PROPOSAL FOR

CORE AREA INFRASTRUCTURE MASTER PLAN

CITY OF WEST FARGO, ND

AE2S

Think Big. Go Beyond.

12.22.2017

www.ae2s.com

December 21, 2017

Chris Brungardt
Public Works Director
City of West Fargo
810 12th Ave NW
West Fargo, ND 58078

RE: Revitalizing West Fargo's Core Area

Dear Chris:
The City of West Fargo is in an exciting position with the opportunity to plan and prioritize your Core Area utilities for the future through master planning. This opportunity also brings with it a great responsibility of ensuring the dollars being expended on these utilities are being used in the most efficient and prudent manner. Having a trusted advisor in your corner who has helped many area municipalities with the master planning process and can help you navigate the financial and asset management aspects of this project is critical for project success. AE2S is excited to assist you with this endeavor and will provide the following:

Unmatched Master Planning Expertise Efficiently Delivers the Best Plan. Master planning is essential for ensuring the continued success of a growing, thriving community like West Fargo. It's equally important for the continued success and redevelopment of areas such as the Core Area, which served as the community foundation upon which the City grew for many years, to ensure these areas provide the same benefits as the newer areas that have been recently developed within the City. We've completed utility master plans for Fargo, Grand Forks, Williston, Bismarck, and Watford City – just to name a few. Not only will this experience help us develop the best plan to position you for the future, but will help us to do so efficiently. A critical component of Master Planning is modeling your utilities. We have previously completed hydraulic modeling of your water distribution system for your connection to Fargo. Additionally, we have highly skilled modeling professionals for stormwater and wastewater modeling. Another key consideration is understanding where underground utilities rehabilitation in lieu of total street and utilities replacement will save you money. Planning together as a team, we will deliver a master plan that sets the best course for the City going forward.

Powerful Decision Analysis Tool Helps You Maximize Existing Assets and Prioritize Improvements. Wouldn't it be great to have confidence knowing you are making the right decisions? We can provide you with a powerful tool that will help you make the decisions that will allow you to maximize your existing assets and advantageously prioritize improvements. This tool will help establish prioritization corridors for the City for a wide variety of improvements that may range from "cost-effective" trenchless technology improvements to "high-dollar" full street and underground utilities replacement and provide you with documentation justifying why you made the decisions you did. We can tailor this tool to make use of the institutional knowledge that your staff has of the Core Area utilities along with data the City has collected from their inspection forms, videos, Cartegraph, and GIS. We used this tool for the City of Fargo for a comprehensive assessment of its sanitary sewer lift stations, which resulted in a risk based, prioritized list of the lift stations that can be utilized for efficient planning and budgeting of future improvements.

Advanced Engineering and Environmental Services, Inc.
4170 28th Avenue South • Fargo, ND 58104 • 701-364-9111

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Specialty Services Create Efficiency and Result in an Effective Master Plan. For a master plan to be truly effective, it needs to be implemented and the resulting projects need to be funded. We will coordinate our work with Cartegraph to ensure the data collection and entry processes for this project work seamlessly with the City's data management structure, and to maximize the usefulness of your GIS. Additionally, AE2S Nexus will help develop the optimal funding options so that projects move from idea to reality.

We look forward to the opportunity to discuss our approach and ideas with you. Please contact me at 701-364-9111, 701-866-0620 (cell), or Brian.Bergantine@ae2s.com with any questions you may have.

In The Spirit of Service,

AE2S

Brian R. Bergantine, PE
Operations Manager

EXECUTIVE SUMMARY

REVITALIZING WEST FARGO'S CORE AREA

POWERFUL DECISION ANALYSIS TOOL

Creating the right plan for your utilities' future will require simultaneously working through multiple variables for the future (use of existing infrastructure, rate and location of redevelopment, and more). AE2S brings a decision-support analysis tool which provides a simple framework that:

- Enables open collaboration among staff in a workshop setting
- Establishes ranking criteria for prioritizing improvements
- Provides a transparent approach
- Documents the basis for decisions

UNMATCHED MASTER PLANNING EXPERTISE

Not only do we understand how critical master planning is, but we know how to deliver the best plan for your specific needs. This knowledge comes from working with multiple communities in the region, such as Fargo, Grand Forks, Williston, and more. We are here to help make sure your utilities are positioned for future success.

SPECIALIZED SERVICES

Beyond traditional engineering services, we offer a variety of service to provide additional value to you. Specifically, our team of underground utility rehab/replacement specialists, asset management specialists, financial analysts, and AE2S Construction will help ensure the master plan includes reliable cost estimates and financial considerations.

LOCAL, RESPONSIVE TEAM WITH EXTENSION OF STAFF MODEL

Your project team is based out of our Fargo office, allowing us to provide fast, responsive service. Our goal is to provide client service so outstanding that you come to view us as an extension of your own staff.

HYDRAULIC MODELING EXPERTISE

Our dedicated modeling experts have completed hundreds of modeling projects, providing them with an understanding of what works and what doesn't. This understanding provides you with proven solutions to inadequate pressures during normal operations and during fire flow conditions, inefficiencies and lack of redundancy, Brookwood Addition water metering locations, storage tank concerns including capacity and water age, while allowing for evaluation of upsizing mains, identifying strategic trunk mains, adding parallel pipes, and looping dead ends.. Not only will we be able to efficiently calibrate your model - we'll be able to enable it to be a powerful tool for solving problems and planning for the future.

POSITIONED FOR CONTINUED EXCELLENCE

The complexity and level of challenges facing aging infrastructure within locations such as the City's Core Area can be overlooked. Taking a proactive approach to develop a master plan that commits to positioning the infrastructure to continued excellence in a prioritized fashion is a great step in maintaining cost effective and efficient services for the customers in this service area and supporting redevelopment.

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INTRODUCTION

Advanced Engineering and Environmental Services, Inc. (AE2S) is a specialized consulting engineering firm that provides professional water, wastewater, and stormwater services to municipal, rural, and industrial clients throughout the region.

AE2S currently has offices located in Fargo, ND and Moorhead, MN and has a total staff of over 275 engineers, civil technicians, surveyors, GIS staff, asset management specialists, financial analysts, instrumentation and controls staff, programmers, and administrative personnel. In addition, we have offices located in Grand Forks, Bismarck, Minot, Dickinson, Watford City, and Williston, ND; Lake of the Woods and Maple Grove, MN; Madison, WI; Bozeman, Great Falls, and Kalispell, MT; and Salt Lake City, UT.

Our core service is water - meaning potable water, wastewater, and water resources consulting, which represents over 70 percent of our annual revenues. Site/civil engineering, structural engineering, electrical engineering, surveying, and mapping are also provided as stand-alone services or in support of our core services.

In addition to the water engineering and consulting services, we also provide value-added services including underground utility rehabilitation/ replacement evaluation, electrical engineering, structural engineering, instrumentation and controls, surveying and mapping, modeling, geographic information systems (GIS), utility financial analysis and planning, asset management, public outreach and communications services, and information technology.

Project Manager

Brian Bergantine, PE will serve as your Project Manager. Brian is already familiar with your water utility through his work on your Water Treatment Facility Services and Study Project as well as work on the project to deliver drinking water to West Fargo from Fargo.

Brian has 24 years of experience helping municipalities and rural water systems in the region and has worked on many infrastructure planning projects for clients such as Fargo and Grand Forks.

Brian is an accomplished Project Manager, and will use his experience, as well as his expert use of project management software and tools to keep your project on schedule and budget, and to keep you informed every step of the way.

Brian's resume which further details his qualifications and experience is presented in Section 5 (Project Staff) of this proposal.

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Year Established: 1991
Type of Ownership: S Corporation

Project Manager & Authorized Negotiator
BRIAN BERGANTINE, PE
Brian.Bergantine@ae2s.com
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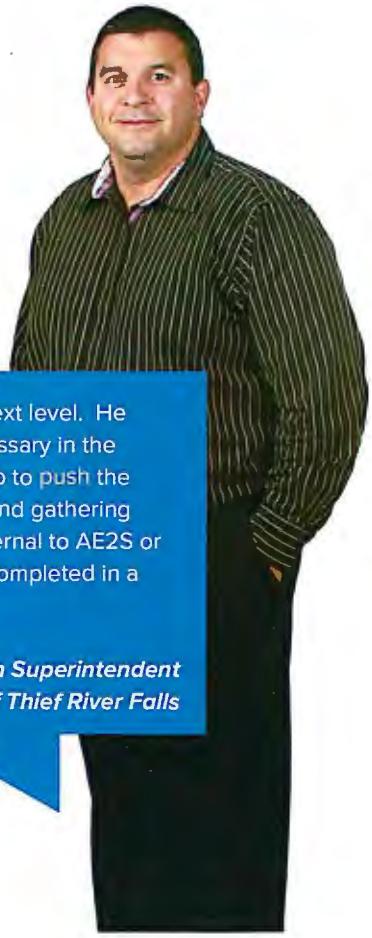
Fargo, ND 58104
Cell: 701-866-0620



"Brian takes project management to the next level. He is very good at the upfront execution necessary in the planning stages of a project, the leadership to push the project team towards the project's goals, and gathering the resources necessary, whether it be internal to AE2S or outside their company, to get the project completed in a timely manner."

Wayne Johnson, Water System Superintendent
City of Thief River Falls

Comprehensive Service Offerings Ensure Your Needs Are Met

We believe in providing as much value as we can to our clients. Because of this, we've continued expanding our service offerings to include many services that go beyond traditional engineering. We have also expanded our number of staff, and have 30 professionals locally available to serve you. By having in-house experts, we are able to better deliver services because of our in-depth understanding of your challenges, opportunities, and of the industry as-a-whole. The graphic above highlights the variety of services we offer.

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ADMINISTRATIVE QUESTIONS

Workload and Manpower

Making your project a success will involve prioritizing time and scheduling issues, quick turn around, and extreme client service.

