CITY of NOVI CITY COUNCIL

Agenda Item F
March 10, 2014

SUBJECT: Approval to award an engineering services agreement to Orchard, Hiltz, and McCliment, Inc. for engineering services related to the 2014 Sanitary Collection System Capacity Study, in the amount of $97,516, including an additional expenditure in the amount of $62,516.

SUBMITTING DEPARTMENT: Department of Public Services, Water and Sewer Division TDK
Department of Public Services, Engineering Division RZ

CITY MANAGER APPROVAL: VC

EXPENDITURE REQUIRED	**$ 97,516**
AMOUNT INCLUDED IN C.I.P.	**$ 35,000**
ADDITIONAL AMOUNT REQUIRED	**$ 62,516 (To be funded by CMOM line item below)**
LINE ITEM NUMBER	**592-592.00-805.026 (Capacity Study)** **592-592.00-936.500 (CMOM)**

BACKGROUND INFORMATION:

The first phase of the City's Sanitary Collection System Capacity, Management, Operation and Maintenance (CMOM) program was completed in 2005 and focused on growth projections, a capacity assessment, and identification of needed improvements to address capacity issues. In consideration of the future growth that was to occur, peak inflow and infiltration (I/I) flow reduction was a key objective identified for the CMOM program to preserve limited outlet capacity to the North Huron Valley Rouge Valley (NHVRV) System south of Eight Mile Road.

Since 2005, the City has implemented additional phases of the CMOM program, which involved inspection and rehabilitation of the collection system to control peak I/I sources. Concurrent with CMOM implementation, many of the planned developments within the City were built-out and are now contributing additional flows to the sanitary collection system.

The 2014 Sanitary Collection System Capacity Study will focus on updating peak design I/I flows in the system to evaluate how CMOM activities and population growth have impacted the capacity of the collection system. In addition, the findings from the proposed capacity study will prove beneficial when negotiating with Wayne County, which owns and operates the NHVRV outlet system. Wayne County is currently implementing its Long Term Corrective Action Plan (LTCAP), which will likely include re-negotiation of outlet capacities and a regional water quality project that could require the City's cost participation. A detailed evaluation of the City's flow contribution to the NHVRV will be valuable in negotiating potential capacity allocations and an equitable cost share for a given regional project.

The Agreement for Professional Engineering Services for Public Projects does not contain a fee category for this type of project, so proposals were requested from the City's three pre-qualified engineering firms. City staff reviewed the proposals and recommends that design

engineering for this project be awarded to OHM. OHM's proposal and a summary of the review scoring are attached.

The fee for the proposed study exceeds the original amount included in the Capital Improvements Program because:

1. The study was expanded to include evaluations of the capacity of the City's 15 sanitary sewage lift/pump stations. Preliminary evaluation of the pump stations located in the Sections 19, 20, 29, and 30 of the City indicates that pending growth will cause these lift stations to exceed their capacity; thus these portions of the system are of critical concern. Expanding the scope resulted in an increased level of effort that will require approximately 700 hours of effort versus the 400 hours that was initially anticipated.

2. The study includes an advanced modeling technique that allows the City to more accurately evaluate the design flows of the collection system. This technique requires the use of the H2OMetrics Antecedent Moisture Model, which adds $16,000 in software licensing costs to the proposal. In spite of these added licensing costs, the OHM fee proposal is over $22,000 less expensive than the next lowest fee proposal.

The findings and recommendations generated as part of this study will serve as a guideline to improve system capacity in anticipation of future growth. As depicted in the expenditure block above, the additional amount required to award the proposed study would be assigned to the CMOM line item budget (592-592.00-936.500), which is dedicated for activities such as this study.

RECOMMENDED ACTION: Approval to award an engineering services agreement to Orchard, Hiltz, and McCliment, Inc. for engineering services related to the 2014 Sanitary Collection System Capacity Study, in the amount of $97,516, including an additional expenditure in the amount of $62,516.

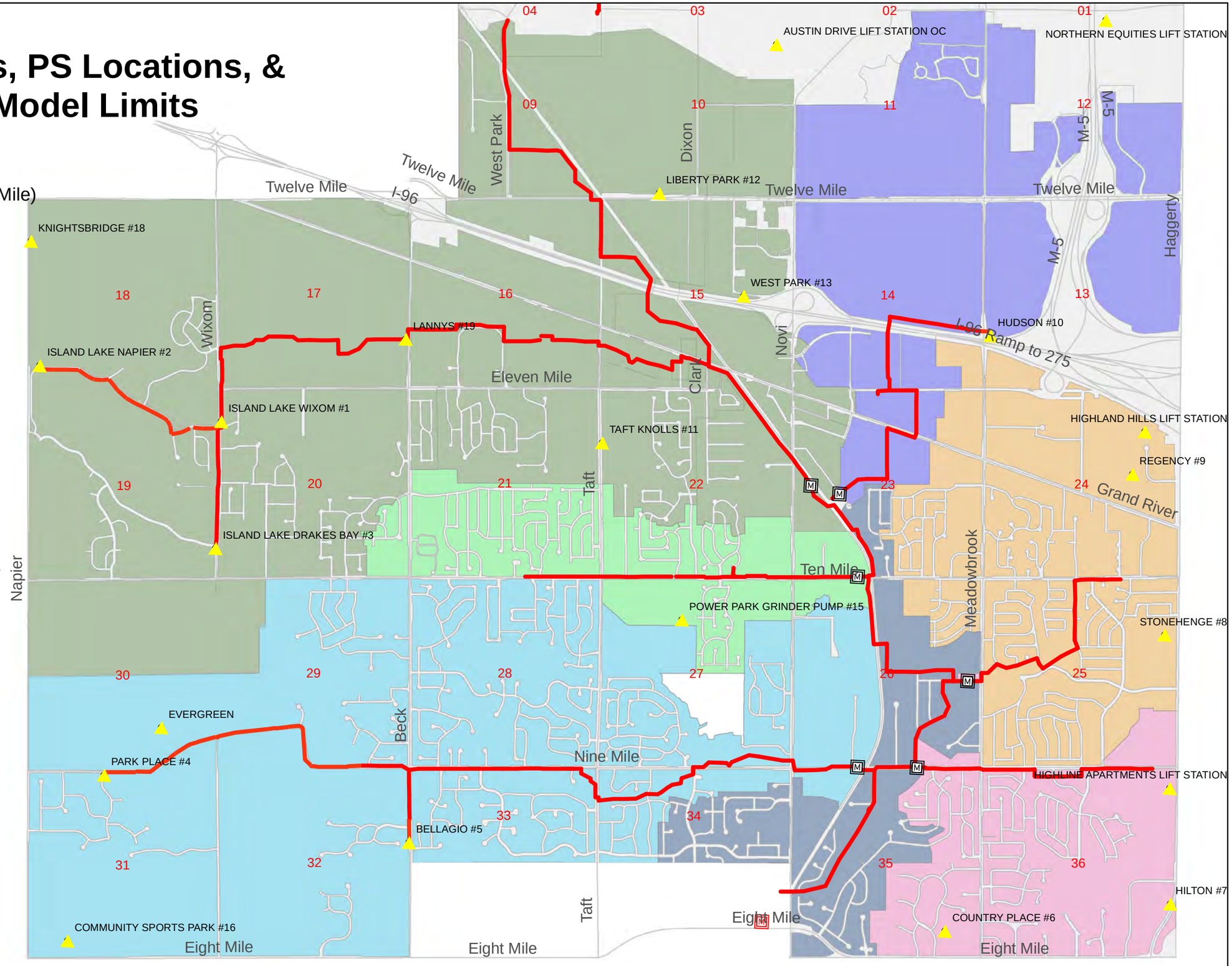
	1	2	Y	N
Mayor Gatt				
Mayor Pro Tem Staudt				
Council Member Casey				
Council Member Fischer				

	1	2	Y	N
Council Member Markham				
Council Member Mutch				
Council Member Wrobel				

Figure 1
Flow Meter Locations, PS Locations, & Proposed Hydraulic Model Limits

Legend

- Outlet Flow Meter Location (Eight Mile)
- Temporary Meter Location
- Sanitary Lift Station
- Walled Lake-Novi WWTP Area
- ELWH
- Hudson
- Interceptor South
- Nine Mile
- Simmons
- Turtle Creek
- Willowbrook
- Proposed Hydraulic Model Extents



Reviewer Summary

(Note: SDA did not submit proposal)

Rate 1 to 2 (2 = best)

	Firm:	OHM	URS
Criteria	Weight		
Professional Qualifications	25	7	5
Project Experience	25	7.5	4.5
Work Plan	25	7.5	4.5
Fee Proposal	25	8	4
		750	450

Comments

OHM

SDA SDA did not submit proposal

URS

Reviewers: Roselle, Kuhns, Croy, Coburn

SUPPLEMENTAL PROFESSIONAL ENGINEERING SERVICES AGREEMENT

2014 SANITARY COLLECTION SYSTEM CAPACITY STUDY

This Agreement shall be considered as made and entered into as of the date of the last signature hereon, and is between the City of Novi, 45175 W. Ten Mile Road, Novi, MI 48375-3024, hereafter, "City," and Orchard, Hiltz & McCliment, Inc. whose address is 34000 Plymouth Road, Livonia, MI 48150, hereafter, "Consultant."

R E C I T A L S:

This Agreement shall be supplemental to, and hereby incorporates the terms and conditions of the AGREEMENT FOR PROFESSIONAL ENGINEERING SERVICES FOR PUBLIC PROJECTS, and attached exhibits, entered into between the City and the Consultant on December 17, 2012.

The project involves the necessary data collection, modeling, and system evaluation to develop a list of recommendations and cost estimates for improvements to the sanitary collection system that would be used in the development of the Capital Improvement Plan for the City.

NOW, THEREFORE, in consideration of the foregoing, the City and Consultant agree as follows:

Section 1. **Professional Engineering Services**.

For and in consideration of payment by the City as provided under the "Payment for Engineering Services" section of this Agreement, Consultant shall perform the work described in the manner provided or required by the following Scope of Services, which is attached to and made a part of this Agreement as Exhibit A, all of said services to be done in a competent, efficient, timely, good and workmanlike manner and in compliance with all terms and conditions of this Agreement.

Exhibit A Scope of Services

Section 2. Payment for Professional Engineering Services.

1. Basic Fee.

Design Phase Services: The Consultant shall complete the design phase services as described herein for a lump sum fee of $97,516, as described in the attached proposal.

2. Payment Schedule for Professional Engineering Services Fee.

Consultant shall submit monthly statements for professional engineering services rendered. The statements shall be based on Consultant's estimate of the proportion of the total

services actually completed for each task as set forth in Exhibit A at the time of billing. The City shall confirm the correctness of such estimates, and may use the City's own engineer for such purposes. The monthly statements should be accompanied by such properly completed reporting forms and such other evidence of progress as may be required by the City. Upon such confirmation, the City shall pay the amount owed within 30 days.

Final billing under this agreement shall be submitted in a timely manner but not later than three (3) months after completion of the services. Billings for work submitted later than three (3) months after completion of services will not be paid. Final payment will be made upon completion of audit by the City.

3. Payment Schedule for Expenses.

All expenses required to complete the scope of services described herein, including but not limited to costs related to mileage, vehicles, reproduction, computer use, etc., shall be included in the basic fee and shall not be paid separately. However, as compensation for expenses that are not included in the standard scope of services, when incurred in direct connection with the project, and approved by the City, the City shall pay the Consultant its actual cost times a factor of 1.15.

Section 4. Ownership of Plans and Documents; Records.

1. Upon completion or termination of this agreement, all documents prepared by the Consultant, including tracings, drawings, estimates, specifications, field notes, investigations, studies, etc., as instruments of service shall become the property of the City.

2. The City shall make copies, for the use of the Consultant, of all of its maps, records, laboratory tests, or other data pertinent to the work to be performed by the Consultant under this Agreement, and also make available any other maps, records, or other materials available to the City from any other public agency or body.

3. The Consultant shall furnish to the City, copies of all maps, records, field notes, and soil tests that were developed in the course of work for the City and for which compensation has been received by the Consultant.

Section 5. Termination.

1. This Agreement may be terminated by either party upon 7- days' prior written notice to the other party in the event of substantial failure by the other party to fulfill its obligations under this agreement through no fault of the terminating party.

2. This Agreement may be terminated by the City for its convenience upon 90 days' prior written notice to the Consultant.

3. In the event of termination, as provided in this Article, the Consultant shall be paid as compensation in full for services performed to the date of that termination, an amount calculated in accordance with Section 2 of this Agreement. Such amount shall be paid by the City upon the Consultant's delivering or otherwise making available to the City, all data, drawings, specifications, reports, estimates, summaries, and that other information and materials

as may have been accumulated by the Consultant in performing the services included in this Agreement, whether completed or in progress.

