 62,747
Task 1.1 Kickoff Meeting	100	\$ 14,005
Prepare and Attend Kickoff Meeting	28	\$ 4,581
Data Collection and Coordination	12	\$ 2,046
Data Review and Coordination	60	\$ 7,378
Task 1.2. Develop Water Main and Sanitary Sewer GIS Database	288	\$ 33,485
Review 2013 through 2016 MACP Data and Import into GIS	58	\$ 6,156
Review Existing Sewer, Force Main and Interceptor Reports	60	\$ 8,506
Import 2015 and 2016 Break History into GIS from Oracle	16	\$ 1,843
Assign Valve Sizes in GIS (Using upstream and downstream pipes)	16	\$ 1,843
Address Data Gaps in GIS Databases	94	\$ 10,581
Develop GIS Water Main and Sanitary Sewer GIS Databases	44	\$ 4,557
Task 1.3. Work Sessions with County Staff	98	\$ 15,257
Develop Questionnaire for Work Sessions	18	\$ 2,931
Work Sessions with County Staff	48	\$ 8,836
Update GIS Databases	32	\$ 3,490
TASK 2. IDENTIFY PROBABILITY AND CONSEQUENCE OF FAILURE FACTORS	61	\$ 10,797
Task 2.1. Identify Factors for Water and Sewer Systems	61	\$ 10,797
Identify Probability and Consequence of Failure Factors based on Data Review	20	\$ 3,378
Identify Weights of Importance	19	\$ 3,174
Workshop with County Staff	16	\$ 3,156
Finalize Factors and Weights	6	\$ 1,090
TASK 3. Development of Risk of Failure Scores	411	\$ 52,629
Task 3.1. Probability of Failure Factor Scores (Water and Sewer)	150	\$ 17,310
Data Processing for Probability of Failure Factors (Total 14 Factors)	82	\$ 9,217
Quantify Scores for Each Water Main and Sanitary Sewer Segment (12,300 and 9,000 segments)	68	\$ 8,093
Task 3.2. Consequence of Failure Factor Scores (Water and Sewer)	142	\$ 16,544
Data Processing for Consequence of Failure Factors (Total 20 Factors)	58	\$ 6,920
Quantify Scores for Each Water Main and Sanitary Sewer Segment (12,300 and 9,000 segments)	84	\$ 9,624
Task 3.3. Develop Risk Scores (Water and Sewer)	44	\$ 6,892
Quantify Risk Scores for Each Water Main and Sanitary Sewer Segment (12,300 and 9,000 segments)	28	\$ 3,756
Workshop to Review and Validate Risk Scores	16	\$ 3,136
Task 3.4. Level of Service Analysis for Vernon Hills Water System	75	\$ 11,883
Simulate Hydraulic Model for Fire Flow Scenario	10	\$ 1,750
Identify Capital Improvement Projects and Develop Costs	34	\$ 5,711
Integrate with 5-year Water Main Replacement Program	31	\$ 4,422
TASK 4. Water Main and Sanitary Sewer Replacement Programs	466	\$ 59,716
Task 4.1. Coordination with Lake County Agencies	110	\$ 14,734
Coordinate and Collect Capital Projects Information	46	\$ 7,189
Review and Incorporate into County's Replacement Programs	64	\$ 7,545
Task 4.2. Annual Budget needs for County's Programs	70	\$ 8,526
Research Industry Guidelines and Benchmarks	14	\$ 2,058
Long Term Planning Analysis based on Remaining Service Life	56	\$ 6,468
Task 4.3. 5-Year Replacement Programs	244	\$ 31,511
Bundle Water Main Segments into Projects	34	\$ 4,069
Bundle Sanitary Sewer Segments into Projects	34	\$ 3,947
Develop Planning Level Cost Estimates for each Water Main Project (Costs based on Per Foot and not by specific location)	50	\$ 6,587
Develop Planning Level Cost Estimates for each Sanitary Sewer Project (Costs based on Per Foot and not by specific location)	50	\$ 6,587
Water Main System Replacement Program (Tables and Maps)	30	\$ 3,593
Sanitary Sewer System Replacement Program (Tables and Maps)	30	\$ 3,593
Workshop to Review Replacement Programs	16	\$ 3,136
Task 4.4. County's PACP Inspection Plan	42	\$ 4,944
Updated PACP Inspection Plan based on Criticality Scores	42	\$ 4,944
TASK 5. Water Main and Sanitary Sewer Replacement Programs Reports	438	\$ 63,971
Task 5.1. Develop Draft and Final Replacement Program Reports	438	\$ 63,971
Develop Draft Replacement Program Reports	328	\$ 45,283
Meeting to Review Draft Reports	16	\$ 3,136
Address Comments and Produce Final Replacement Program Reports	30	\$ 4,919
Project Management and Invoices	64	\$ 10,634
TASKS 1 THROUGH 5 TOTAL	1,862	\$ 249,860