Project team members have already allocated an appropriate amount of time in their schedules to successfully complete your project, and their current and projected workload is presented in the table below.

Deep Bench

With a staff of over 275 professionals, we have the manpower needed to make this project a success. While we are committed to the staff we are proposing for your project team, we can draw upon our pool of staff members should any unforeseen circumstance arise or if additional manpower should be needed.

WORKLOAD MANAGEMENT

HOW WORKLOAD WILL BE MANAGED

Delivering the right staff at the right time is one of our most important commitments to you. Furthermore, we strive to make this seamless and invisible to you. Here's how that happens:

Our Project Manager, Brian Bergantine, already has estimated the level of effort (hours required for the work) and timing for that effort (schedule) for the key staff proposed for your Core Area Infrastructure Master Plan project. This data is entered into and maintained in the AE2S Staff Commitment Tool. This tool allows our project managers to coordinate and sequence the projected assignments for the staff committed to you – making sure they are available for your project as promised.

AE2S STAFF COMMITMENT TOOL

- Staff Qualifications
- Level of Effort
- Timing

→ **THE RIGHT PEOPLE DELIVERED TO WEST FARGO AS PROMISED**

TEAM MEMBERS AVAILABILITY

AUTHORIZED NEGOTIATOR
Brian Bergantine, PE
Operations Manager
Brian.Bergantine@ae2s.com
4170 28th Avenue South
Fargo, ND 58104
Cell: 701-866-0620

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SUMMARY OF TECHNICAL PROCESS

System Understanding

The City of West Fargo is a prospering community that has experienced rapid growth over the past two decades. While much of the growth can be attributed to the construction of new developments and infrastructure to the west and south extents of the City, the infrastructure in the Core Area of town has, for the most part, remained original construction. Aging infrastructure now presents the difficult question of rehabilitation versus complete replacement, and the City has made the prudent decision to address this through infrastructure master planning. A master plan is a substantial financial undertaking, but when executed properly, it serves as an invaluable tool for a City and supports plans for redevelopment. The following section provides an overview of our project approach for executing the defined project tasks. With our unmatched and proven master planning experience, we will work with you to develop an effective master plan to revitalize the Core Area of West Fargo.

INFRASTRUCTURE DATA COLLECTION

OBJECTIVE: Updated inventory and condition list of Core Area water, sanitary, and storm sewer assets.

The foundation for developing an effective master plan is sufficient and accurate data. We will optimize data collection to maximize the value of existing information, while making the best use of the survey crew, thus ensuring data is organized and accurate for analysis in future phases.

Collected Data Will Include:

- Data from recent field collection efforts
- Historic documents, such as assessments and analyses
- Public Works staff institutional knowledge
- Surveys

We will evaluate the current data structure in place by reviewing GIS, GPS, condition assessment, and inspection forms for Water, Sanitary, Storm, and Street data. If needed, attribute fields will be added to the GIS data, so applicable information from GPS, Inspection Forms, or Condition Assessment data can be incorporated. The GPS data will be converted to a GIS format and imported to the appropriate data structure. The point ID from the GPS data will be maintained in the GIS data and used to link to available spherical videos and inspection forms in ArcGIS Map. Manhole attributes will be updated based on information in the inspection form. The sanitary and storm GIS dataset provided by the City will be updated with the processed manhole GIS data from GPS data and inspection forms. Features with location and information from recent field collection efforts will replace current Sanitary and Storm features.

Along with sanitary and storm updates, street inventory and condition information will be added to the GIS. Record drawings, O&M manuals, plat dates and City records will be used to fill in data for water, sanitary, storm and street infrastructure not covered in the recent field collection effort. The sewer televising video will be reviewed and areas of concern will be documented using a simple rating scale (i.e., 1-Very Good to 5-Very Poor). The documented areas will assist in identifying and prioritizing needed improvements.

WEST FARGO CORE AREA INFRASTRUCTURE

Field Data Collection will include:

SANITARY SEWER

10,000 Feet
Sanitary Sewer Video

10
Sanitary Sewer Lift Stations

300
Sanitary Manholes

STORM SEWER

10
Key Areas

20
Gravity Storm Sewer Outfalls
(Along Drain 21 & the Sheyenne River)

8
Storm Sewer Lift Stations

50
Storm Manholes

After the data is compiled and organized, we will meet with Public Works staff to discuss any data discrepancies and areas with known drainage and flooding issues before sending the local field crew out to survey. A local crew will be used to perform a topographic survey for City-identified areas prone to street flooding. Data dictionaries and protocols used by the field crew will match the data structure for GIS and Cartegraph during the survey. Visual field inspections and Unmanned Aerial System (UAS) drone documentation will be performed for 20 gravity storm sewer outfalls. Inventory field sheets will be completed, so that you have consistent documentation of outfall inspections.

AE2S has two certified UAS pilots and the capability to navigate FAA rules and regulations as they relate to flying at the project study area.

INFRASTRUCTURE DATA COLLECTION TASKS	
RFP TASK DESCRIPTION	**PROPOSED TASK SERVICES**
Review City provided data	• Compile key information for location, age, size/capacity, and material type of water, sanitary, and storm infrastructure • Compile street inventory and condition • Attend one (1) meeting with Public Works representatives to identify historical problem areas • Review sewer televising video, complete sewer rating scale, and document areas of concern
Conduct topographic survey	• Conduct full topographic survey of 10 key areas for five (5) days
Visual field inspections	• Conduct visual inspection of key areas to determine severity of flooding impacts • Conduct visual inspection and UAS drone video documentation of key gravity storm sewer outfalls along Drain 21 and Sheyenne River • Conduct visual inspection of major sanitary and storm sewer lift stations
Complete City inspection forms	• Document data collected from visual inspections to populate Outfall Reconnaissance Inventory Field Sheets and Lift Station Inspection Forms, and review data from previously completed Manhole Inspection Forms

GIS SERVICES

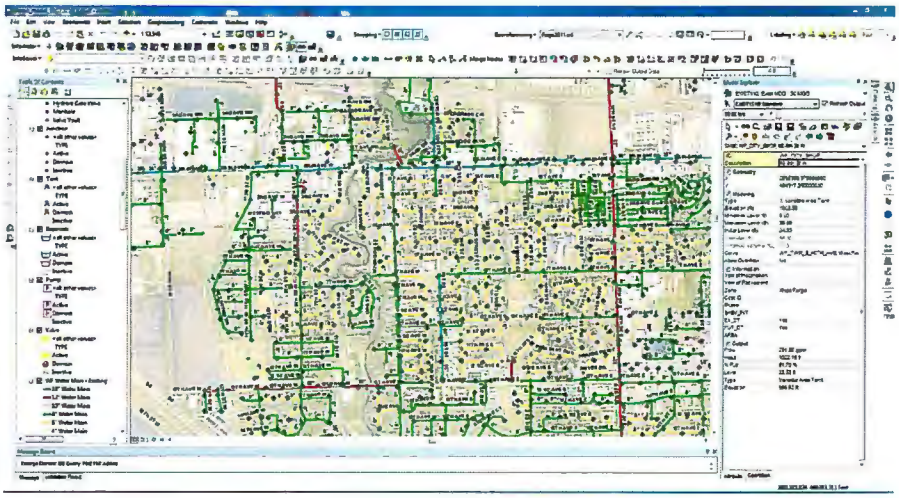
Geographic Information Systems

As information for utilities continues to increase, resources to manage this information need to improve as well. That is where Geographic Information Systems (GIS) come in. AE2S has helped numerous clients utilize GIS technology to integrate database information with the unique visualization and geographic analysis benefits offered by interactive maps. Through interactive desktop or web-based GIS, valuable information, such as pipe size and material, land ownership, legal descriptions, etc., can be viewed with the click of a mouse or touch of an iPad.

WATER DISTRIBUTION SYSTEM MODELING

OBJECTIVE: Calibrate water model to identify Core Area water system inadequacies.

Modeling is a critical path of both designing and operating water distribution systems to ensure consistently reliable, efficient, and safe service. Once developed, with proper management and calibration, a system model is a valuable tool for planning and simulating system operation prior to and after improvements, and for day-to-day operations. We are already experienced with your water distribution system model from our work on the Fargo Water Service to West Fargo Project. This will allow us to efficiently and effectively calibrate the water distribution system model for the Core Area of town.



Once calibrated, the distribution system model will be used for the following evaluations:

- Pressure Zone and Fire Flow
- Water Storage
- Water Age

WATER DISTRIBUTION SYSTEM MODELING TASKS	
RFP TASK DESCRIPTION	**PROPOSED TASK SERVICES**
Calibrate existing hydraulic model	• Gather calibration data for model calibration including hydrant flow tests, tower levels, Fargo booster station pump flows, and extended period pressure tests • Perform 7-day extended period simulations to further refine hydraulic model
Identify system inadequacies	• Provide "heat maps" depicting locations of system inadequacies including: - Normal pressures < 45 psi - Fire flows < 20 psi - Areas of excessive water age • Perform extended period storage evaluation for the four water towers and provide charts to depict any inadequacies
Identify improvement alternatives	• Develop maps to depict needed water main improvements • Provide recommendations to maximize oscillation of water tower levels including strategic operation of distribution system valves • Identify optimum meter location for Brookwood Addition • Evaluate leak detection results to identify improvements needed for mains crossing rivers and drains

Calibration Checklist Ensures Thorough Model Calibration and Establishment of Model Conditions

CALIBRATION CHECKLIST

- WATER MAIN LAYOUT REVIEW
- WATER DEMAND INFO.
- PUMPING & STORAGE FACILITIES INFO.
- ACCESS TO FACILITIES & ASSISTANCE W/ FIELD DATA COLLECTION

HYDRAULIC MODEL CALIBRATION

Model calibration ensures that the model accurately reflects pressures, flows, and water tower levels in the distribution system. Models are calibrated by adjusting system characteristics to match field data collected during flow tests on fire hydrants. Calibration requires collection of field data that is used during the calibration process.