Section 6. Disclosure.

The Consultant affirms that it has not made or agreed to make any valuable gift whether in the form of service, loan, thing, or promise to any person or any of the person's immediate family, having the duty to recommend, the right to vote upon, or any other direct influence on the selection of consultants to provide professional engineering services to the City within the two years preceding the execution of this Agreement. A campaign contribution, as defined by Michigan law shall not be considered as a valuable gift for the purposes of this Agreement.

Section 7. Insurance Requirements.

1. The Consultant shall maintain at its expense during the term of this Agreement, the following insurance:

A. Worker's Compensation insurance relative to all Personnel engaged in performing services pursuant to this Agreement, with coverage not less than that required by applicable law.

B. Comprehensive General Liability insurance with maximum bodily injury limits of $1,000,000 (One Million Dollars) each occurrence and/or aggregate and minimum Property Damage limits of $1,000,000 (One Million Dollars) each occurrence and/or aggregate.

C. Automotive Liability insurance covering all owned, hired, and non-owned vehicles with Personal Protection insurance to comply with the provisions of the Michigan No Fault Insurance Law including Residual Liability insurance with minimum bodily injury limits of $1,000,000 (One Million Dollars) each occurrence and/or aggregate minimum property damage limits of $1,000,000 (One Million Dollars) each occurrence and/or aggregate.

D. The Consultant shall provide proof of Professional Liability coverage in the amount of not less than $1,000,000 (One Million Dollars) per occurrence and/or aggregate, and Environmental Impairment coverage.

2. The Consultant shall be responsible for payment of all deductibles contained in any insurance required hereunder.

3. If during the term of this Agreement changed conditions or other pertinent factors should in the reasonable judgment of the City render inadequate insurance limits, the Consultant will furnish on demand such additional coverage as may reasonably be required under the circumstances. All such insurance shall be effected at the Consultant's expense, under valid and enforceable policies, issued by the insurers of recognized responsibility which are well-rated by national rating organizations and are acceptable to the City.

4. All policies shall name the Consultant as the insured and shall be accompanied by a commitment from the insurer that such policies shall not be canceled or reduced without at least thirty (30) days prior notice to the City.

With the exception of professional liability, all insurance policies shall name the City of Novi, its officers, agents, and employees as additional insured. Certificates of Insurance evidencing such coverage shall be submitted to Sue Morianti, Purchasing Manager, City of Novi, 45175 West Ten Mile Road, Novi, MI 48375-3024 prior to commencement of performance under this Agreement and at least fifteen (15) days prior to the expiration dates of expiring policies.

5. If any work is sublet in connection with this Agreement, the Consultant shall require each subconsultant to effect and maintain at least the same types and limits of insurance as fixed for the Consultant.

6. The provisions requiring the Consultant to carry said insurance shall not be construed in any manner as waiving or restricting the liability of the Consultant under this Agreement.

Section 8. Indemnity and Hold Harmless.

A. The Consultant agrees to indemnify and hold harmless the City, its elected and appointed officials and employees, from and against any and all claims, demands, suits, losses and settlements, including actual attorney fees incurred and all costs connected therewith, for any damages which may be asserted, claimed or recovered against the City by reason of personal injury, death and/or property damages which arises out of or is in any way connected or associated with the actions or inactions of the Consultant in performing or failing to perform the work.

The Consultant agrees that it is its responsibility and not the responsibility of the City to safeguard the property and materials used in performing this Agreement. Further, this Consultant agrees to hold the City harmless for any loss of such property and materials used pursuant to the Consultant's performance under this Agreement.

Section 9. Nondiscrimination.

The Consultant shall not discriminate against any employee, or applicant for employment because of race, color, sex, age or handicap, religion, ancestry, marital status, national origin, place of birth, or sexual preference. The Consultant further covenants that it will comply with the Civil Rights Act of 1973, as amended; and the Michigan Civil Rights Act of 1976 (78. Stat. 252 and 1976 PA 4563) and will require a similar covenant on the part of any consultant or subconsultant employed in the performance of this Agreement.

Section 10. Applicable Law.

This Agreement is to be governed by the laws of the State of Michigan and the City of Novi Charter and Ordinances.

Section 11. Approval; No Release.

Approval of the City shall not constitute nor be deemed release of the responsibility and liability of Consultant, its employees, associates, agents and subconsultants for the accuracy and competency of their designs, working drawings, and specifications, or other documents and services; nor shall that approval be deemed to be an assumption of that responsibility by the City for any defect in the designs, working drawings and specifications or other documents prepared by Consultant, its employees, subconsultants, and agents.

After acceptance of final plans and special provisions by the City, Consultant agrees, prior to and during the construction of this project, to perform those engineering services as may be required by City to correct errors or omissions on the original plans prepared by Consultant and to change the original design as required.

Section 12. Compliance With Laws.

This Contract and all of Consultants professional services and practices shall be subject to all applicable state, federal and local laws, rules or regulations, including without limitation, those which apply because the City is a public governmental agency or body. Consultant represents that it is in compliance with all such laws and eligible and qualified to enter into this Agreement.

Section 13. Notices.

Written notices under this Agreement shall be given to the parties at their addresses on page one by personal or registered mail delivery to the attention of the following persons:

City: Rob Hayes, P.E., Director of Public Services and Maryanne Cornelius, Clerk, with a copy to Thomas R. Schultz, City Attorney

Consultant: Vyto Kaunelis, P.E., Principal

Section 14. Waivers.

No waiver of any term or condition of this Agreement shall be binding and effective unless in writing and signed by all parties, with any such waiver being limited to that circumstance only and not applicable to subsequent actions or events.

Section 15. Inspections, Notices, and Remedies Regarding Work.

During the performance of the professional services by Consultant, City shall have the right to inspect the services and its progress to assure that it complies with this Agreement. If such inspections reveal a defect in the work performed or other default in this Agreement, City shall provide Consultant with written notice to correct the defect or default within a specified number of days of the notice. Upon receiving such a notice, Consultant shall correct the specified defects or defaults within the time specified. Upon a failure to do so, the City may terminate this Agreement by written notice and finish the work through whatever method it deems appropriate, with the cost in doing so being a valid claim and charge against Consultant; or, the City may preserve the claims of defects or defaults without termination by written notice to Consultant.

All questions which may arise as to the quality and acceptability of work, the manner of performance and rate of progress of the work, and the interpretation of plans and specifications shall be decided by the City. All questions as to the satisfactory and acceptable fulfillment of the terms of this agreement shall be decided by the City.

Section 16. Delays.

No charges or claims for damages shall be made by the Consultant for delays or hindrances from any cause whatsoever during the progress of any portions of the services specified in this agreement, except as hereinafter provided.

In case of a substantial delay on the part of the City in providing to the Consultant either the necessary information or approval to proceed with the work, resulting, through no fault of the Consultant, in delays of such extent as to require the Consultant to perform its work under changed conditions not contemplated by the parties, the City will consider supplemental compensation limited to increased costs incurred as a direct result of such delays. Any claim for supplemental compensation must be in writing and accompanied by substantiating data.

When delays are caused by circumstances or conditions beyond the control of the Consultant as determined by the City, the Consultant shall be granted an extension of time for such reasonable period as may be mutually agreed upon between the parties, it being understood, however, that the permitting of the Consultant to proceed to complete the services, or any part of them, after the date to which the time of completion may have been extended, shall in no way operate as a waiver on the part of the City of any of its rights herein set forth.

Section 17. Assignment.

No portion of the project work, heretofore defined, shall be sublet, assigned, or otherwise disposed of except as herein provided or with the prior written consent of the City. Consent to sublet, assign, or otherwise dispose of any portion of the services shall not be construed to relieve the Consultant of any responsibility for the fulfillment of this agreement.

Section 18. Dispute Resolution.

The parties agree to try to resolve any disputes as to professional engineering services or otherwise in good faith. In the event that the parties cannot resolve any reasonable dispute, the parties agree to seek alternative dispute resolution methods agreeable to both parties and which are legally permissive at the time of the dispute. The parties agree to use their best efforts to resolve any good faith dispute within 90 (ninety) days notice to the other party. In the event the parties cannot resolve that dispute as set forth above, they may seek such remedies as may be permitted by law.

WITNESSES

_____

_____

Orchard, Hiltz, and McCliment, Inc.

_____
By:
Its:

The foregoing _____ was acknowledged before me this ____ day of _____, 20___, by _____ on behalf of _____.

_____
Notary Public
_____ County, Michigan
My Commission Expires: _____

WITNESSES

_____

_____

CITY OF NOVI

_____
By:
Its:

The foregoing _____ was acknowledged before me this ____ day of _____, 20___, by _____ on behalf of the City of Novi.

_____
Notary Public
Oakland County, Michigan
My Commission Expires: _____

EXHIBIT A - SCOPE OF SERVICES

Consultant shall provide the City professional engineering services in all phases of the Project to which this Agreement applies as hereinafter provided. These services will include serving as the City's professional engineering representative for the Project, providing professional engineering consultation and advice and furnishing customary civil, structural, mechanical and electrical engineering services and customary engineering services incidental thereto, as described below.

A. **Basic Services**.

1. See attached.

B. **Performance.**

1. The Consultant agrees that, immediately upon the execution of this Agreement, it will enter upon the duties prescribed in this agreement, proceed with the work continuously, and make the various submittals on or before the dates specified in the attached schedule. The City is not liable and will not pay the Consultant for any services rendered before written authorization is received by the Consultant.

2. The Consultant shall submit, and the City shall review and approve a timeline for submission of plans and/or the completion of any other work required pursuant to this Scope of Services. The Consultant shall use its best efforts to comply with the schedule approved by the City.

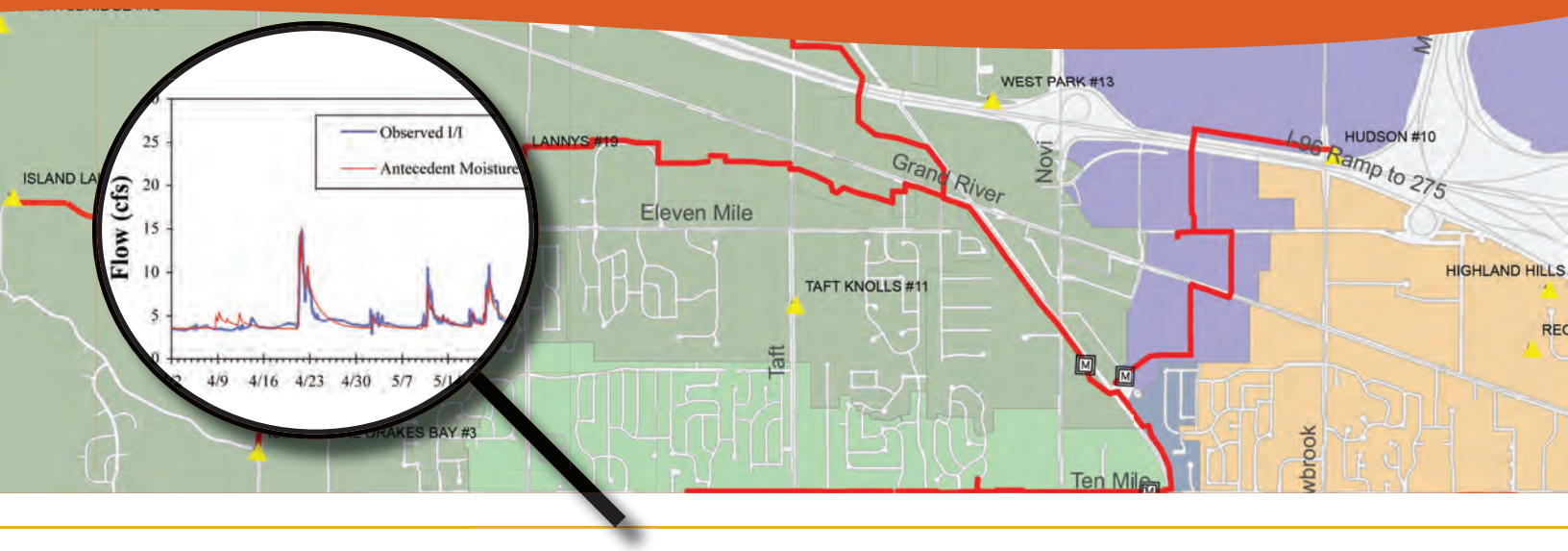
3. If any delay is caused to the Consultant by order of the City to change the design or plans; or by failure of the city to designate right-of-way, or to supply or cause to be supplied any data not otherwise available to the Consultant that is required in performing the work described; or by other delays due to causes entirely beyond the control of the Consultant; then, in that event, the time schedules will be adjusted equitably in writing, as mutually agreed between the City and the Consultant at the moment a cause for delay occurs.