We will collaborate with your distribution personnel to gather calibration data. These data include hydrant flow tests, background data such as water tower levels, booster stations pump flows, and extended period pressure tests.

FIRE HYDRANT FLOW TESTS

We will utilize pressure / flow metering equipment to conduct flow testing on strategically located fire hydrants selected to represent characteristics of the distribution system that affect water flow and head loss. We will develop a field data collection plan with data sheets to record the data collected during flow tests. We will also organize collection of water tower elevation data (using pressure recorders) and pump data from the Fargo booster stations needed to complete the calibration. These data will be collected by our field personnel, with the assistance of two Public Works staff, during the hydrant flow testing.

EXTENDED PERIOD PRESSURE TESTS

Pressure recorders at hydrants will also be used to perform extended pressure tests. Extended pressure tests

FIRE FLOW TESTING

Fire Flow Testing

Fire hydrant flow tests typically include three hydrants: one hydrant is used to capture the static pressure (no flow condition), and two other flowing hydrants to simulate strain on the system and enable the capture of the residual pressure on the static hydrant. If the residual pressure doesn't drop more than 10 pounds of pressure from the static pressure, a fourth hydrant is used to provide additional flow to create the desired drop in pressure.

will be conducted on up to 12 hydrants at strategic locations. Pressure recorders will remain on the hydrants for two weeks to measure the dynamic changes of the pressure within the system. The data will help fine tune the pipe roughness coefficients and provide a more accurate calibration of the model.

STEADY STATE CALIBRATION

The hydrant flow test data, water storage levels, pump flow rates, and estimated demands are entered into the software for each fire flow test. The hydraulic modeling software is then used to predict the pipe roughness coefficients for different pipe sizes and types of material. These pipe roughness coefficients are then established throughout the entire hydraulic model to complete the static calibration effort.

EXTENDED PERIOD CALIBRATION

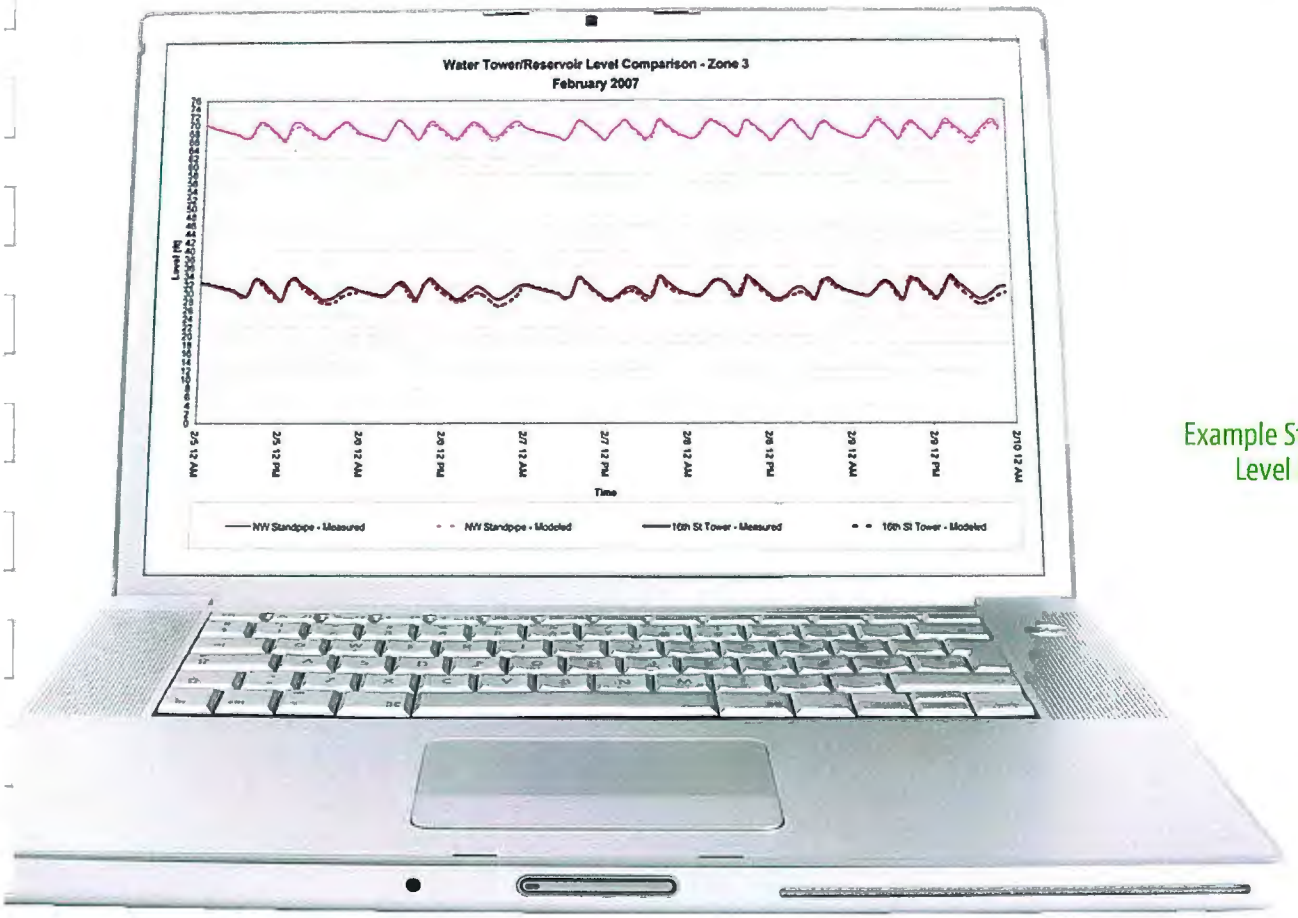
Extended period calibration will be performed to further refine the model to match water tower levels and extended pressure testing results. We typically calibrate the extended period simulation (EPS) to a seven-day period. The adjustments that are made during extended period calibration typically include global demand adjustments, which will include the diurnal patterns created for the model.

During the extended period calibration, the calibration is verified when the modeled water tower elevations are within two to three feet of actual water tower elevations, and model pressures are within two to five psi of actual pressures at the residual hydrants of the flow test. EPS runs should reflect distribution system operations (show appropriate water tower level variations and system pressures) for multiple days.

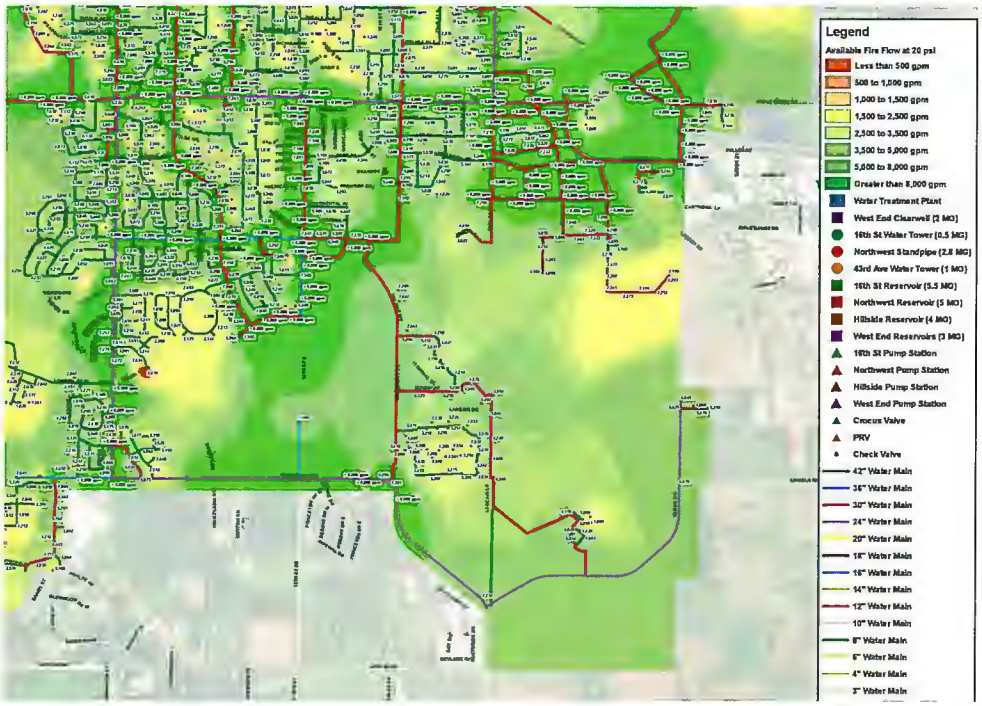
Uses for Your Hydraulic Model:

1. Existing System Analysis
2. Future Growth Analysis
3. Capital Improvements Plan Development
4. Operational Understanding
5. Asset Management

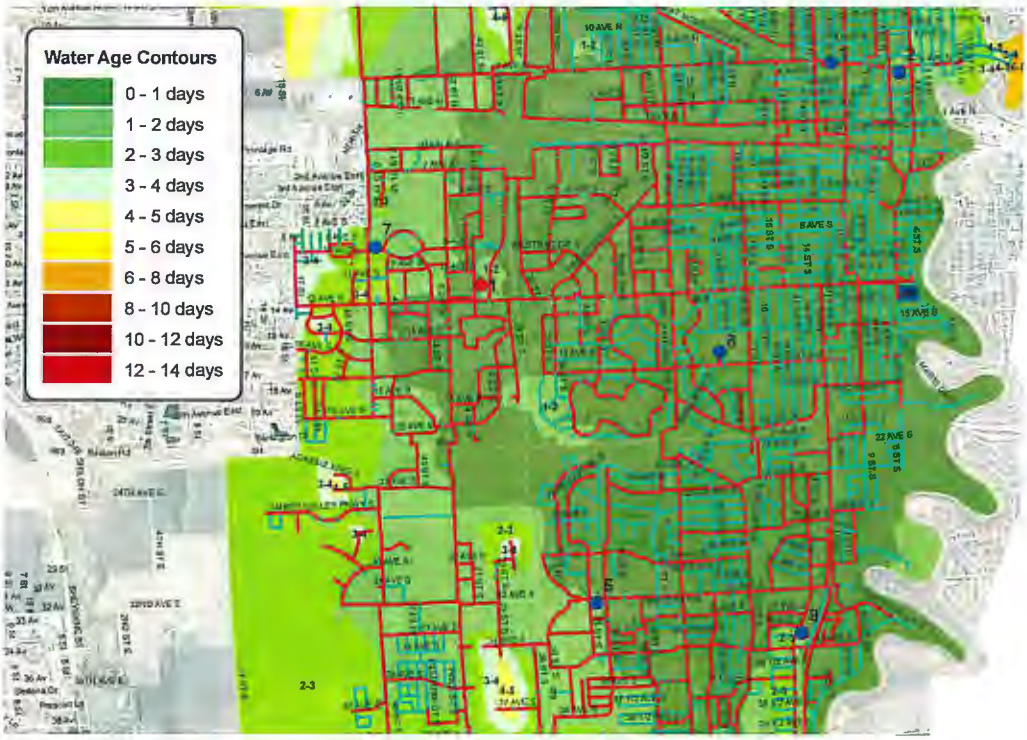
We have extensive experience with calibrating models and follow guidelines provided by *AWWA Manual 32 "Computer Modeling of Water Distribution Systems"* and EPA modeling requirements for a calibrated model for determining Stage 2 DBP monitoring locations. This level of calibration for EPS is necessary for performing water quality studies and reflecting impacts of demand variations on distribution system operations. The key outcome of the model is accurately reflecting storage facility levels. We have performed this high level calibration for 20 other water systems.



Example Storage Facilities Level Calibration



Fire Flow Analysis Helps Identify and Prioritize Improvements to Mitigate Low Fire Flow



Water Age Maps Show Impacts of Potential Improvements on Water Age

STORM SEWER SYSTEM MODELING

OBJECTIVE: Calibrated storm sewer model to identify Core Area storm sewer inadequacies.

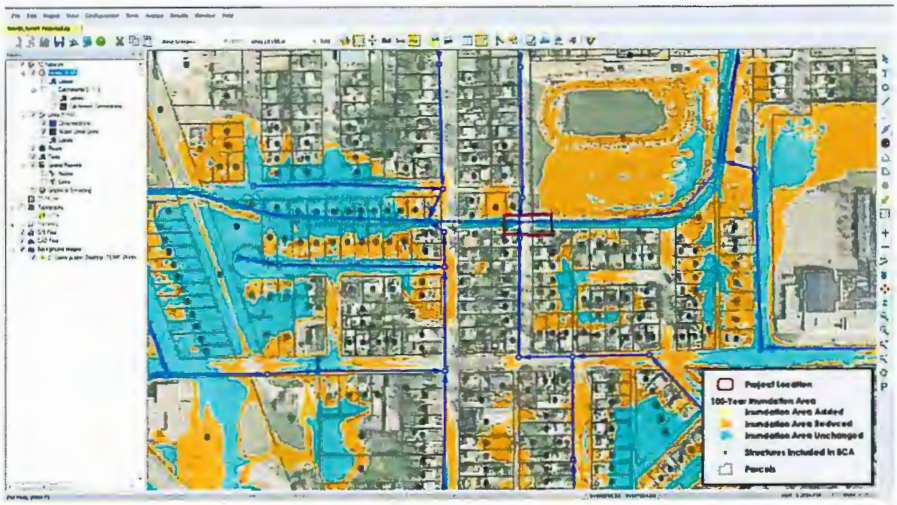
Our approach to storm sewer modeling focuses on maximizing your previous investment in the data collected and software, utilizing XPSWMM.

We will evaluate your storm sewer system to identify inadequacies. A system model will be developed to clearly identify between storm sewer capacity issues (i.e., undersized pipes) or areas flooding because of lack of catch basin capacity.

Utilizing the information you provide from past flooding locations, we will validate the model results for accuracy and alternatives analysis to alleviate flooding through cost-effective solutions.

We will work with you to develop an acceptable level of risk. In other words, we will clearly identify tolerances for flooding, especially with the flat topography throughout the City. Implementing flood reduction measures for a 100-year compared to a 25-year event might only reduce the risk by a few tenths of feet because of the topography but cost twice as much.

We will deliver results and recommendations in easily-understandable maps that the City Commission and the public can digest, while also providing adequate engineering information for implementing the proposed improvements. Inundation area maps, as shown in the example graphic below, are a great way to show areas being removed from flooding because of improvements being made.



STORM SEWER SYSTEM MODELING TASKS	
RFP TASK DESCRIPTION	**PROPOSED TASK SERVICES**
Sheyenne River Model	**Overall Goal:** Identify deficiencies throughout the storm sewer system by developing a comprehensive storm sewer model for the Sheyenne River contributing watershed. • Input data from data collection phase into XPSWMM • Develop maps identifying system inadequacies (undersized or lack of inlets and storm sewers) • Develop maps identifying reduction in flooding based on recommended improvements (upsizing or constructing new inlets and storm sewers) • Identify areas of inadequate street grade and provide recommended improvements
Downtown Redevelopment Model	**Overall Goal:** Develop solutions to mitigate flooding throughout the downtown redevelopment areas. • Utilize the existing conditions XPSWMM model to evaluate flood mitigation measures (i.e., storage facilities, pipe and inlet modifications, street grade changes) • Develop maps identifying proposed improvements and benefits provided to the system (i.e., inundation area maps, trunk line improvements) • Provide areas of where retention is needed and corresponding volumes.

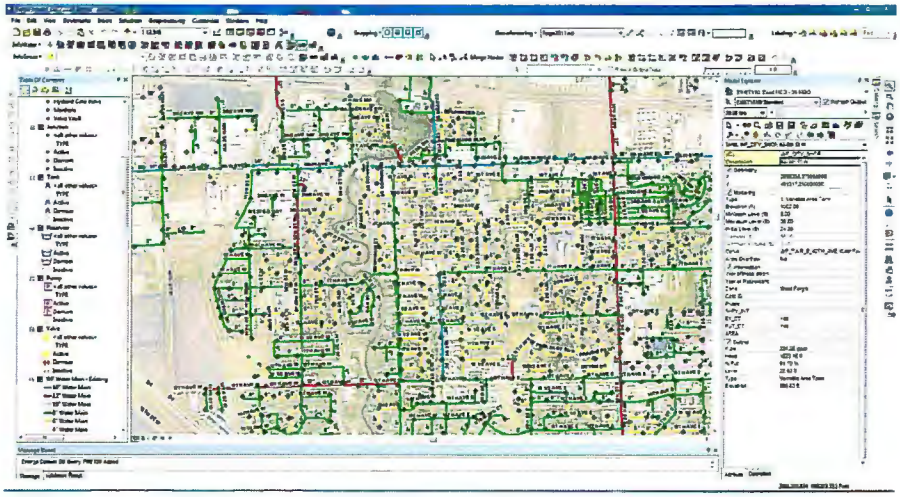
INFRASTRUCTURE DATA ENTRY

OBJECTIVE: Updated Core Area GIS information for use in Cartegraph software and development of accurate water and stormwater models.

During the Infrastructure Data Collection Phase, numerous data types will be gathered, organized, and collected. In this phase, all the data types will be combined with the City-Wide Infrastructure GIS. This phase will incorporate:

- Manhole information with supporting information (e.g., field inspection sheets and spherical manhole videos)
- Additional information from the topographic survey and visual field inspection with supporting information (e.g,. inventory field sheets, photos, and drone videos or photos)
- Updates from historic documents, assessments, and analysis with supporting information (e.g., televising videos) to the original Infrastructure GIS dataset

During the data integration, standards and field types needed to capitalize on the functionality of Cartegraph will be reviewed, tested, and implemented. To confirm the pipe networks have connectivity in the study area, the data for each system will be imported into a geometric network to check connectivity. Areas with connectivity issues will be addressed to ensure the GIS data is ready for distribution or storm sewer system modeling.



A variety of methods will be used to perform QA/QC on the GIS dataset in the study area:

- **Visual Spot Check** - Zoom to different areas to look for outliers in connectivity or elevation
- **Feature and Layer Summarization Checks** - Compare count summaries from GPS and GIS datasets
- **Attribute Table Completeness Analysis** - Find features with inconsistent or incomplete attribute info and resolve if needed
- **Select by Location Analysis** - Select features not intersected by pipelines and resolve if needed

With relevant and complete data, cartographic production will highlight replacement needs based on age and material, analysis will create scenarios for utility relocates, and weighing criteria calculations will prioritize risk of failure and consequence of failure.

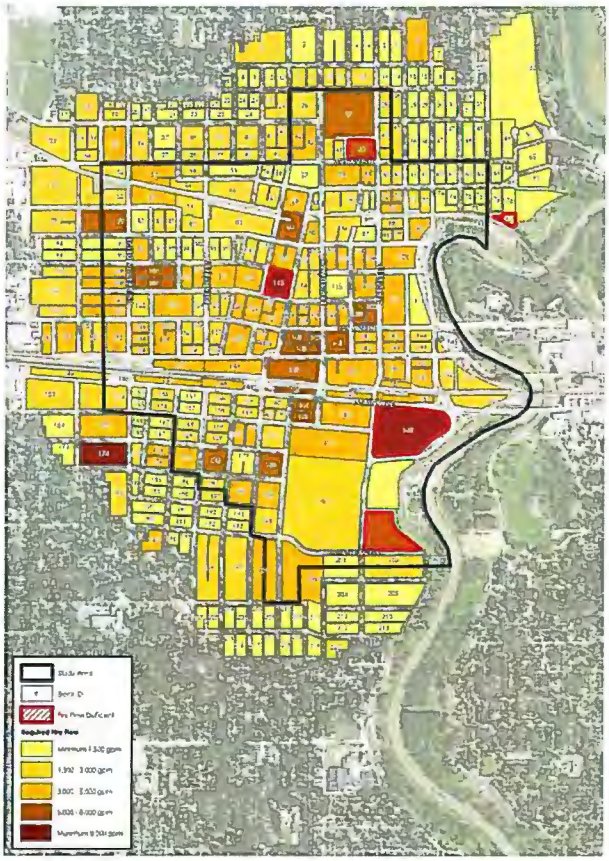
AE2S has helped numerous clients utilize GIS technology to integrate database information with the unique visualization and geographic analysis benefits offered by inter-active maps. Through interactive desktop or web-based GIS, valuable information, such as pipe size and material, infrastructure age, etc., can be easily viewed with the click of a mouse or touch of an iPad.