4. Since the work of the Consultant must be coordinated with the activities of the City (including firms employed by and governmental agencies and subdivisions working with the City), the Consultant shall advise the City in advance, of all meetings and conferences between the Consultant and any party, governmental agency, political subdivision, or third party which is necessary to the performance of the work of the Consultant.

Proposal for

Engineering Services to Prepare a Sanitary Collection System Capacity Study

February 13, 2014



City of Novi

45175 W. Ten Mile Rd.
Novi, MI 48375-3024

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- Dedication – Do what it takes
- People Caring Organization
- Teamwork – Desire to be a valued member of your team

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OHM Advancing Communities

February 13, 2014

Timothy Kuhns, PE
City of Novi
45175 W. Ten Mile Rd.
Novi, MI 48375-3024

RE: Engineering Services to Prepare a Sanitary Collection System Capacity Study

Dear Mr. Kuhns:

The City of Novi is continuing to pro-actively plan for its sewer capacity needs through a structured program called the Capacity, Management, Operation, and Maintenance Program (CMOM). The City desires to update the prior analyses based on the changes that have occurred over the past decade. We understand that your key objectives include:

- Evaluation of existing and future flows for the areas tributary to the Huron Rouge Sewage Disposal System (HRSDS). This includes an assessment of dry weather flows based on anticipated growth and wet weather flow based on regulatory requirements.
- A hydraulic evaluation to determine if sufficient capacity exists or if further improvements are required.

The team that we have identified for this project is very qualified to perform the requested work and has a wealth of experience with similar projects. We have formulated a detailed plan of action to achieve your objectives. Key concepts in our approach include the following:

- Our hydrologic modeling approach is built on a continuous, predictive framework, which will use the long-term data at the outlet meter for calibration and validation. The shorter-term data from the other meters will use a similar process, incorporating the understandings from the outlet meter. Our methodology uses the Antecedent Moisture Model. This methodology has been proven very effective in many projects using a "brutally honest" approach to defining the accuracy of validation.
- Our team has been intimately involved in the prior work, so we will "hit the ground running" on this important project. This not only includes work with the City of Novi, but also with the HRSDS (both Wayne County and DWSD), which will be critical for outlet capacity availability evaluations. We have further ensured that the project team has the availability to perform the required work on a timely basis.
- Using innovation to come up with better ways to make use of available data is an important part of our approach. Some tools, such as MatLab and H2OMetrics, make analyses more efficient, others, such as the Antecedent Moisture Model, provide proven predictive capabilities that have not been demonstrated with any other tool that we're aware of. Other techniques, such as "null modeling" and QDF, provide logical approaches to utilizing data that help to provide accurate assessments upon which to confidently base alternative analyses. The City already has i3DLab and MatLab, which can be used with our model deliverables for system diagnostics going forward.

We are extremely enthusiastic about this project and look forward to working together on this next phase of the CMOM process. Please give us a call if you have any questions or comments. Thank you for your consideration.

Sincerely,
OHM Advisors

Vyto Kaunelis, PE
Principal

OHM Advisors
34000 PLYMOUTH ROAD
LIVONIA, MICHIGAN 48150
T 734.522.6711
F 734.522.6427
OHM-Advisors.com

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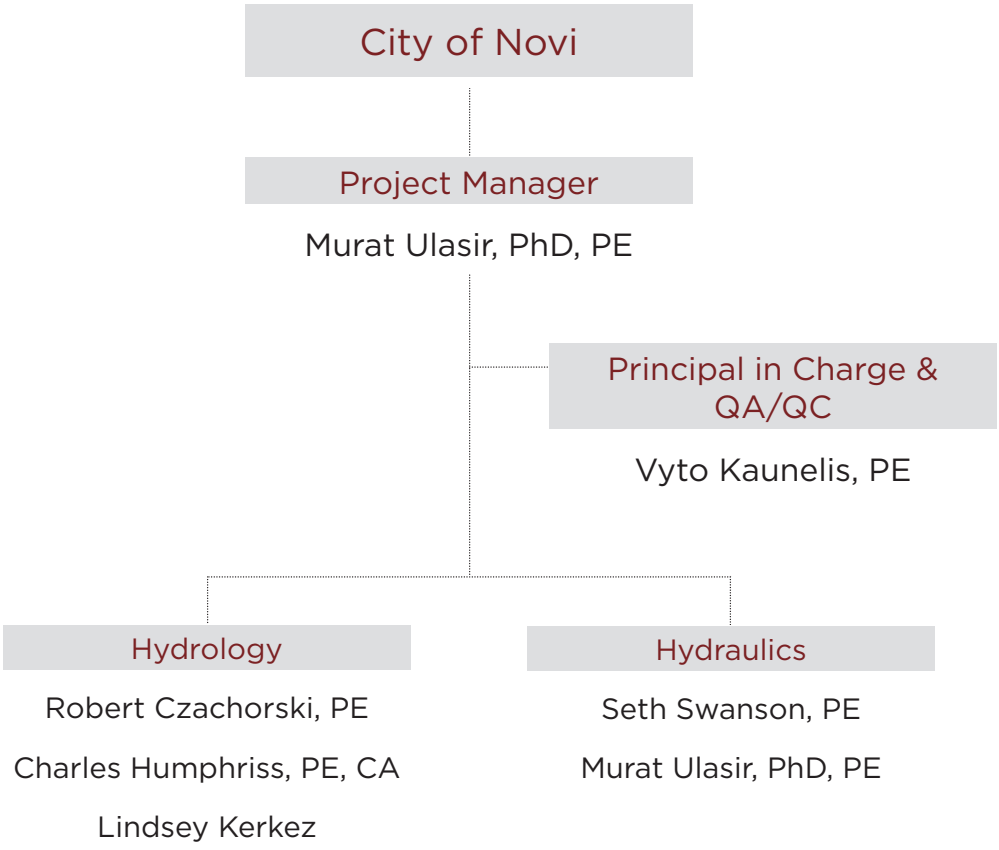
Organizational Chart



Professional Qualifications

Murat Ulasir, PhD, PE | Project Manager, Hydraulics

Education

- Post doctoral research in Environmental and Water Resources Engineering, University of Michigan, 2002
- Doctoral Degree in Environmental and Water Resources Engineering, University of Michigan, 2001
- Master of Science in Environmental and Water Resources Engineering, University of Michigan, 1996
- Bachelor of Science in Environmental Engineering, Technical University of Istanbul, 1992

Professional Registration

Professional Engineer, MI, 2003, #51291

Experience

14 years, 12 with OHM Advisors

Professional Affiliations

- Michigan Water Environment Association, 2001
- American Water Works Association, 2005

Background

As a Technical Specialist, Murat Ulasir successfully combines broad hydraulic and hydrologic research experience and system understanding with pragmatic engineering approaches, which are compliant with regulatory requirements and unique client needs.

Murat has experience with developing and calibrating a wide range of water, wastewater, and storm water related numerical models as well as using such models for system wide planning, optimization analyses, and capital improvements as well as infrastructure management planning purposes.

Murat also has extensive experience with presenting technically complex concepts in public presentations utilizing a variety of media (GIS, 3-D visualization modeling, etc.) in order to facilitate understanding and meaningful collaboration.

His desire to provide his clients with the simplest answer to their complex challenges propelled Murat to develop processes and applications utilized by a broad range of client base. One such application is what is referred to as i-Track, a sanitary sewer part 41 permit application that helps municipalities track their sanitary sewer part 41 permits, as well as the impact of these permitted flows on overall system hydraulic capacity. It is a web based application utilizing ArcGIS capabilities along with database management and sanitary sewer modeling capability. Murat has also developed a Water Infrastructure Number process by which water main improvement needs can be prioritized for infrastructure management purposes giving consideration to a wide variety of information, such as road condition, water main breaks, system age, material, hydraulic deficiencies, customer complaints, water quality deficiencies, etc.

Relevant Experience

Infrastructure Asset Management
City of Southfield Pilot Area Water Main Condition Assessment and Leak Detection – 2010
City of Livonia Water Master Plan and Capital Improvements Plan – 2009
City of Dearborn Water Master Plan and Capital Improvements Plan – 2008
City of Southfield Infrastructure Asset Management Program – CIP Development for Road, Water, Sewer, and Storm Infrastructure – 2008
City of Southfield Water Main Infrastructure Asset CIP Prioritization – 2007
City of Westland Water Main Infrastructure Repair / Rehab Prioritization – 2007

Water System Studies and Analyses
City of Farmington Hills Water Mater Plan & Infrastructure Prioritization and Condition Forecasting– 2011
City of Dearborn Water System Evaluation & Infrastructure Prioritization– 2010

Relevant Experience Continued

Water System Studies and Analyses (continued)
City of Romulus Water System Evaluation – 2010
City of Livonia Water Master Plan – 2009
Charter Township of Superior Water Storage Tank Feasibility Study – 2009
City of Dearborn Water Master Plan – 2008
City of Southfield Infrastructure Asset Management Program – 2008
City of Romulus Water System Study – 2007
City of Southfield Water Master Plan Update – 2006
City of Romulus Water System Study – 2006
YCUA Water Master Plan Update – 2005
Water Reliability Study, Village of Dexter, Washtenaw County, MI – 2005
Water Master Plan Study, Ypsilanti Community Utilities Authority, MI – 2004
Water Master Plan Study, Charter Township of Superior, MI – 2003
Water Modeling Study, Ypsilanti Community Utilities Authority, Ypsilanti, MI – 2001
Water Modeling Study, Augusta Township, MI – 2001
Water Modeling Study, City of Dearborn, MI – 2001

Sanitary Sewer System Studies and Analyses
City of Ann Arbor Sanitary Sewer Wet Weather Evaluation, Ann Arbor, MI – Ongoing
Oakland County Evergreen Farmington Sewage Disposal System Long Term Corrective Action Plan, MI – 2009-Present (ongoing)
Oakland County Clinton-Oakland Sewage Disposal System Master Plan, MI – Ongoing
City of Troy Hydraulic Deficiency Investigation, City of Troy, MI – 2013
Novi CMOM, City of Novi, MI – 2007
Sanitary Sewer Capacity Analysis, Village of Dexter, Washtenaw County, MI – 2005
Sanitary Sewer Capacity Analysis, Superior Township, MI – 2005
Sanitary Sewer Master Plan, Scio Township MI – 2004
Sanitary Sewer Master Plan, City of Romulus, MI – 2003

Inflow and Infiltration Studies and Analyses
Evergreen Farmington Sewage Disposal System Inflow / Infiltration Investigation, Oakland County, MI – 2009-Ongoing
Sanitary Sewer Metering, Phase II, Charter Township of Superior, MI – 2005
Sanitary Sewer Metering, Phase I, Charter Township of Superior, MI – 2005
Scio Township Inflow and Infiltration Study, Scio Township, MI – 2004
Superior Township Inflow and Infiltration Study, Superior Township, MI – 2003

Hydrologic System Studies and Analyses
Metropolitan Sewer District of Greater Cincinnati – 2013
Malletts Creek Restoration, City of Ann Arbor – 2011
County Farm Park Creek Restoration and Required Wetland Detention Creation, City of Ann Arbor – 2011
West Park Stormwater Modeling, Washtenaw County Water Resources Commissioner – 2011
M-10, Lahser to M-39 (Southfield), URS/MDOT – 2005
I-75 Gibraltar to Sibley, URS Corporation, Various Locations, MI –2005
Michigan East Central Drain Drainage Study, Washtenaw County, MI – 2005
I-96, M-39 to Schaefer, City of Detroit, MI – 2005
I-75 Corridor EPE, MDOT, MI – 2004
Storm Water Management Master Plan, City of Westland, MI – 2004
Derbyshire Drain, Washtenaw County Drain Commissioner, Ypsilanti Township, MI – 2003

Professional Qualifications

Vytautas (Vyto) Kaunelis, PE | Principal in Charge & QA/QC

Education

- Master of Science in Civil Engineering, University of Michigan, 1984
- Bachelor of Science in Civil Engineering, University of Michigan, 1976

Professional Registration

Professional Engineer, MI, 1979, #27579

Experience

37 years of experience – 10 years with Wayne County Department of Environment, 17 years with another Southeastern Michigan-based consulting engineering firm, and 10 years with OHM Advisors

Professional Affiliations

- Water Environment Federation
- American Public Works Association

Background

Vyto Kaunelis is a principal at OHM Advisors and currently serves as the Chairman of the Board. He is responsible to his clients to provide innovative, cost-effective, and quality solutions to the variety of issues facing communities today. He focuses on the big picture to create unique solutions, which often involves local communities and regional agencies collaborating to achieve greater results than they could individually. Examples of this include his involvement on the DWSD Water System Technical Advisory Committee (TAC) activities, the Wayne County NHV/RV sanitary system wet weather plan to meet MDEQ requirements, and the Oakland County Water Resources Commissioner's implementation of a unique monitoring and billing system for the Clinton-Oakland Sanitary Disposal System.

Relevant Experience

Sanitary Sewer System Flow Monitoring and Wet Weather Evaluation Project, Ann Arbor, MI – Ongoing
Senior technical resource for Ann Arbor footing drain disconnection wet weather flow reduction evaluation and alternatives evaluation project.

GDRSS Flow Balance Revisit, Detroit Water and Sewerage Department, Detroit, MI – Ongoing
Technical advisor for DWSD GDRSS flow balance revisit project.

Elevated Storage Tank, City of Farmington Hills – Ongoing
Principal in Charge responsible for the design of a 3 MG elevated composite storage tank.

Wayne County As-Needed Services for Wastewater Facilities – 2008-Ongoing
Principal in Charge for as-needed services for a number of combined sewer overflow and regional transportation systems. The scope of work included long-term planning for all the facilities and implementation for a variety of improvements.

Sanitary Sewer and Storm Sewer Improvements Project, Village of Urbancrest, Ohio – Ongoing
Principal in Charge for approximately 3,750 linear feet of sanitary sewer pipe rehabilitation and 11 storm catch basin reconstructions, with corresponding pavement and curb and gutter replacements necessary for construction. Responsible for the creation of construction documents, bidding, and inspection. Challenges include ensuring that all Ohio Public Works Commission (OPWC) funding source requirements are adhered to, as well as careful coordination with a concurrent street improvement project.

Relevant Experience Continued

Combined Sewer Overflow Long-Term Control Plan, City of Peoria, IL – Ongoing
As a subconsultant to Symbiont, our team performed hydrologic modeling using the i3D antecedent moisture model. The model utilized the long-term flow metering data (several years) from the main interceptor to develop "parent models" that accounted for long-term impacts of antecedent moisture variations. The parent models were then scaled to the local temporary flow metering data to develop accurate hydrologic models for the local sub-districts. This allowed accurate model development from a relatively short period of local flow metering, and provided a mechanism to best extract useful information from the temporary metering program.

Clinton-Oakland Sanitary Disposal System – Reporting System, Oakland County Water Resources Commissioner, MI – Ongoing
Principal in Charge for upgrades to the management and reporting system for this sewer disposal system serving 9 communities and over 250,000 people. The new system provides methodologies and tools for billing the local communities based on actual meters flows from nearly 60 flow meters in the system. Antecedent moisture models were developed to review meter flows for accuracy during wet weather periods.

Representative to DWSD Technical Advisory Committee, Wayne County DOE – Ongoing
Technical Advisor to Wayne County on water and wastewater issues related to DWSD (CS-1472). DWSD initiated a partnering effort with the water system customers, called the Technical Advisory Committee (TAC). Vyto was hired by Wayne County DOE to represent the interests of the Wayne County Communities on the TAC. Vyto was actively involved with the TAC Work Groups, particularly the Rates Work Group. He developed an understanding of key issues affecting rates and helped communities work on specific issues that needed to be addressed. For example, the Wayne County communities identified that a "Look-Back" on the water rates would be desirable and this was implemented for the FY 2010-2011 rate year. Other important Work Groups were the Analytical Work Group that addressed technical issues, and the Contracts Work Group that developed the Model Contract.

Evergreen-Farmington Sewage Disposal System, Long Term Corrective Action Plan, Oakland County Water Resources Commissioner – 2008-Ongoing
Principal in Charge for development of a long term plan to address sewer overflows from the County's EFSDS system, which collects sewage from 15 communities comprising over 300,000 people. The project scope included detailed field investigations, modeling, analysis, development of alternatives, and development of the Long Term Corrective Action Plan. The project is being conducted in a phased approach and additional work is ongoing.

Clinton-Oakland and Evergreen-Farmington Sanitary Disposal Systems – Billing Systems, Oakland County Water Resources Commissioner, MI – 2007-Ongoing
Principal in Charge for Oakland County Water Resource Commissioner meter based billing implementation for Clinton-Oakland and Evergreen-Farmington Sewage Disposal Systems. The system serves approximately 350,000 people in fifteen communities. Scope included flow meter data review, mass flow balance, billing system development, community coordination and processing of flows for the bills.

Flow Metering Standard Operation Procedures and Services, Metropolitan Sewer District of Greater Cincinnati, Hamilton County, OH – 2013
Principal in Charge for Metropolitan Sewer District of Greater Cincinnati (MSDGC) flow metering standard operating procedures and as-needed modeling services project. The project prepared standard operating procedures for operations (SOPs), maintenance and analysis of over 300 sewer flow meters and rain gauges for MSDGC. As the District began working with multiple vendors for flow and rainfall monitoring, they desired to have a consistent set of standards to be followed for field procedures and data processing. OHM Advisors prepared a series of SOPs memos documenting all aspects of existing practices and made recommendations for enhancements.

Professional Qualifications

Robert S. Czachorski, PE | Hydrology

Education
- Master of Science in Hydraulics in Civil Engineering, University of Michigan, 1996
- Bachelor of Science in Civil Engineering, University of Michigan, 1994

Professional Registrations
Professional Engineer:
- MI, 1998, #43827
- OH, 2009, #73798

Experience
20 years, 10 with OHM Advisors

Professional Affiliations
- American Institute of Hydrology - Registered Professional Hydrologist
- Michigan Water Environment Association - Collection System Committee Member
- Michigan Water Environment Association - Member, Past Vice President
- Southeast Michigan Council of Governments, Regional GIS Coordination Committees - Member
- Water Environment Federation - Member

Awards
Developed new hydrologic model for antecedent moisture to improve the state-of-the-art in SSO Analysis, WEFTEC Award – 2001

Background

Robert Czachorski has 20 years of experience in consulting with a primary focus on water resources and municipal engineering. He has been a project manager for dozens of water resources projects and has been the client representative for some of OHM Advisors' largest accounts, including the Oakland County Water Resources Commissioner, the Metropolitan Sewer District of Greater Cincinnati, and Ypsilanti Community Utilities Authority. He is our team's lead technical expert on sanitary collection systems and leads all of our team's national sewer work. He is responsible for managing and overseeing a variety of projects for water, sewer and storm water systems, as well as mentoring, managing and developing a project staff of 8 to 12 people.

Robert is a nationally recognized expert in wet weather issues and sanitary collection systems. He has published several papers that highlight many unique insights and techniques for system analysis, including a new hydrologic model for antecedent moisture impacts on sewer systems, which resulted in a 2001 Award from the Water Environment Federation (WEF) and a 2007 award from the Consulting Engineers Council, the leading industry professional association. Robert has presented this work and received regulatory approvals for projects in Michigan, Illinois, Indiana, Wisconsin and EPA Region 5. He has conducted sanitary sewer studies for which he performed flow metering analysis, I/I studies and hydrologic and hydraulic models for some of the largest collection systems in the country. Robert has performed water and sewer studies for nearly 100 municipal utility systems throughout the country. He has helped these agencies gain a better understanding of the system, improve system performance, and optimize capital upgrades.

Relevant Experience

Sanitary Sewer Wet Weather Evaluation Project, Ann Arbor, MI – 2013
Project manager and lead technical public engagement engineer for the City's evaluation of their sanitary collection system. The City of Ann Arbor performed approximately 2,700 footing drains disconnections (FDDs) from the their sanitary sewer system between 2001 and 2012. The City retained OHM Advisors to perform an evaluation of the effectiveness of the FDD program and develop alternatives for improving the sanitary system. Our team's approach included flow metering, FDD effectiveness evaluation, hydrologic modeling, hydraulic modeling, capacity assessment, alternative evaluation and an extensive public engagement program.

Sanitary Sewer Flow Monitoring Standard Operating Procedures, Metropolitan Sewer District of Greater Cincinnati – 2013
Prepared standard operating procedures for operations (SOPs), maintenance and analysis of over 300 sewer flow meters and rain gauges for MSDGC. As the District began working with multiple vendors for flow and rainfall monitoring, they desired to have a consistent set of standards to be followed for field procedures and data processing. OHM Advisors prepared a series of SOPs memos documenting all aspects of existing practices and made recommendations for enhancements.

Relevant Experience Continued

Sanitary Sewer Modeling Services, Metropolitan Sewer District of Greater Cincinnati – 2013
Project manager for as-needed modeling services to support MSDGC's extensive and detailed collection system model that is used to manage their multi-billion dollar sewer upgrade program. Modeling is performed using EPA-SWMM and tasks include hydraulic evaluation and modeling, I&I analysis and hydrologic modeling, making use of MSDGC's over 300 flow meters and rain gauges.

I/I Removal Evaluation for West Bloomfield, Waterford and Auburn Hills, Oakland County WRC – 2012
Program Manager and technical lead for the evaluation of I/I source removal for several communities tributary to the Clinton-Oakland Sewage Disposal System (COSDS). Over 10 years of flow meter data, spanning a period before and after system rehabilitation, were used to quantify the impacts of sewer rehabilitation and footing drain removal programs. The Antecedent Moisture Model was also used to quantify the hydrologic impact for each footing drain removal and identified the reductions in the individual flow components.

East Side Interceptor Sewer Study, City of Bloomington, IL – 2012
Technical lead for the evaluation of the City's East Side Interceptor, including analysis of meter data and wet weather modeling. The antecedent moisture model was used to evaluate the design peak flows and storage requirements for the development of a comprehensive sanitary Master Plan.

Rock River Water Reclamation District Hydrologic/ Hydraulic Analysis, Rockford, IL – 2011
Project Manager responsible for evaluation of flows within the Rock River Water Reclamation District sewer system to evaluate the sizing for a wet weather storage lagoon and influent pumps. The antecedent moisture model was used to perform a continuous simulation and frequency based approach for sizing storage.

Sanitary Sewer Flow Monitoring and Analyses, Millersville, TN – 2010
QA/QC Manager for Inflow/Infiltration Study including flow monitoring, identification of problem I/I sub-areas, and recommendations for future SSES and sewer rehabilitation work.

Sanitary Sewer Modeling Study, Galesburg, IL – 2010
Performed a modeling study of the City's sewer system to evaluate the cost effectiveness of storage and pump capacity upgrades. The study included hydrologic modeling using the i3D antecedent moisture model, hydraulic modeling, alternative overvaluation and cost estimates. The report recommended a strategy for cost effectively improving the system and addressing regulatory requirements to reduce overflows.

Evergreen-Farmington Sewage Disposal System, Long Term Corrective Action Plan, Oakland County Water Resources Commissioner – 2009-2012
Program Manager for development of a long term plan to address sewer overflows from the County's EFSDS system, which collects sewage from 15 communities comprising over 300,000 people. As program manager, responsibilities included leading the project team and subconsultants, developing the project scope and schedule, developing the program strategies, managing the technical tasks and coordinating with the 15 communities and the MDEQ. The project scope included detailed field investigations, modeling, analysis, development of alternatives, and development of the Long Term Corrective Action Plan.

Oakland Macomb Interceptor Drain Design (OMID), Oakland and Macomb Counties, MI – 2009-2012
Project Manager for OHM Advisors for the design of the upgrades to the OMID. Oakland County and Macomb County formed a Chapter 21 Drainage District to take over operation and maintenance of the OMID, which collected sewage from approximately 900,000 people in the two counties. The pipe was constructed with cast-in-place concrete using tunneling and is approximately 25 miles long and consists of pipe sizes from 48 to 144-inch in diameter and 20 to 120 feet deep. The interceptor has deteriorated in many sections, and several sink-holes have occurred along its length, necessitating several expensive emergency repairs. OHM Advisors scope included survey of approximately 35% of the interceptor, survey for easements documents, topographic mapping for two of the structures and design of the bypass pump station. The bypass pump station has a capacity of 90 cfs, is 85 feet deep and is built within a 65-foot diameter structure to house the station, gates and access shaft for equipment. The preliminary cost estimate for the station is approximately $6 million.

Professional Qualifications

Charles Humphriss, PE, CA | Project Engineer, Hydrology

Education

- Bachelor of Science in Civil and Environmental Engineering, University of Michigan, 2006
- Bachelor of Science in Fisheries and Wildlife, Michigan State University, 1998
- Field Methods in Fluvial Geomorphology, Wayne State University, 2009
- 38-Hour Army Corps of Engineers Wetland Delineation Training Program

Professional Registrations

- Professional Engineer, MI, 2011, #6201058033
- Certified Arborist, Certificate #MI-4055A

Experience

13 years, 7 with OHM Advisors

Background

Charles Humphriss is a water resources engineer in the Environmental & Water Resources Group. His interest in natural resources led him to focus on hydraulic and hydrologic systems analyses. Charles is involved with stormwater management improvement projects and sanitary sewer inflow and infiltration studies. He enjoys opportunities to perform hydraulic modeling, analysis of sewers and streams, wetland delineation, river assessment and restoration, and tree surveys.