INFRASTRUCTURE DATA ENTRY TASKS	
RFP TASK DESCRIPTION	**PROPOSED TASK SERVICES**
GIS Data Entry	• Input data from Data Collection Phase into City GIS utilizing ESRI ArcMap V10.1 • Link videos, photos, inspection forms, and other critial data to key infrastructure

EVALUATION OF EXISTING INFRASTRUCTURE

OBJECTIVE: Develop clear understanding of existing infrastructure condition to identify improvement alternatives.

It is crucial to have a clear understanding of the condition of your utilities in order to recommend improvements. A working knowledge of the pavement system is also vital to planning future growth because improvement projects in the study area typically involve all utilities in a corridor. With completion of the data collection and calibrated water and storm sewer models, you will have powerful tools to identify current deficiencies, as well as needed improvements, for the existing Core Area water, sanitary, and storm sewer utilities. With these tools, we will develop maps to clearly depict identified deficiencies and develop a list of needed improvements for each utility which will include a detailed description of the recommended improvement, detailed maps of the improvement, and a proposed schedule for the improvement. Considerations will be made to street condition through the review of past City street inspection forms and reconnaissance with City personnel to help determine timing of utility replacements and/or relocations. The evaluation will exclude utilities that are PVC, due to the assumption that the remaining service life of PVC is adequate beyond the extents of the 20-year master plan.



Example Fire Flow and Deficiencies Map

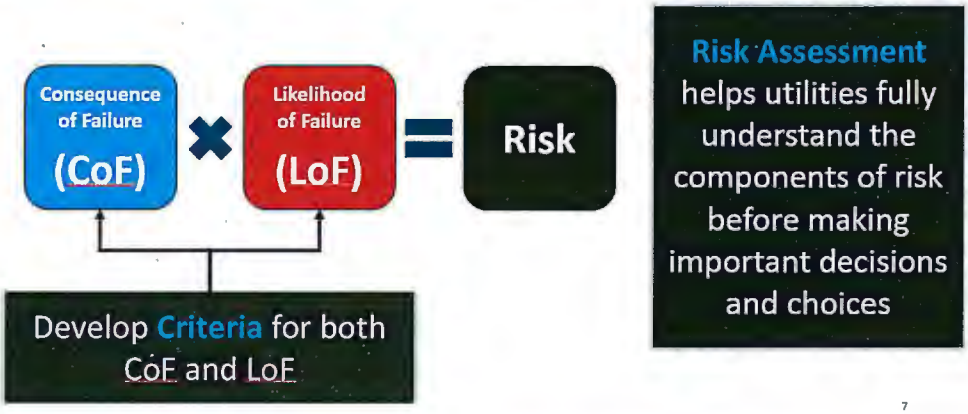
EVALUATION OF EXISTING INFRASTRUCTURE TASKS	
RFP TASK DESCRIPTION	**PROPOSED TASK SERVICES**
Utility Replacement Evaluation	• Develop maps identifying age and material for existing water, sanitary, and storm utilities • Identify utilities in need of replacement
Utility Relocation Evaluation	• Develop map identifying utilities located in alleys and backyards • Determine feasibility for relocation
Lift Station Evaluation	• Evaluate the pumping capacities of the major sanitary and storm sewer lift stations from data collected in the Data Collection Phase, and determine if increased capacities are needed • Determine risk of lift stations to assist with prioritizing necessary improvements
Street Condition Evaluation	• Develop street condition map to align the timing of necessary utility improvements with street improvements

In addition to the underground utilities, an evaluation will be performed on the key sanitary and storm sewer lift stations. While lift station condition and capacity will be key considerations for the evaluation, it is also recommended that a risk assessment is completed for the key lift stations. A risk assessment includes establishing criteria to determine the consequence of failure and likelihood of failure of each lift station to calculate a lift station risk score, which is utilized to determine the priority in which improvements should be made.

RISK ASSESSMENT

Case Study: Fargo Lift Station Risk Assessment

RISK ASSESSMENT SIMPLIFIED

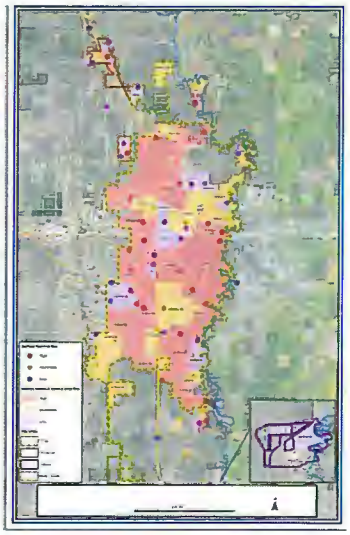


RISK RESULTS

Improvement Priority	Lift Station Number
[illegible]	
1 of 67	23
2 of 67	22
3 of 67	60
4 of 67	1
5 of 67	2
6 of 67	10
7 of 67	28
8 of 67	46
9 of 67	61
10 of 67	64
11 of 67	25
12 of 67	58
13 of 67	32
14 of 67	15
15 of 67	53
16 of 67	3
17 of 67	50
18 of 67	19
19 of 67	7
20 of 67	4
21 of 67	51
22 of 67	26
23 of 67	24

Improvement Priority	Lift Station Number
Moderate Risk	
24 of 67	59
25 of 67	8
26 of 67	45
27 of 67	37
28 of 67	29
29 of 67	43
30 of 67	49
31 of 67	16
32 of 67	57
33 of 67	62
34 of 67	40
35 of 67	9
36 of 67	21
37 of 67	6
38 of 67	31
39 of 67	12
40 of 67	18
41 of 67	56
42 of 67	54
43 of 67	66
44 of 67	48
45 of 67	68
46 of 67	39

Improvement Priority	Lift Station Number
[illegible]	
47 of 67	34
48 of 67	36
49 of 67	13
50 of 67	11
51 of 67	20
52 of 67	52
53 of 67	47
54 of 67	14
55 of 67	44
56 of 67	67
57 of 67	55
58 of 67	33
59 of 67	30
60 of 67	63
61 of 67	73
62 of 67	69
63 of 67	65
64 of 67	38
65 of 67	70
66 of 67	71
67 of 67	72



AE2S recently completed a Lift Station Risk Assessment for the City of Fargo's 67 sanitary lift stations.

PRIORITIZE INFRASTRUCTURE IMPROVEMENTS

OBJECTIVE: A risk-based, prioritized list of improvement projects for Community Investment Plan (CIP).

Determining the optimal time to replace underground infrastructure is a challenge all communities face. For instance, a water main might have several years of service life remaining, but it gets replaced simply because it lies within a corridor that has been targeted for other utility rehabilitation.

As part of the overall Core Area Infrastructure Master Plan, our team will prepare an Improvements Prioritization Plan that will include a prioritized ranking system that will evaluate all infrastructure assets (street, water, sanitary, and storm) within specific corridors. Each corridor then will be ranked in terms of overall need.

By taking this "corridor-specific" approach, West Fargo will have the ability to not only consider the replacement needs of individual utilities, but will also be able to rank the overall needs of key corridors as part of its capital improvements process.

Proposed Process*

1. Asset Type Identification
2. Prioritize All Asset Types with Ranking System
3. Determine Prioritized Ranking for City "Improvement Corridors"
4. Divide City into "Improvement Corridors" and Rank Corridors
5. Use Ranked Corridors to Guide Timing of Infrastructure Improvements

*Process is flexible and can be adjusted based on West Fargo's needs and goals.

1 Asset Type Identification and Data Collection

Typical Municipal Infrastructure Assets:

Vertical Assets

- Water Storage Reservoirs
- Water Towers
- Storm Lift Stations
- Sanitary Lift Stations

Horizontal Assets

- Roads
- Water Pipelines
- Sanitary Sewers
- Manholes
- Storm Sewers and Outfalls

Compile Data on Assets

Location

Actual location of the asset utilizing a referencing system of GIS

Physical Attributes

- Material
- Size
- Length
- Age

Condition

- Generic (Good, Bad, Ugly)
- Detailed (PCI, PACP)

2 Prioritize Asset Types with Ranking System

- ☑ Develop a numerical-based ranking system to rate individual assets
- ☑ Use ranking system to prioritize assets from high to low priority
- ☑ The ranking systems can be adjusted based on initial results

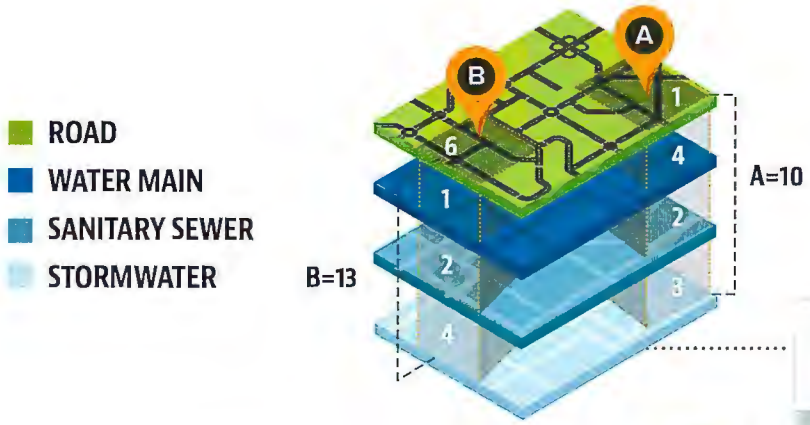
RANKING SYSTEM EXAMPLES

- Pipes with larger capacity and larger service areas rank higher than smaller pipes
- Pipes in poor condition or with frequent breaks rank higher than pipes in good condition
- Roads with more lanes and traffic rank higher than less important roads
- Roads in poor condition (low PCI score) rank higher than roads in good condition
- Lift stations with larger capacities and services areas rank higher than smaller lift stations

3

Determine Prioritized Ranking for City "Improvement Corridors"

Develop a prioritization ranking system with consideration for all asset types.