Charles also holds a bachelor's degree in Fisheries and Wildlife, with an emphasis in Conservation and Environmental Management. As a grass roots community organizer, he led work to protect laws that keep our lakes, streams, and drinking water safe. Charles also worked as a scientist aboard several Alaskan fishing vessels to promote conservation of the fishery. His background in these and other water resources related issues add value to his career as a water resources engineer.

Charles is skilled in the following computer programs: HEC RAS, EPA SWMM, EPANET, FlowLink, ArcGIS, AutoCAD, and MATLAB.

Relevant Experience

Grosse Ile Township Sanitary Sewer Compliance Program, Grosse Ile Township, MI – Ongoing
Performed antecedent moisture hydrologic modeling for evaluation of design wet weather flows and development of alternatives based on MDEQ SSO Policy. Performed inflow and infiltration analyses. Reviewed flow meter and rain gauge data for quality control.

Clinton Oakland Sanitary Disposal System (COSDS), Monthly and Quarterly Reporting, Oakland County Water Resources Commissioner, MI – Ongoing
Performs quarterly mass flow balance for the COSDS. Helped develop the billing system in 2006. Performs hydraulic modeling and subsequent adjustment of incrementally-metered peak flows to ensure potential peak flow penalties are computed correctly. Performs dye test period break analyses, wet weather flow editing, inflow & infiltration analyses, as-needed billing system analyses, and presentation of quarterly billing results at COSDS Technical Committee Meetings.

Evergreen-Farmington Sanitary Disposal System (EFSDS), Quarterly Reporting, Oakland County Water Resources Commissioner, MI – Ongoing
Performs quarterly mass flow balance for the EFSDS. Helped develop the billing system in 2008. Performs dye test period break analyses, wet weather flow editing, inflow & infiltration analyses, as-needed billing system analyses, and presentation of quarterly billing results at EFSDS Technical Committee Meetings.

Relevant Experience Continued

Metropolitan Sewer District of Greater Cincinnati (MSDGC) Sanitary Sewer Flow Monitoring Standard Operating Procedures, MI – 2012
Prepared standard operating procedures for operations, maintenance, and analysis of over 300 sewer flow meters and rain gauges for MSDGC.

Malletts Creek Assessment and Restoration, Washtenaw County Water Resources Commissioner, Ann Arbor, MI – 2011
Performed creek assessment, sediment sampling / analysis, and helped design streambank stabilization, in-stream structures, and other restoration measures for approximately three miles of impaired reaches within Malletts Creek.

River Assessment and Restoration Projects – 2010
Field measurements were performed and engineering methods applied to calculate Bank Erosion Hazard Index and Near Bank Stress ratings used to estimate streambank erosion rates and to demonstrate the need for funding of several streambank stabilization projects:

- Great Lakes Restoration Initiative Grant Proposals
  - Bell Creek, Livonia, MI
  - Bishop and Ingersol Creeks, Novi, MI
- Huron River 2010 State Revolving Fund Project Plan
  - Millers Creek (four reaches), Ann Arbor, MI
  - Malletts Creek (seven reaches), Ann Arbor, MI
  - Traver Creek, Ann Arbor, MI

Rain Garden Design, Cities of Auburn Hills, MI and Westland, MI – 2010
Responsible for plant selection, site layout, quantity calculation, and cost estimates for several rain gardens for the City of Auburn Hills, MI and the City of Westland, MI.

Wetland Delineation and Tree Survey, Wayne County Airport Authority – 2009
Wetland delineation and tree survey for force main construction project.

Mass Flow Balance, Detroit Water and Sewerage Department, Detroit, MI – 2009
Developed Mass Flow Balance Tool (MFB) to analyze sanitary flows tributary to the Detroit Water and Sewerage Department (DWSD).

Flow Metering and Inflow & Infiltration Study, City of Westland, MI – 2008
Led field crews in sanitary sewer flow meter installations and data collection at 24 metering sites. Reviewed flow meter and rain gauge data for quality control. Performed antecedent moisture hydrologic modeling for inflow and infiltration evaluations.

Galloway Stormwater Management SRF Project Plan, Auburn Hills, MI – 2007
Performed HEC-RAS river hydraulic modeling of the Galloway Ditch. Engineer responsible for the evaluation of retrofit stormwater best management practices (BMPs) alternatives. Selected BMPs included a meandering stream, wetland construction, stream bank stabilization, and a vegetated buffer. Prepared State Revolving Fund (SRF) project plan to obtain funding for project.

Flow Metering and Inflow & Infiltration Study, Ypsilanti Communities Utility Authority (YCUA), Ypsilanti, MI – 2007
Supervised field crews in sanitary sewer flow meter installations and data collection. Reviewed flow meter and rain gauge data for quality control. Performed antecedent moisture hydrologic modeling and hydraulic modeling to evaluate the effectiveness of sewer rehabilitation, and to evaluate inflow and infiltration levels in other major parts of the system.

Professional Qualifications

Lindsey Kerkez | Project Engineer, Hydrology

Education

- Master of Science in Environmental Engineering, concentration in Environmental Fluid Mechanics and Hydrology, University of California, Berkeley, 2008
- Bachelor of Science in Agricultural and Biological Engineering, concentration in Soil and Water Resources Engineering, University of Florida, 2007

Professional Registrations

Engineer In Training, FL, 2007, #1100011672

Experience

6 years, 1 with OHM Advisors

Background

Lindsey Kerkez is a water resources engineer in the Environmental & Water Resources Group. Lindsey is involved with sanitary sewer inflow and infiltration studies. Her interest in natural resources led her to focus on hydrologic and climatological systems analyses. She enjoys opportunities to perform analysis of sewers and streams, river assessment and restoration, engaging the public to increase understanding of complex projects, and using computer programs to make processes more efficient.

Lindsey's background provides her with theoretical and practical tools necessary to operate and evaluate environmental models. She is proficient at presenting results and synthesizing information across a wide set of disciplines and to a broad spectrum of individuals. Her Bachelor's degree in Agricultural and Biological Engineering allowed her to have a greater understanding of interconnections in natural systems.

Lindsey is skilled in various computer programs, including H20MAP, ArcGIS, MATLAB, Global Climate Modeling, Linux Scripting and Visual Studio.

Relevant Experience

Ypsilanti Community Utilities Authority Meter-Based Billing System, Ypsilanti, MI – Ongoing
Performs quarterly mass flow balance of Ypsilanti Community Utilities Authority (YCUA) flows. Developing meter correlations used for wet weather sanitary sewer flow editing and engaging YCUA's contract customers on the transition to a flow based billing system. Also performs dye test period break analyses, wet weather flow editing, inflow and infiltration analyses, and presentation of quarterly billing results.

Ann Arbor Sanitary Sewer Wet Weather Evaluation Project, Ann Arbor, MI – 2014
Reviewed flow meter and rain gauge data for quality control. Performed antecedent moisture hydrologic modeling to evaluate the inflow and infiltration removal after a footing drain disconnection program. Performed regression analysis on results to ensure statistical significance. Aided in presentation of results to citizens.

Scio Township Water Reliability Study, Scio, MI – 2014
Managed hydrant flow testing for calibration of H20MAP model. Performed simulations of current and future flows for average conditions, peak conditions and fire flow.

Inflow & Infiltration Study, West Bloomfield Township, MI – 2008
Performed antecedent moisture hydrologic modeling to evaluate the inflow and infiltration removal after a sewer rehabilitation program. Performed regression analysis on results to ensure statistical significance.

Lindsey Kerkez | Project Engineer, Hydrology

Relevant Experience (with other firms)

Metronome Systems, Berkeley, CA – 2013
Manager at startup company providing ultra-low power wireless sensing solutions for environmental measurement applications. Handled day-to-day logistics to aid in development of a prototype wireless unit.

Accelerating Discovery in Science and Engineering through Petascale Simulations and Analysis, Berkeley, CA – 2012
Studied the effect of convective cloud processes on climate simulations. Perturbed sub-grid physics parameterizations and analyzed effects on mean climate and El Nino prediction. Project funded by the National Science Foundation.

Evolution of a compound channel: Tassajara Creek, Dublin, California – 2007
Conducted an evaluation of a river restoration project in suburban California. This included survey work, drawings of cross-sections and long profile, and evaluation of connection with the floodplain. Results were presented at the 5th Annual Berkeley River Restoration Symposium. This work is published in the California Water Resources Archive at UC Berkeley.

Sustainable Design and Implementation of a Solid Waste Management System in Kratovo, Macedonia, Gainesville, FL – 2007
Managed team of students, professors and professional engineers on two international assessment trips and the design of a comprehensive solid waste management plan. Maintained partnerships and collaborations with Peace Corp, USAID, Macedonian governmental and citizen groups. In charge of fundraising and managing over $50,000 as well as obtaining the Environmental Protection Agency P3 (People, Prosperity, Planet) Award Grant. This project was initiated and reviewed by Engineers Without Borders – USA.

Hydrology and Water Quality Laboratory, Gainesville, FL – 2007
Analyzed soil samples to quantify optimal river flow rate to prevent salt water intrusion in southern Florida rivers. Completed University Scholars Research Grant: Comparison of Inverse Calibration Methods in Hydrological Modeling from phosphorus mining runoff.

Professional Qualifications

Seth Swanson, PE | Project Engineer, Hydraulics

Education

- Master of Science in Agricultural & Biosystems Engineering, South Dakota State University, 2008
- Bachelor of Science in Civil & Environmental Engineering, South Dakota School of Mines & Technology, 2005

Professional Registrations

Professional Engineer, MI, 2013, #6201060067

Experience

5 years, <1 with OHM Advisors

Background

Seth Swanson is a water resources engineer in OHM Advisors' Environmental & Water Resources Group. His agricultural background led him to focus on the analysis and design of hydrologic and hydraulic systems. Seth is involved with modeling water systems and designing system components. He enjoys opportunities to be involved in many aspects of water system engineering to better understand the complexities involved in good design and operation.

Seth has worked in several states from the Upper Midwest to Appalachia. He grew up working on a farm in South Dakota and has since worked with rural systems in Iowa and Minnesota, and with coal companies in Pennsylvania and West Virginia. His work in different regions and industries has given him an appreciation for the often unseen variety of resources and services that people produce and offer to make life better for everyone.

Seth is skilled in various computer programs, including GIS and CADD software platforms.

Relevant Experience

Seth's most recent modeling and design experience was his involvement with the City of Novi water master plan as well as water storage tank and booster station design. Before joining OHM Advisors, he performed water resources work in Pennsylvania, Iowa and Minnesota.

EXPERIENCE

Introduction

The OHM Advisors team possesses a strong, regional experience with sanitary sewer capacity evaluation and modeling, as demonstrated by our project experience matrix. Included with our summary project experience matrix are select few write-ups detailing the specific tasks related to these projects and how, we believe, they match the requirements associated with this proposed study. We are also experienced in developing and costing pragmatic, reasonable alternatives for system improvements. Finally, our project team has developed regional expertise in what we referred to in the project experience matrix as continuous model calibration and validation. This expertise refers to not only hydrologic but also hydraulic calibration of sanitary sewer systems. For details, please refer to our proposed work plan.

Past Involvement with Similar Projects

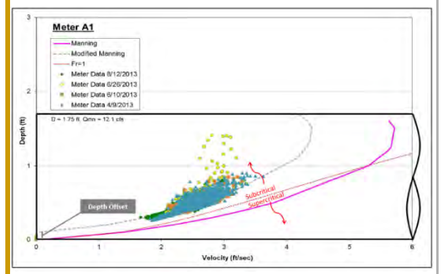
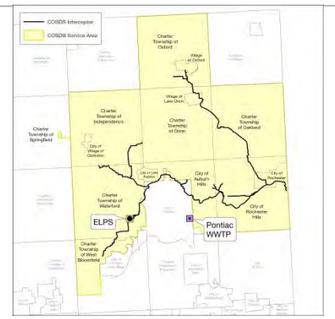
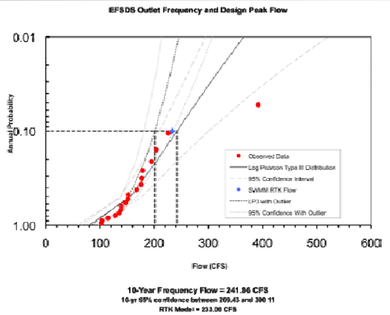
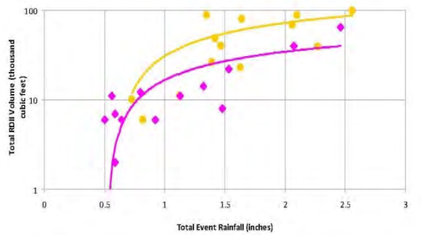
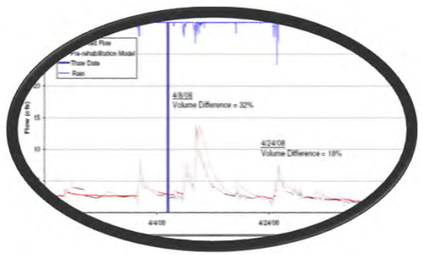
Project Experience Matrix

Minimum Requirements (based on the RFP)

Additional Qualifications (consultant supplement)

Project	Year Completed	Featured Projects (with project write-up)	1. Experience in Sanitary Sewer Overflow and Inflow/ Infiltration Studies	2. Experience in Sanitary Sewer Master Planning & Capacity Evaluations	3. Experience in Sewer Flow Monitoring and Data Gathering	4. Experience in Design of Sanitary Sewer Systems	5. Experience Utilizing SWMM Modeling Software	6. Experience in Applied GIS Applications and Databases	7. Additional: Continuous Model Calibration and Validation
1 - City of Ann Arbor Sanitary Sewer Wet Weather Evaluation Project	Ongoing	1	•	•	•	•	•	•	•
2 - Oakland County WRC - Clinton-Oakland Sewage Disposal System As-Needed Services	Ongoing	2	•	•	•	•	•	•	•
3 - Oakland County WRC - Evergreen-Farmington Sewage Disposal System As-Needed Services and Long Term Corrective Action Program	Ongoing	3	•	•	•	•	•	•	•
4 - Bloomington, IL Sanitary Sewer Master Plan	Ongoing		•	•	•		•	•	•
5 - Metropolitan Sewer District of Cincinnati, OH AS-Needed Modeling and Flow Metering Standard Operating Procedures	Ongoing		•		•		•	•	
6 - Grosse Ile Township Sanitary Sewer Evaluation	Ongoing		•	•			•		•
7 - Oakland County WRC Inflow & Infiltration Removal Evalation for West Bloomfield, Waterford and Auburn Hills	2012	4	•		•		•		•
8 - City of Livonia Sanitary Sewer System Evaluation (SSES)	2012		•		•	•			
9 - City of Dearborn Combined Sanitary & Storm Sewer System Investigation	2012		•		•	•		•	
10 - Rockford, IL Hydrologic/Hydraulic Analysis	2011		•	•		•	•		•
11 - Western Townships Utilities Authority (WTUA) Sanitary Sewer Antecedent Moisture Model	2011		•		•				•
12 - Marion, IN CSO Long Term Control Plan Update	2010			•	•		•		•
13 - Heart of the Valley, WI (Kaukauna, Kimberly, Darboy, Combined Locks, Little Chute) - Inflow & Infiltration Removal Evaluation	2009	5	•		•		•		•
14 - City of Columbus, OH Pilot Inflow & Infiltration Removal Evaluation	2009		•		•				•
15 - Galesburg, IL Sanitary Sewer Modeling Study	2009		•	•			•		•
16 - Ypsilanti Community Utilities Authority (YCUA) Paint Creek Rehabilitation Evaluation	2008		•		•		•		•
17 - Ypsilanti Community Utilities Authority (YCUA) Sewer Master Plan and Sanitary Sewer Evaluation Study (SSES)	2008		•	•	•	•	•	•	•
18 - City of Novi CMOM Program Development	2008		•	•	•	•	•	•	•
19 - Wayne County NHV/RV Interceptor Model and Sanitary Sewer Evaluation Study (SSES)	2008		•	•	•	•	•	•	•
20 - Owosso Sanitary Sewer Evaluation	2008		•	•	•		•	•	•
21 - City of Westland Flow Metering and Inflow & Infiltration Evaluation	2008		•		•	•			•
22 - City of Auburn Hills Sanitary Master Plan	2008		•	•	•	•	•	•	•
23 - Orion Township Sanitary Master Plan	2008		•	•	•	•	•	•	•
24 - Fishers, IN Sanitary Sewer Evaluation	2008		•						•
25 - Perioa, IL Long Term Control Plan Modeling	2008			•					•
26 - Scio Township Sanitary Master Plan	2007		•	•	•	•	•	•	•
27 - Huron Township Sanitary Master Plan	2007		•	•	•	•	•	•	
28 - Hinsdale, IL Combined Sewer Overflow and Stormwater Planning Study	2007			•	•	•	•		•
29 - Dexter Sanitary Sewer Model and Equalization Basin	2007		•	•	•	•	•	•	•
30 - Westland Pilot Footing Drain Disconnection	2007		•		•	•			
31 - City of Romulus Footing Drain Disconnection	2007		•		•	•			
32 - Auburn Hills - Bloomfield Orchards Footing Drain Disconnection	2006		•		•	•			
33 - Farmington Footing Drain Disconnection	2006		•		•	•			

PAST INVOLVEMENT WITH SIMILAR PROJECTS

	1. Sanitary Sewer Wet Weather Evaluation Project Ann Arbor, MI	2. Clinton-Oakland Sewage Disposal System As Needed Services Oakland County, MI	3. Evergreen-Farmington Sewage Disposal System As Needed Services, Oakland County, MI	4. Inflow & Infiltration Removal Evaluation Oakland County, MI	5. Inflow & Infiltration Removal Evaluation Sheboygan, WI
PROJECT NAME:					
CLIENT NAME:	City of Ann Arbor	Oakland County Water Resources Commissioner	Oakland County Water Resources Commissioner	Oakland County Water Resources Commissioner	Heart of the Valley Metropolitan Sewerage District (HOVMSD)
CLIENT TELEPHONE:	734-794-6411	248-858-1069	248-858-1069	248-858-1069	920-208-0296
CONTACT PERSON:	Nick Hutchinson – Engineering Manager 301 E. Huron Street Ann Arbor, MI 48107	Tim Prince – Chief Engineer One Public Works Drive, Waterford, MI 48328	Tim Prince – Chief Engineer One Public Works Drive, Waterford, MI 48328	Tim Prince – Chief Engineer One Public Works Drive, Waterford, MI 48328	Tammy Kuehlmann – Donohue Assoc. 731 N. Jackson Street, Milwaukee, WI 53202
DESCRIPTION:	The City of Ann Arbor has removed significant amount of footing drains from its sanitary sewer system. The City initiated a wet weather evaluation program aimed at **1- Hydrologic Evaluation**: utilizing nearly 30 temporary meters in order to evaluate dry and wet weather flows **2 – Modeling and Capacity Assessment**: A calibration as well as assessment of the sanitary sewer system for capacity deficiencies **3 – Alternatives Evaluation:** Evaluation of alternatives for moving forward in a manner, which reduces the risk of basement backups as well as SSOs	The Oakland County Water Resources Commissioner (WRC) owns and operates the Clinton Oakland Sewage Disposal System (COSDS), which collected sewage from over 300,000 people in eleven communities in Oakland County, Michigan. OHM Advisors has performed extensive metering, modeling and analysis for WRC on this system as outlined below: **1- Master Planning**: identify improvement needs and overcome system bottlenecks. **2 – Flow Investigation**: wet weather inflow source field (CCTV, smoke testing) and analytical investigation. **3 – Alternatives Evaluation:** hydraulic alternatives, cost estimates, construction recommendations.	The EFSDS is a regional system that collects sewage from over 300,000 people within 15 communities in southern Oakland County. OHM Advisors has been assisting OCWRC to develop a Long Term Corrective Action Plan (LTCAP). The LTCAP includes an extensive flow metering and modeling investigation of the system to identify required upgrades. Select specific tasks include the following: **1 – Master Plan Model**: the Master Plan involved the development of a detailed hydraulic model of the system, future population and flow projections and a system capacity assessment. Model included continuous, antecedent moisture modeling **2 – Hydraulic Discrepancy**: Mismatches between model and field observations were discovered and action plans identified to address problems.	Evaluated the impact of I/I source removal for several communities tributary to the Clinton-Oakland Sewage Disposal System (COSDS). Approximately 6 years of flow meter data, spanning a period before and after system rehabilitation, were used to quantify the impacts of sewer and manhole rehabilitation efforts. A separate scatterplot and antecedent moisture modeling analysis for a sewer district in Auburn Hills revealed a significant reduction in wet weather response resulting from a 530-home footing drain disconnection program.	The Heart of the Valley Metropolitan Sewerage District (HOVMSD) owns and operates a sanitary collection system within a 20.3 square mile area located in Outagamie County, Wisconsin, which serves approximately 47,500 residents within 5 municipalities. Donohue and Associates retained OHM on behalf of the HOVMSD to perform an analysis of the system flows and the effectiveness of the sanitary sewer rehabilitation that took place from 2004 to present. This was done by preparing a pre-rehabilitation antecedent moisture model based on the 2004 to 2006 metering data for each community tributary to the HOVMSD system and comparing the pre-rehabilitation model to the post-rehabilitation data that was collected from 2007 to 2009.
START WORK DATE:	2013	2007	2008	2011	2008
ORIGINAL PROJECT BUDGET:	$950,000	$1,000,000	$980,000	$40,000	$65,000
FINAL PROJECT BUDGET:	$998,000	$1,000,000	$980,000	$40,000	$65,000
ORIGINAL COMPLETION DATE:	Ongoing	Ongoing	Ongoing	2012	2009
FINAL COMPLETION DATE:	Ongoing	Ongoing	Ongoing	2012	2009
IF PROJECT BUDGET OR TIME WAS INCREASED, PLEASE EXPLAIN:	Final project budget was increased because City requested additional flow metering & community engagement	N/A	N/A	N/A	N/A
FIRM(S) WHO PERFORMED WORK ON PROJECT:	OHM Advisors, FIYF, PI	OHM Advisors	OHM Advisors	OHM Advisors	OHM Advisors
KEY ISSUES RELATED TO RFP:					
LEGEND: REFER TO THE PROJECT EXPERIENCE MATRIX FOR KEY ISSUES CRITERIA Min. RFP Req.'s Additional Qual.'s					

Project Understanding

In 2005, the City of Novi completed the first phase of its Capacity, Management, Operation, and Maintenance (CMOM) program. Since then, the City completed additional phases, including but not limited to the following:

- 2005 – 2007: performing sewer system evaluation surveys in high priority areas
- 2007 – 2008: implementation of rehabilitation in pilot areas
- 2008 – current: managing and improving system performance on different sub-areas

Concurrent to CMOM implementation, many of the planned developments within the City were built out and are now contributing additional flows to the sanitary collection system. In addition, the City experienced recession along with the rest of the nation as well as a follow up uptick in growth. It is because of these reasons that the City desires to update the capacity analysis of its sanitary collection system tributary to the Huron Rouge Sewage Disposal System (HRSDS).

The key objectives of the capacity analysis include:

1. An evaluation of existing and future system flows for the portion of the system tributary to the HRSDS, including:
   a. An assessment of existing flows based on flow metering data
   b. An estimate of dry weather flows based on anticipated growth, and an
   c. Evaluation of design wet weather flows based on MDEQ SSO policy.
2. A hydraulic evaluation of the performance of the system for existing and future flow conditions for the portion of the system tributary to HRSDS.

As identified in the request for proposal, an important aspect of a capacity study such as requested in this proposed work, is the

- Proper, reasonable and defensible identification of the wet weather flow components of the flows captured through flow meters, as well as the
- Reasonable process of converting these flow components into a design event based representative hydrograph for alternative evaluation (a continuous, as opposed to an event modeling approach).

In the Southeast Michigan region, OHM Advisors has pioneered the use of frequency based design event modeling, which has been accepted by the MDEQ as a valid approach consistent with their SSO policy. We propose to utilize this process to identify flow components as well as identify design event peak flow rates and design hydrographs.

Our team is very familiar with the City sewer system as many of the key staff involved in this proposed work also worked with the City in implementing its CMOM project phases. Therefore, our proposed work plan makes extensive use of the already developed engineering work on the City system and meshes well with the City's resources. We offer the following approach and scope to accomplish the goals of this proposal.

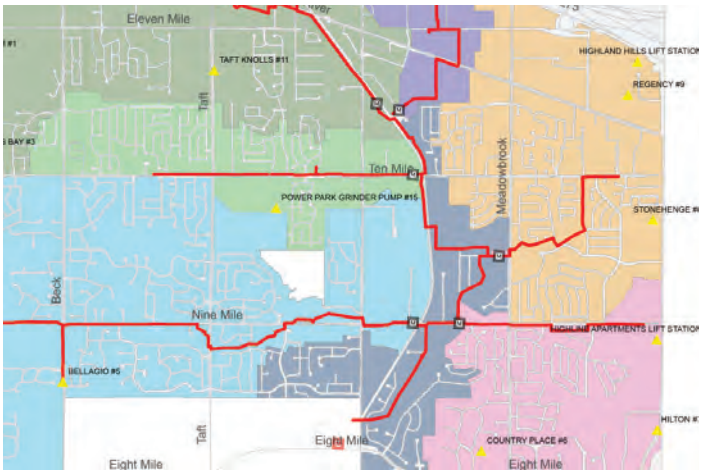
Proposed Approach

The proposed work plan is sub-divided into tasks as identified in the request for proposal.