Potential Examples include:

- Importance of all asset types are equal, or
- Water and sewer importance are equal and roads are slightly more important, or
- Roads are most important, followed by large diameter pipes, and lastly small diameter pipes

Corridor A (10) < Corridor B (13) =
Improve Corridor B

4

Divide Core Area into "Improvement Corridors" and Rank Corridors

- Divide Core Area into sections for prioritization with consideration to all assets types
- Within each section, the assets *(Step 1)* and their rankings *(Step 2)* are compiled
- The sections are ranked using the approach previously established *(Step 3)*
- Results in each section are assigned a global rank and priority

5

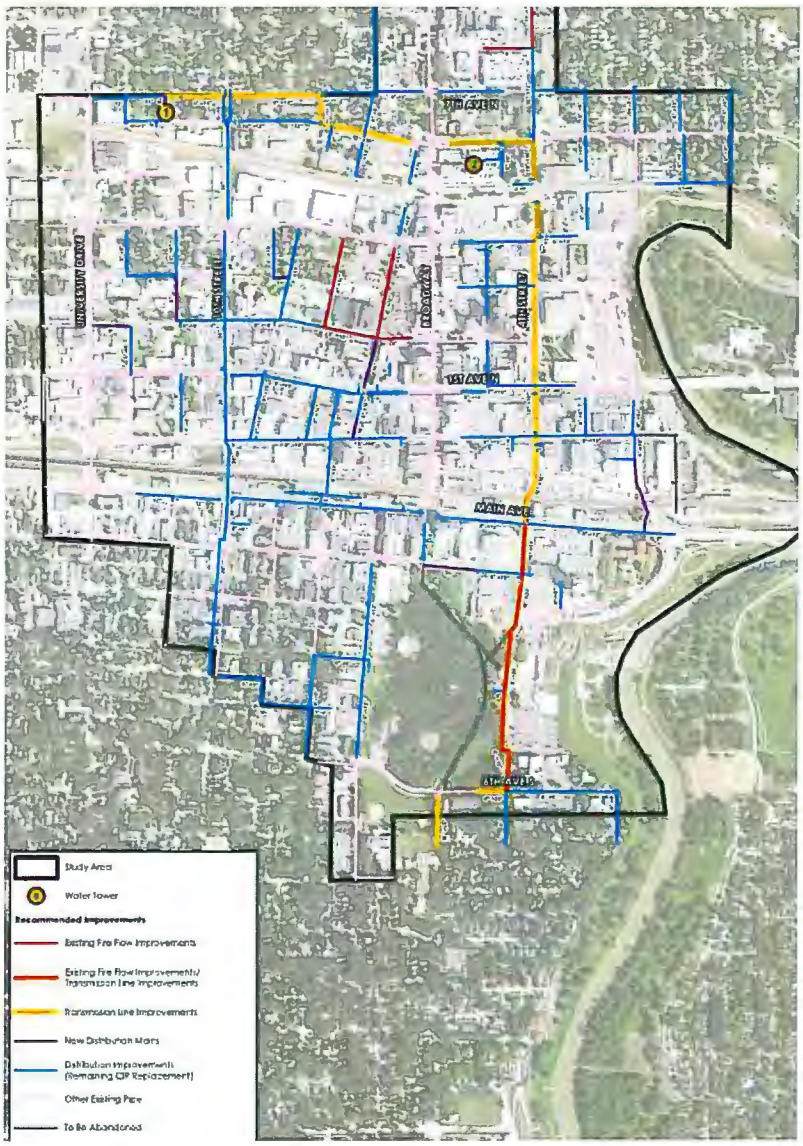
Use Ranked Corridors to Guide Infrastructure Improvements

- Use the ranked and prioritized sections to guide timing of improvements in Community Investment Plan (CIP)
- Sections with highest rank are most critical for immediate improvements

	1	2	3	4	5	6	7	8	9
A	A1	A2	A3	A4	A5	A6	A7	A8	A9
B	B1	B2	B3	B4	B5	B6	B7	B8	B9
C	C1	C2	C3	C4	C5	C6	C7	C8	C9
D	D1	D2	D3	D4	D5	D6	D7	D8	D9
E	E1	E2	E3	E4	E5	E6	E7	E8	E9
F	F1	F2	F3	F4	F5	F6	F7	F8	F9
G	G1	G2	G3	G4	G5	G6	G7	G8	G9

Red: High Improvement Priority
Yellow: Moderate Improvement Priority
Green: Low Improvement Priority

PRIORITIZE INFRASTRUCTURE IMPROVEMENTS TASKS	
RFP TASK DESCRIPTION	**PROPOSED TASK SERVICES**
Prioritize Infrastructure Improvements	• Conduct a workshop with key City representatives to prioritize asset types and establish criteria for ranking improvement corridors with emphasis on the remaining service life of an asset • Utilize improvement corridors to guide timing of proposed infrastructure improvements • Develop map depicting proposed infrastructure improvements for each utility • Categorize proposed infrastructure improvements into the following timing categories: - 0 – 5 years, with the proposed improvement specifically listed for each year - 5 – 10 years - 10 – 20 years - Beyond 20 years



Example Recommended Water Main Improvements Map

CONSTRUCTION COST ESTIMATING AND FINANCING

OBJECTIVE: Establish budgeting tool and project funding strategy for implementing the necessary improvements.

AE2S is experienced in cost estimating, budgeting, and cost control for public works projects. We maintain an extensive file of project costs, consisting of historical bid tabulations, manufacturer quotations, and published estimating guides. We also have working relationships with several local utility contractors who are called upon to provide cost estimating assistance for utility construction projects. In fact, we have a construction company that provides cost estimates and bids for the same type of projects. Because of this, our team will develop construction cost estimates for the proposed improvements that you can use with confidence to develop your annual construction budgets.

CONSTRUCTION COST ESTIMATING AND FINANCING TASKS	
RFP TASK DESCRIPTION	**PROPOSED TASK SERVICES**
Construction Cost Estimates	• Develop opinions of probable construction costs for the proposed infrastructure improvements in both 2018 dollars, and dollars for the estimated year of the improvement • Provide regional versus local improvement dollars for the proposed improvements when applicable
Financing	• Evaluate and identify funding strategies for the proposed improvements • Compile a comparative matrix of similar regional projects, each with specific financing methods used for each

AE2S NEXUS

AE2S NEXUS The Financial Link

In 2010, AE2S launched AE2S Nexus, a division developed to assist public and private clients with issues beyond engineering services. From our traditional financial roots in cost of service analysis, rate design, revenue adequacy analysis, and rate modeling dating back to 1999, AE2S Nexus has grown into a complete financial resource for our clients.

AE2S Nexus provides project development and administration services, utility rate planning and long-term financial planning, utility management and implementation, and support with project funding and financing programs. Together, these services allow AE2S Nexus to serve as a valuable resource for our clients and partners to ensure their financial success.

Funding Strategy Development

To determine the proper funding strategy for the proposed improvements, we believe it is important to first develop an inventory of the City's current financial resources, including utility revenues, special assessments, property taxes, and other revenue sources, as well as expenditures and existing outstanding debt. This will help our Nexus team determine the optimal funding strategy for executing the needed improvements. Our team will also explore State grant and/or low interest loan opportunities to minimize the tax burden on your residents.

CITY INVOLVEMENT

OBJECTIVE: Solicit City input and incorporate City preferences and objectives. Keep City informed of project progress.

Collaborative decision making is critical in any master planning process. Developing optimal solutions and communicating those solutions to all levels of your organization ensures quality products are delivered. We will structure our master planning communications to achieve collaborative decision making and listening closely to make sure we've got everybody who needs to be "on-board".

In addition to the individual meetings defined in the previous phases, we will participate in the following meetings:

CITY INVOLVEMENT TASKS	
RFP TASK DESCRIPTION	**PROPOSED TASK SERVICES**
Attend four (4) City staff meetings for review and coordination	• Schedule and coordinate the following anticipated meetings: - One (1) Kick-off Meeting - Two (2) Progress and Coordination Meetings - One (1) Final Review Meeting to discuss and review the final prioritized improvements list • For all meetings, we will organize and lead the meeting, provide draft agenda for your review/comment, final agenda, and meeting minutes documenting decisions and action items
Participate in two (2) City Commission Meetings	• We will attend two (2) City Commission Meetings to present the results and recommendations of the Core Area Infrastructure Master Plan, and prepare all necessary information for each meeting

COLLABORATIVE APPROACH DELIVERS PLAN THAT REFLECTS YOUR PRIORITIES

LISTEN
We listen to make sure we understand your goals and wishes.

INCORPORATE
We incorporate what we hear from you into your master plan.

COMMUNICATE
We communicate solutions and the reasoning behind those solutions to all levels of your organization to obtain buy in.

REPORT PRODUCTION

OBJECTIVE: Provide deliverables to communicate plan and guide implementation.

A Draft Core Area Infrastructure Master Plan, including chapters for the specific efforts listed below, will be submitted to you for review. Your comments and feedback on the plan, as well as our response and/or recommended action, will be documented in a spreadsheet. A workshop will be conducted to review comments, feedback, and responses.

Once the review workshop is completed and you and the project team have approved any changes to the master plan, we will incorporate the final changes to the document and deliver the final Core Area Infrastructure Master Plan to the City in two (2) paper copies and a searchable electronic PDF copy. All modeling files and GIS files developed during the project will also be presented to you upon completion.

REPORT PRODUCTION TASKS	
RFP TASK DESCRIPTION	**PROPOSED TASK SERVICES**
Downtown Retention Technical Memorandum	• Provide one (1) paper copy and one (1) electronic PDF copy of downtown retention evaluation
Water Distribution System Technical Memorandum	• Provide two (2) paper copies and one (1) electronic PDF copy of water distribution system modeling findings
Storm Sewer Technical Memorandum	• Provide two (2) paper copies and one (1) electronic PDF copy of storm sewer modeling findings
Community Investment Plan Project List	• Provide one (1) paper copy and one (1) electronic PDF copy of the updated CIP project list, including the following for each project: - Description and justification for project - Anticipated timeline for implementation - Probable construction cost opinion - Project location
Additional Improvement Alternates	• Provide one (1) paper copy and one (1) electronic PDF copy for the following additional improvement alternates to be included as an exhibit to original proposed improvement: - Downtown Development Retention - SM20 and SM21 Improvements - Replacing existing sanitary sewer with new sanitary sewer for one residential block - 1st Ave sanitary sewer improvements from 2nd St to 4th St
Draft Core Area Infrastructure Master Plan	• Provide two (2) paper copies and one (1) electronic PDF copy of the complete Draft Core Area Infrastructure Master Plan for review and comment
Final Core Area Infrastructure Master Plan	• Provide two (2) paper copies and one (1) electronic PDF copy of the Final Core Area Infrastructure Master Plan

5
PROJECT STAFF

The team we've assembled for your system improvements project has the right combination of expertise, proven experience, and availability. From infrastructure master planning, model calibration, GIS data collection/entry, and mapping to underground utility rehabilitation/replacement and distribution storage, this team has tackled the same issues that will be critical to help you achieve your goals.

The organizational chart presented below shows how the project team will interact with you and each other. Team members' availability is shown as a percentage of time reserved for serving you, denoted in parentheses behind the team members' names. The pages that follow feature the resumes for the key personnel comprising your project team. These resumes present only the most relevant experience for each individual.

CITY OF WEST FARGO

CHRIS BRUNGARDT
Public Works Director

CHARLIE VEIN, PE (10%)
Principal-in-Charge

BRIAN BERGANTINE, PE (40%)
Project Manager

PROJECT TEAM

RYAN GRUBB, PE (50%)
Project Engineer

BRIAN WEISS, PE (30%)
Water Modeling Engineer

BOONE MARUSKA, PE (30%)
Wastewater Modeling Engineer

JUSTIN KLABO, PE, CFM (30%)
Stormwater Modeling Engineer

KEVIN SMITH, AICP (30%)
Municipal Management Specialist

CAROL WICKENHEISER, GISP (10%)
GIS Specialist

DAN LISSICK (30%)
GIS Specialist

SHAWN GADDIE, PE (10%)
Funding/ Financial Services

Charlie Vein, PE

Principal-in-Charge

Mr. Vein has more than 39 years of professional engineering experience serving clients throughout North Dakota and Minnesota and over 25 years experience as President of AE2S. He has managed a wide variety of projects ranging from simple site plans to multi-million dollar, multi-year rural water system and water treatment plant designs. Specific areas of experience include the following: water supply, treatment, and distribution; wastewater collection, transmission, and treatment; stormwater collection; flood control and response; streets, curbs, and gutters; site planning; and structures. For the last 34 years, Mr. Vein has specialized in providing services to the water industry.

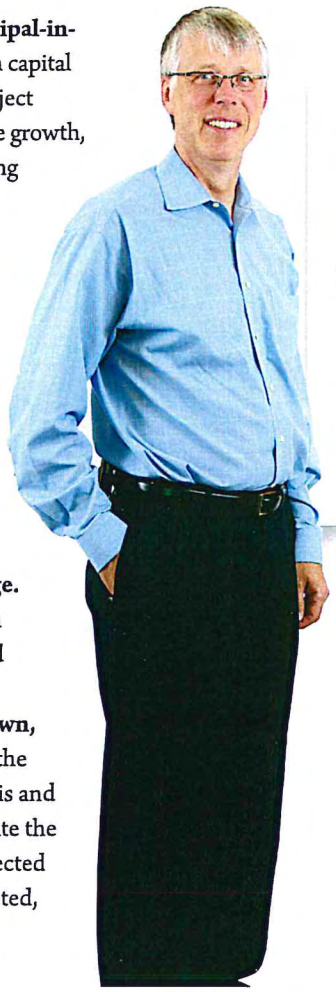
SPECIFIC RELEVANT EXPERIENCE

- **Water Treatment Facility Services and Study, West Fargo, ND - Principal-in-Charge.** Creation of a Master Plan for switching the West Fargo WTF from a ground water source to either a surface water source or a combination of ground water and surface water sources. The project included a verification of forecasted water demands, a review of the existing water quality and quantity supply plan, establishment of primary and secondary standards and objectives, determination of feasible treatment technologies, anticipated water distribution system water quality impacts, identification of water treatment residual impacts, preparation of preliminary WTF layouts, and preparation of preliminary capital, operation and maintenance (O&M), and life cycle costs.
- **Comprehensive, Growth, and Financial Planning, Williston, ND - Principal-in-Charge.** Development of a 6-year growth projection forecast associated with capital improvement plans and financial analysis related to growth impacts. The project included identifying strategic initiatives needed to support present and future growth, quantifying capital investments required to manage growth, and implementing initiatives as directed by City leaders. Initiatives have included coordinating the implementation of an asset management program in the Public Works Department, administering a capital improvements program, procuring consultant services for selected capital projects, managing an IT needs assessment, facilitating a stormwater utility research plan, and coordinating various inter-agency meetings.
- **Distribution System Plan, Jamestown, ND - Principal-in-Charge.** Phased project which included the south end model and preliminary system evaluation, distribution system model development and calibration, existing system evaluation, and distribution system improvements planning.
- **Comprehensive Water System Plan, Bemidji, MN - Principal-in-Charge.** Assessment of the water system supply, treatment, storage, and distribution components and issues related to future planned annexation and continued growth for a 20-year growth period.
- **Hydraulic Modeling Support, Watertown Municipal Utilities, Watertown, SD - Principal-in-Charge.** Calibration of the existing hydraulic model of the water distribution system for the purpose of performing operational analysis and to review pressure and available fire flow throughout the system. To calibrate the model, fire flow testing and extended pressure testing information was collected in the field. Extended period simulation and static calibration were completed, along with a technical memorandum documenting the calibration process.

EDUCATION
Bachelor of Science, Civil Engineering, University of North Dakota

REGISTRATIONS
Professional Engineer: North Dakota, Montana, South Dakota, Minnesota

CONTACT
Charles.Vein@ae2s.com
T: 701-746-8087
C: 701-739-9056



WHY CHARLIE?

Charlie has extensive experience in utility planning for clients throughout the region.

Brian Bergantine, PE

Project Manager

Brian has over 24 years of experience with all facets in the water field, including project management, design, permitting, construction administration and observation, capital improvements planning, feasibility studies, master planning reports, and regulatory evaluation.

SPECIFIC RELEVANT EXPERIENCE

- **Water Treatment Facility Services and Study, West Fargo, ND - Project Manager.** Creation of a Master Plan for switching the West Fargo WTF from a ground water source to either a surface water source or a combination of ground water and surface water sources. The project included a verification of forecasted water demands, a review of the existing water quality and quantity supply plan, establishment of primary and secondary standards and objectives, determination of feasible treatment technologies, anticipated water distribution system water quality impacts, identification of water treatment residual impacts, preparation of preliminary WTF layouts, and preparation of preliminary capital, operation and maintenance (O&M), and life cycle costs.
- **Downtown Water and Sewer Master Plan, Fargo, ND - QA/QC.** Development of a master plan for the Downtown area to enable the City to understand the long term needs and capacities of water and sewer infrastructure within the area. This project included an update of the current water distribution model, as well as the expansion of the existing dynamic collection system model that was developed for the City in 2013.
- **Water Distribution System Master Plan, Fargo, ND - Project Engineer.** Conducted a planning effort which included an overview of the water distribution system, forecasting future water demands for the 15-year, 25-year, and 50-year planning periods; and development of improvement concepts and cost estimates, including approximately $54 million in hydraulic improvements and $127 million in water main replacement. Project included prioritizing improvements within a water system capital improvements plan and ultimately funding these improvements.
- **South Side Water and Wastewater Preliminary Planning, Fargo, ND - Project Manager.** Development of preliminary planning for the south side growth area of the City of Fargo. Over the last decade, the City of Fargo has experienced steady growth on the south side of town. The City had conducted two master planning efforts in 2005 that changed the way the Water and Wastewater Utilities planned for future infrastructure improvements. These plans acted as roadmaps to assist in identifying infrastructure needs, recommending improvements, and proactively maintaining excellent service to their customers. The City proceeded with preliminary planning for this area to help guide the infrastructure decisions for the next 20+ years. This project included the update of the south side water distribution and wastewater collection models, projecting buildout impacts of the FM Flood Diversion project, and estimating water and wastewater demands for 2040 and beyond.

EDUCATION
Bachelor of Science, Civil Engineering, University of North Dakota

REGISTRATIONS
Professional Engineer: North Dakota, South Dakota, Minnesota

CONTACT
Brian.Bergantine@ae2s.com
T: 701-364-9111
C: 701-866-0620

WHY BRIAN?

Brian has over 24 years of experience planning for and implementing water projects for utilities throughout the region.