Task 1 – Provide Assistance in System Flow Monitoring

It is our understanding that the City has deployed six temporary flow meters throughout the City at major inputs to the interceptor system. As per the request for proposal, we provided a lump sum allowance of $10,000 to provide assistance for the City in maintaining the flow meters. Our company has expertise in the areas of

- Meter maintenance,
- Site reconnaissance,
- Meter re-installation,
- Meter calibration,



Existing Meter Locations

- Meter data quality evaluation,
- Pump station meter data evaluation,
- Rain gage equipment maintenance, data evaluation, and installation

We also have good working relationships with several meter vendors we would be able to sub-contract in case specific needed assistance exceeds our expertise levels.

Task 2 – Dry Weather Flow Evaluation

The dry weather flow evaluation will include an analysis of existing, planned, not fully occupied, and future base flows for the areas tributary to the HRSDS. An analysis of existing dry weather flows will include the Wayne County outlet meter, six system branch meters, and seven pump stations. Specific tasks include:

- **Determine existing system base flows.** Existing base flows will be quantified through analysis of diurnal sewage flow signals from flow metering data collected during the 2014 monitoring period. Pump station data for dry weather conditions will be used to estimate daily average sanitary sewer flows for the tributary area.
- **Compare flows to prior monitoring data.** Flow data collected during the 2014 monitoring period will be compared to prior monitoring data to evaluate changes and verify flow consistency between metering periods.
- **Provide a Mass Flow Balance.** Continuity checks and per capita flows will be evaluated to verify that the meter data is reasonable.
- **Perform an REU analysis of planned and future development.** Anticipated future growth will be estimated as follows:
  1. Developments that were in the planning stages during the 2005 study will be evaluated to determine the current level of completion/utilization (percent occupied) using information provided by the City. Flows for fully occupied developments will be assumed to be contained in the flow metering data. For partially occupied developments, the un-occupied percent will be converted to anticipated future flow.
  2. Developments that are currently in the planning stages will be evaluated using approved site plans provided by the City.
  3. Future developments in vacant land areas will be evaluated using densities listed in the 2005 Study for vacant parcels.
- **Compute additional base flows for anticipated growth.** Results of the REU analysis will be used in conjunction with SEMCOG people per household estimates and existing per capita flow rates to compute additional base flows for planned and future development.

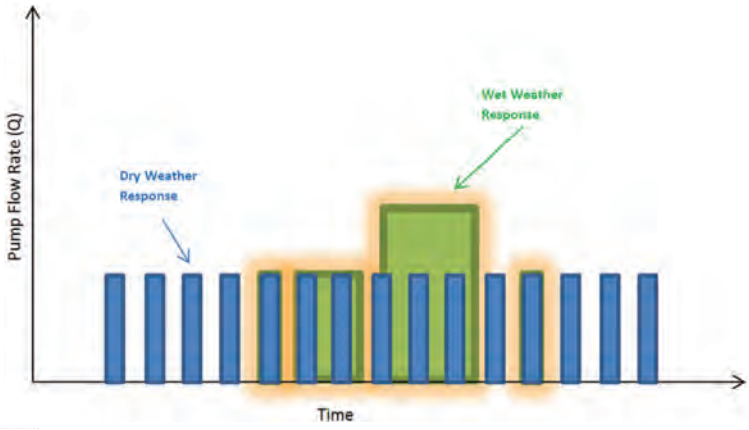
As part of this task, we assume that the City GIS will contain vacant parcels, type of development anticipated at these vacant parcels, planned development REUs, percent occupation in areas where full occupation does not exist, areas that are currently under construction, and population in meter district areas based on 2010 census data (if the City possesses this information).

Task 3 – Wet Weather Flow Evaluation

We understand that an accurate representation of the system I/I is needed to perform a worthwhile capacity analysis. The analysis of wet weather flows will include the Wayne County outlet meter, six system branch meters, and seven pump stations. Specific tasks include:

Perform I/I analysis of system flows. This task is sub-divided into two sections:

- **Flow meter data analysis:** Areas with relatively high I/I flow rates will be identified by computing wet weather peaking factors, capture coefficients (percent of rainfall over meter district captured in sewer), and per capita flow rates by sub-district for each significant storm event during the 2014 monitoring period. EPA benchmarks for excessive dry weather infiltration and excessive wet weather inflow will also be evaluated to identify sub-districts where I/I source removal would likely be cost-effective.
- **Pump station data analysis:** It is our understanding that the City can provide pump station flow data



digitally (i.e. pump flow rate versus time). We propose to calculate capture coefficients for each of the pump stations by subtracting dry weather pumping response from the wet weather pumping response, which will result in wet weather rain dependent inflow / infiltration (RDII) volume. Knowing the tributary area as well as storm event, a capture coefficient can be calculated for the storm events. This approach will not only provide a sense for the wet weather response of the pumping stations but also allow for the ranking of the station responses based on RDII response for future CMOM activity planning purposes.

Perform analysis of rainfall for suitability in use for hydrologic modeling. It is our understanding that currently, there is only one rain gage in the City. Spatial uniformity of rain is important in modeling hydrologic system response to storm events. It has been our experience that uniform rain event calibration, particularly for the outlet meter, which collects a large area of the City, will produce a more reliable hydrologic model for long term simulations. Therefore, as part of our proposal, we propose that the City utilize a temporary rain gage for the duration of the monitoring period. The OHM team proposes to discuss the rental of this gage with the City under Task 1 and the allocated fixed budget for monitoring purposes. The remainder of the proposal is based on the assumption that a second, temporary rain gage will be utilized.

Rain events will be qualified for modeling purposes based on spatial uniformity, amount of rainfall, and ground condition (thawed/frozen). Rainfall data will be analyzed to identify spatially-uniform storm events because the accuracy of the hydrologic model is directly related to the uniformity of rainfall over the drainage area. Flow versus rain will be reviewed to determine the minimum rainfall depth that produces a significant system response and smaller storms will be excluded for modeling purposes. Storms that fall on frozen ground will be excluded because frozen ground is inconsistent with normal design conditions.

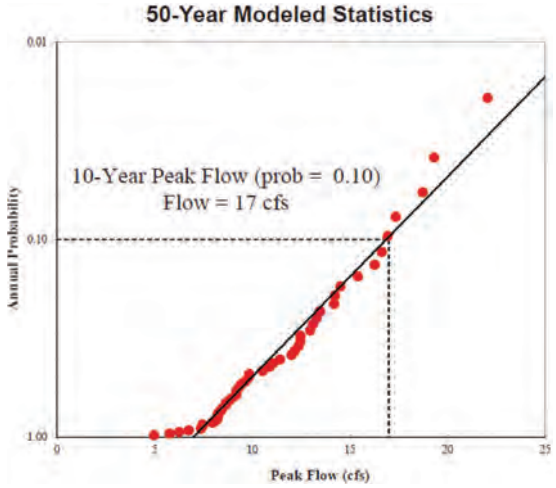
Hydrologic model development. The analysis for developing the hydrologic model for the flow meters will utilize the H20metrics - Antecedent Moisture Model (AMM). The unique strength of this model is that it can take precipitation as well as temperature variability (to account for seasonal changes) in aggregate and generate a flow response that uniquely matches the response of a sewer system as recorded by flow meters. The following bullets summarize the hydrologic model development process for the flow meter data:

- Develop a parent model for the entire sewer system using data from the Wayne County outlet meter (BG-1) and rain gage data.
- Develop six sub-district models corresponding to the location of existing City-operated flow meters within the six sub-areas of the sewershed.
- Calibrate the model for the selected data and validate model parameters by using flow, rain and temperature data not used for calibration.
- Quantify model performance with accuracy of fit analysis.
- Conduct a continuous, 60-year analysis using rain gage and temperature data from Detroit City Airport – the purpose of this analysis is to expose the hydrologic model to rain patterns typically seen in this area and evaluate the risk of peak flow rates that the City system may be encountering, which is described in the next bullet.
- Perform a frequency analysis based on the continuous 60-year simulation and use the results to develop design peak flows for use in the capacity assessment.
- Distribute system flows to model based on tributary drainage area, house count, or City's sense of flow split. Verify the flow split with the sub-district flow data and models.

With regard to pump station data, we propose the following modeling approach:

- Develop a scatter plot between total rain volume vs RDII volume response
- Develop a statistically most representative curve representing this data (utilizing regression coefficients as a guide)
- Determine the projected RDII volume for a 25 year, 24-hour storm volume
- Based on flow meter response characteristics of the meter districts that the pump stations are tributary to, assume that a similar hydrograph shape response is applicable so that a peak design event flow rate can be estimated and compared against pump station capacity. A more detailed analysis of the peak design event flow response of the tributary areas upstream of the pumping stations could be performed using pump station head-discharge curves, pump well volumes, on-off, times etc. under a separate study, if the City deems such an analysis necessary for some of the pumping stations.

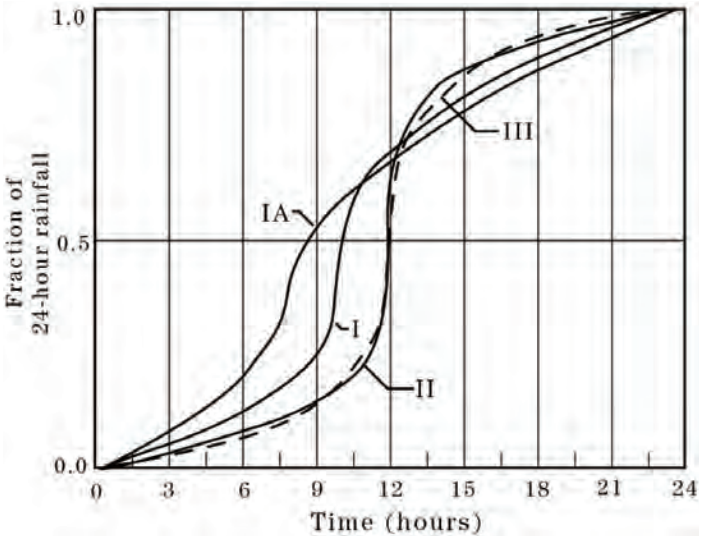
Evaluate peak design flows consistent with MDEQ SSO policy. The most robust means by which system hydraulic capacity deficiencies can be evaluated involves continuous modeling simulation that includes a design hydrograph at each of the metered locations (i.e. a continuous, dynamic simulation model as opposed to a steady state, point flow input simulation model). Therefore, we propose do develop design event hydrographs for each of the meter locations we perform hydrology evaluations for.



Example Peak Flow Frequency Plot

In the Southeast Michigan region, OHM Advisors pioneered the use of frequency-based design event modeling, which has been accepted by the MDEQ as a valid approach consistent with their SSO policy. We propose to utilize this process to identify the 10-year frequency design flow rate at the system outlet and convert the 10-year flow rate into multiple design event hydrograph scenarios for consideration during the development of alternatives. Multiple design hydrograph scenarios will be generated by using multiple hydrograph development methodologies that are consistent with MDEQ SSO policy, as described below. We propose to use multiple methods to verify that each method produces a similar result and then select the most appropriate design scenario for alternative evaluation purposes.Throughout the design hydrograph development process, we plan to continuously solicit City staff input, particularly in the context of frequency of occurrence type risk level protection and the City's comfort level with this risk. In general terms, below are a set of techniques that our team is familiar with regarding the development of design event hydrographs:

1. **Design storms for design hydrograph development:** This approach presumes the existence of an appropriate rain distribution for defining the design system hydrograph response. The SCS Type II rain distribution (applicable for the State of Michigan and accepted by the MDEQ) will be utilized as part of this approach. We propose to run the 25-year, 24-hour design rainfall under growth conditions through the calibrated AMM, which will result in a first-cut growth design hydrograph and a first-cut dormant design hydrograph. In each case, antecedent moisture conditions will be adjusted by adjusting the number of dry days between the last observed rainfall and the design storm until the peak of the resulting hydrograph matches the 10-year frequency design peak flow rate identified at the meter. This methodology will be used for the system outlet meter as well as the six branch meters.



Example of SCS Type II Rainfall Distribution

2. **QDF model for design hydrograph development:** OHM Advisors developed this innovative approach, which we refer to as the Flow Rate (Q) – Duration – Frequency (QDF) model. As part of this approach, we utilize the hydrologic model response to several decades of rain data that we used as part of developing peak flow frequency distribution. This hydrologic model data will consist of a multitude of hydrographs of varying durations, volumes, and peak flow rate responses. The QDF model allows for the statistical analysis of this data in order to determine the statistically significant correlation between peak flow rate, volume, and duration. We propose to use this approach as an extra check at the system outlet for comparison to the design hydrographs generated from the design storm approach described above. This extra check is expected to give

the City a higher level of confidence in the system outlet design hydrograph, which is critical for contract capacity negotiations and potential infrastructure improvements.

3. Please refer to the earlier write up on estimating design event peak flow responses for calculating design event peak flow rates for areas tributary to the pumping stations

Compare peak design flow to existing contract capacity. Evaluate how the current peak design flow rate compares with the existing contract outlet capacity to the North Huron Valley Rouge Valley (NHV/RV) System.

Prepare technical memorandum. Prepare flow evaluation technical memorandum that summarizes the key findings from the dry weather and wet weather flow analyses.

Deliver hydrologic model digital files. The City has existing access to Matlab and H20metrics software, which are needed to run the model, so digital delivery of the hydrologic model will allow the City to use the model as a diagnostic tool to evaluate system performance going forward.

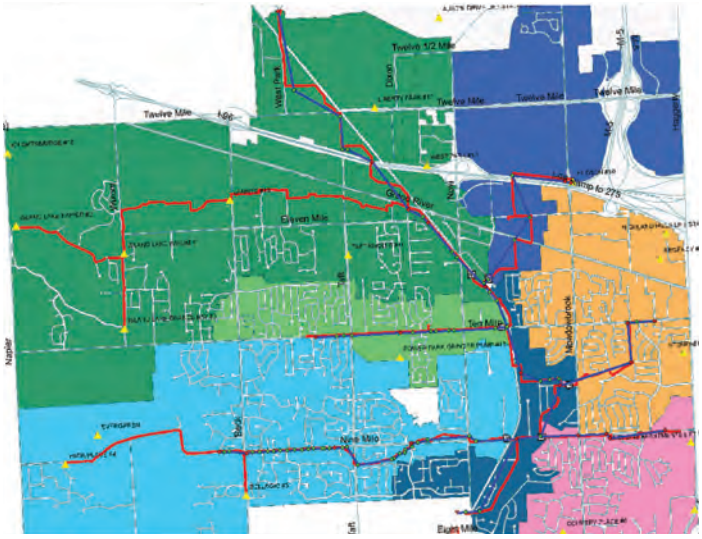
Task 4 – Hydraulic Model Calibration and Capacity Analysis

It is our understanding that the current model is in the EPA SWMM platform. We propose to continue using this modeling platform for this task.

4a – Model Infrastructure Update

As part of this task, we propose to extend the bounds of the existing model to include interceptor that was shown in the request for proposal. We overlaid the existing model with the proposed extension (map provided in the original request for proposal) and have identified approximately 8 miles of additional sewer extension needs, most of which are in the ELWH district (north of 8 Mile Road, southwest of Grand River Road (see figure).

As part of this task, we also propose to make the necessary conveyance system upgrades (which we assume to consist primarily of either parallel interceptor upgrades with no complicated diversion structures or sewer segment enlargements or lining) along the above-outlined existing and proposed model extent.



Proposed Extension (Shown in Red Lines) and Existing Model (Shown in Dark Blue Lines)

For this task, we assume that the City does have a comprehensive GIS database, which includes pertinent information to accomplish this task (e.g. interceptor diameter, length, upstream and downstream inverts, either depth from invert of pipe to the ground surface or ground surface elevation, conveyance system improvement locations, etc.). We also assume that the City will be able to readily provide as-built information on any diversion structures associated with conveyance system improvements, as needed.

4-b – Hydraulic Model Calibration and Validation

Once the system model parameters (such as diameters, inverts, lengths, ground cover, structures, etc.) are updated, the model can be used for calibration purposes. Our team will approach calibration through the process we term Null Modeling, utilizing one event for calibration and one for validation, depending on the number and scale of the events that will be captured during the flow metering period. Null modeling means that our hydraulic calibration process involves the use meter flow and depth data as opposed to a flow data that the model calculates based on prescribed sewershed parameters in the numerical model. The benefit of this approach is that any discrepancy between the modeled and observed sewer depth for a defined flow rate is only due to system hydraulic parameters and not hydrologic parameters. If the City has meter data in areas other than shown in the map included in the original request for proposal, our team plans to utilize this information in order to assess model performance in these areas through the use of what is referred to as the scatter plot process. In other words, we propose to plot the available meter data against model performance for the design event and note any discrepancy.

Throughout the model calibration and validation process, discrepancies that cannot be accounted for by simple and reasonable model parameter adjustments (e.g. Manning losses or minor loss coefficient adjustments) will be identified as hydraulic discrepancy areas. More specific evaluation would likely be required as a separate study.

4-c – Update Base Flow Allocation

This task involves updating existing base flow allocation (based on meter data results) and future base flow allocation (based on flow projections) as identified as part of Task 2.

4-d – Update Peak Design Flows

The purpose of this task is to distribute design peak flow rates identified in Task 3 in the City hydraulic model. This distribution is proposed to be made such that the model predicted peak flow rates match the peak flow rates at the temporary meter locations identified and analyzed as part of Task 3.

4-e – Evaluation of System Hydraulic Performance

This task consists of simulating the existing model for design peak flow conditions in order to identify system hydraulic deficiencies. A deficiency is proposed to be identified as a hydraulic capacity limitation resulting in sewer surcharging, unless this surcharging is in an area the City deems is acceptable.

Simulation Routing Model

It is our understanding that the existing hydraulic model is a steady state model, which not only utilizes a constant input flow rate but also performs the hydraulic simulation with the "steady state" hydraulic routing model in SWMM. We firstly propose that the routing option be changed to "dynamic" routing model. The reason for this approach is that under the proposed routing model, the model can better account for gradually varied and backflow flow profiles (for alternative evaluation purposes) and would also be more stable during surcharge conditions.

4-f – Maps and Hydraulic Grade Line Profiles

This task involves the displaying of pertinent hydraulic simulation information. We propose to use two approaches:

1. *Use of capacity maps:*
   A capacity map color codes the remaining capacity in the sanitary sewer district for each sanitary sewer that is modeled. For example, a depth ratio capacity map would calculate the peak depth in the sanitary sewer in relation to the diameter of the sewer. Any ratio greater than or equal to one would suggest that the pipe is under-sized because the depth in the sewer reached the diameter of the sewer pipe for a certain design event.

Example Hydraulic Capacity Map

2. *Use of cross-sectional profiles:*
   We also propose to provide cross sectional profiles for stretches of the system that are identified as having deficiencies. Below is a cross sectional profile taken from the existing City of Novi SWMM model.

4-g – Technical Memorandum

The purpose of this task is to summarize the findings of Task 4.

Task 5 Evaluation of Alternatives

Capacity issues can be categorized as follows:

a. Downstream capacity issues for the HRSDS (insufficient outlet capacity), and
b. Limitations within the Novi trunk sewer system.

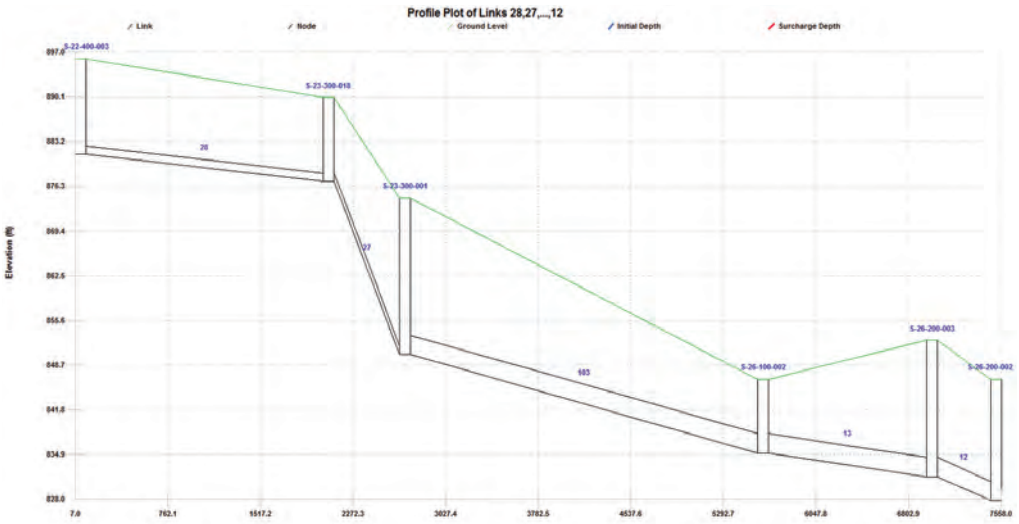
The approach for each category will be somewhat different, so they are described separately.

Outlet Capacity

Once the required outlet capacity is estimated, there are several options for addressing the additional capacity need.

The simplest and most likely approach is to obtain additional capacity. A large amount of work has been done previously to consider purchase of additional outlet capacity from WTUA. Wayne County, the owner and operator of the HRSDS, has indicated that additional capacity may be available due to an increase in the proposed new contract

with DWSD. There is a benefit to the system of using the additional capacity for base flow, rather than just peak wet weather flow. The interceptor system piping has some constraints, which will limit the amount of additional capacity that can be purchased. A hydraulic capacity analysis was performed to estimate the available capacity. Wayne County will be initiating the Long Term Corrective Action Plan (LTCAP) Study within the next few months, but final results will not be available until next year.



Example SWMM Profile Plot

The second option is to construct an equalization basin to reduce the peak flow downstream. This is likely to be a more costly and disruptive option. However, it is prudent to have at least one other option considered.

A third option is to consider work to further reduce wet weather flows. Considering that the City has already performed work to implement this option, further reduction may be impractical.

Specific tasks:

5a1. Identify the additional outlet capacity required. Compare the required capacity to the preliminary allocations identified by Wayne County and the prior discussions with WTUA to determine if acquisition of the additional outlet capacity is feasible.

5a2. Compare the required outlet capacity to the available interceptor capacity based on the prior modelling study performed as part of the WTUA negotiations.

5a3. Conduct a meeting with Wayne County and a meeting with WTUA to (a) identify the desired outlet capacity and (b) determine if sufficient capacity is likely to be available. If capacity is expected to be available, obtain whatever information is available to estimate the cost of the additional capacity.

5a4. Estimate the required storage volume for an equalization basin to reduce flows to available outlet capacity. Develop initial concepts for design of the storage facility (either tank or linear storage). Develop preliminary cost estimate for this alternative.

Trunk System Capacity

Based on the prior work, it is expected that constraints in the existing trunk sewer system will be addressed by providing additional conveyance capacity. An evaluation will be performed to identify an appropriate approach for providing the capacity. The information will be sufficient for identifying items for a capital improvement program.

Specific tasks:

5b1. Evaluate the existing system to determine suitable approaches for providing additional conveyance capacity. Factors to be considered in developing a suitable approach will include, but are not limited to capital cost, life cycle cost, ease of construction, construction impacts on neighboring areas, and implementation concerns. We expect that meaningful consideration of these factors will not involve detailed investigations.

5b2. Develop conceptual design for needed system improvements. Generally, it is expected to consist of simple sketches with initial quantification of infrastructure.

5b3. A cost estimate will be developed. An implementation schedule will also be developed based on the expected timing of the development that is creating the need for the improvements.

Report:

5c. A report will be prepared based on the investigations completed. An executive summary memorandum will document the key findings and recommendations. Technical memoranda that provide the results of the flow analysis and the capacity analysis will also be provided. The documents will be integrated together such that the complete document provides a cohesive understanding of the information and a logical progression to the recommendations.

Task		Role on Project:	Murat Ulasir, PE	Robert Czachorski, PE	Charles Humphriss, PE	Seth Swanson, PE	Lindsey Kerkez	Vyto Kaunelis, PE	Derek Klenke		
			Project Manager	Project Engineer	Project Engineer	Project Engineer	Project Engineer	QA/QC	Project Engineer	Hours per Task:	Estimated Cost per Task:
		Hourly Rate:	$150	$165	$124	$108	$103	$175	$103		
1	Provide Assistance in System Flow Monitoring		1	1	12	0	38	0	43.1359	95.1359	$10,160
2	Dry Weather Flow Evaluation		6	3	12	0	73	0	0	94	$10,402
3	Wet Weather Flow Evaluation		12	5	81	0	110	2	0	210	$24,349
4	Hydraulic Model Calibration and Capacity Analysis		15	1	4	156	0	2	0	178	$20,109
5	Evaluation of Alternatives		32	6	10	52	0	22	0	122	$16,496
TOTAL		Hours per Person:	66	16	119	208	221	26	43.1359	699.136	$81,516

H20metrics Antecedent Moisture Model Licensing Fee for 7 Meters: $16,000

Total Project Effort: $97,516