Ryan Grubb, PE
Project Engineer

Mr. Grubb's experience includes planning, preliminary engineering, design, computer aided drafting and modeling, site permitting, and construction observation and administration services. Project work includes water treatment plant rehabilitation and design, site grading, finished water pump station and transmission main design and construction observation, development of process and instrumentation diagrams, and estimation of probable project costs.

SPECIFIC RELEVANT EXPERIENCE

- **Water Service to West Fargo, Fargo, ND - Project Engineer.** Design and construction of two booster pump stations and interconnecting pipelines to supply the City of West Fargo with water from the City of Fargo. The project included a 30-foot by 45-foot CMU and brick structure with precast roof to house three 1,250 gpm pumps, process piping, electrical gear, and controls. Identical structures are being constructed at two locations, 32nd Ave in Fargo and on Main Avenue in West Fargo.
- **Water System Facility Planning, Brookings, SD - Project Engineer.** Preparation of a Facilities Plan Report to identify and plan system improvements to meet water demands of a growing residential and industrial customer base. The project considers multiple aquifer water sources, treatment options for hardness, iron and manganese removal, multiple options for treatment facilities, and modifications to the distribution system to connect to potential water treatment facility locations. The existing hydraulic model was updated and calibrated for evaluating water age to control DBP formation, assessing the feasibility of eliminating a pressure zone, and identifying improvements to mitigate low fire flows.
- **Downtown Water Tower Improvements, Fargo, ND - Project Engineer.** Evaluation of alternatives to improve performance of three pre-1950s water towers in downtown Fargo, including a detailed life-cycle cost analysis. The 50-year life-cycle cost analysis compared the costs of on-going rehabilitation against replacement with one or two new towers. Based on the significant long-term cost savings of replacement of the towers documented in the study, the City intends to move forward with replacement of the aging water towers.
- **Williston Regional Water Treatment Plant Expansion, Williston, ND - Project Engineer.** Expansion of the WTP from 10 MGD to 14 MGD with the addition of a 1 mg clearwell and six dual media filters. The project also included the evaluation of the existing conventional intake, preliminary horizontal collector well evaluation, and preliminary engineering to expand plant capacity from 14 to 21 MGD.
- **2011 Utility Improvements, Parshall, ND - Project Engineer.** Water and sewer pipe extensions, as well as replacement of the master lift station. A city-wide wastewater collection evaluation was also completed to determine the condition, depth, slope, material, and size of all manholes and pipes. A profile of the existing system was created from the results of the evaluation, enabling the creation of maps and the prioritization of the next phase of work.
- **Membrane Water Treatment Plant, Valley City, ND - Project Engineer.** Retrofit of the WTF, including the use of UF membrane filtration and NF membrane filtration for sulfate removal.

EDUCATION
Bachelor of Science, Civil Engineering,University of North Dakota

REGISTRATIONS/CERTIFICATIONS
Professional Engineer: North Dakota, Minnesota, South Dakota

CONTACT
Ryan.Grubb@ae2s.com
T: 701-364-9111

WHY RYAN?

Ryan is an exceptionally talented engineer with planning expertise.

Brian Weiss, PE

Water Modeling Engineer

Brian is experienced in both civil and environmental engineering projects. He has performed extensive hydraulic modeling, preliminary and final design engineering, and prepared plans and specifications on a number of water projects. He provides modeling services for Fargo, Grand Forks, Bismarck, Mandan, Williston, and Valley City, ND; Eden Prairie, Burnsville, St. Louis Park, Roseville, Apple Valley, and Alexandria, MN; Sioux Falls, Rapid City, Watertown, Pierre, and Brookings, SD, and many other communities.

SPECIFIC RELEVANT EXPERIENCE

- **West Fargo Water Supply from the City of Fargo, Fargo, ND - Hydraulic Modeling Engineer.** Incorporated an existing hydraulic model of West Fargo into the existing City of Fargo model to analyze the ability to serve the City of West Fargo from the Fargo water system. Analysis included the incorporation of booster pump stations between the systems and determining system operations based on the new supply and the ability to fill the West Fargo water towers. Used the hydraulic model to determine the pump curve parameters and evaluate the final pump selections for the booster pump stations. Developed a city-wide unidirectional flushing program (UDF) using a hydraulic model of the West Fargo water system. The UDF was implemented to completely flush and turnover the entire water system to the new supply.
- **Water Distribution System Master Plan, Fargo, ND - Hydraulic Modeling Engineer.** Development of an overview of the water distribution system, forecasting future water demands for the 15-year, 25-year, and 50-year planning periods; and development of improvement concepts and cost estimates, which include approximately $54 million in hydraulic improvements and $127 million in water main replacement. Included prioritizing these improvements within the water system capital improvements plan and ultimately funding these improvements.
- **Downtown Water and Sewer Master Plan, Fargo, ND - Hydraulic Modeling Engineer.** Development of a master plan for the Downtown area to enable the City to understand the long-term needs and capacities of water and sewer infrastructure within the area. This project included an update of the current water distribution model, as well as the expansion of the existing dynamic collection system model that was developed for the City in 2013.
- **Hydraulic Analysis of Northwest Area, Sioux Falls, SD - Hydraulic Modeling Engineer.** Hydraulic analysis for determining how to serve new industrial development in the NW area of Sioux Falls. Evaluating the ability of the existing system to serve this new growth area along with analyzing the possibility of a new pressure zone. Analysis included the interaction of the system with service from the Lewis and Clark Rural Water System. A technical memorandum provided recommendation for future water main and water storage improvements.
- **Water Distribution Model, St. Louis Park, MN - Hydraulic Modeling Engineer.** Development and calibration of the City's water distribution system. Work included creating the model from the City's GIS database, allocating geo-coded demands, and calibrating the hydraulic model. The model is used to analyze the impacts of replacing and upsizing existing cast-iron water main on pressures and available fire flow. With ongoing redevelopment, the hydraulic model is used to ensure adequate capacity for the increase in population density related to mixed used multi-family housing.

EDUCATION

Master of Science, Civil and Environmental Engineering, South Dakota State University; Bachelor of Science, Civil and Environmental Engineering, South Dakota State University

REGISTRATIONS/CERTIFICATIONS

Professional Engineer: North Dakota, Minnesota, South Dakota

Certified Master Modeler: Water Distribution Systems

CONTACT

Brian.Weiss@ae2s.com
T: 701-746-8087

WHY BRIAN?

Brian is AE2S' lead modeling expert and brings a wide breadth of experience and unmatched technical acumen. Brian has received formal training and been recognized as a "Certified Master Modeler" by the Bentley WaterGEMS company.

Boone Maruska, PE

Wastewater Modeling Engineer

Mr. Maruska has a wide variety of experience working with municipalities including both as an engineer and as an operator. Areas of specialized expertise include hydraulic modeling, pipeline design, master planning, and water/wastewater system analysis and monitoring.

SPECIFIC RELEVANT EXPERIENCE

- **Broadway Interceptor Collection System Monitoring, Fargo, ND - Hydraulic Modeling Engineer.** Collection system monitoring to establish baseline flow information to help the City gauge the effectiveness of its efforts to remove sources of I&I within the collection system. Monitoring included the deployment of six flow meters, two automatic rain gauges, and five lift station monitors.
- **Downtown Water and Sewer Master Plan, Fargo, ND - Hydraulic Modeling Engineer.** Development of a master plan for the Downtown area to enable the City to understand the long term needs and capacities of water and sewer infrastructure within the area. This project included an update of the current water distribution model, as well as the expansion of the existing dynamic collection system model that was developed for the City in 2013.
- **Fargo South Side Water and Wastewater Master Plan, Fargo, ND - Hydraulic Modeling Engineer.** Development of a master plan for the South Side growth area of the City of Fargo to guide the infrastructure decisions for the next 20 years. The project includes the update of the current water distribution model as well as the development and completion of a static collection system model for the area.
- **Lift Station 48 Sewer Service Area Plan, Fargo, ND - Hydraulic Modeling Engineer.** Rehabilitation and upgrade of the existing lift station, including replacement of pumps, control panel, valve vault, piping, and valves to meet anticipated higher peak flow demands. Installation of a new generator, sluice gate and flow meter were included in this project. The project also included diverting a portion of the existing gravity flow to reduce flows to the lift station.
- **Water System Master Plan Update, Bozeman, MT - Hydraulic Modeling Engineer.** Facility Plan Update, including a water distribution system model update, fire flow analysis, pressure zone and pressure reduction study, water audit, CIP development, and a non-potable irrigation system study.
- **Hydraulic Analysis of Northwest Area, Sioux Falls, SD - Hydraulic Modeling Engineer.** Hydraulic analysis for determining how to serve new industrial development in the NW area of Sioux Falls. Evaluating the ability of the existing system to serve this new growth area along with analyzing the possibility of a new pressure zone. Analysis included the interaction of the system with service from the Lewis and Clark Rural Water System. A technical memorandum provided recommendation for future water main and water storage improvements.

EDUCATION
Bachelor of Science, Civil Engineering, North Dakota State University

REGISTRATIONS
Professional Engineer: North Dakota

CONTACT
Boone.Maruska@ae2s.com
T: 701-364-9111
C: 701-388-5732

WHY BOONE?

Boone has worked closely with Brian on multiple projects, including modeling two areas of Fargo, ND where the City was experiencing challenges.

Justin Klabo, PE, CFM

Stormwater Modeling Engineer

Mr. Klabo has extensive design and construction experience in a range of water resources projects. Mr. Klabo's AE2S and prior experience includes serving as the project manager, lead modeling engineer, design engineer and in construction oversight roles for projects including urban storm sewer analysis, flood mitigation, 2-D watershed modeling, FEMA permitting, watershed studies, stream restoration, stormwater basins, regulatory permitting, site design, and erosion and sediment control.

SPECIFIC RELEVANT EXPERIENCE

- **St. Paul Campus Hydraulic Analysis (University of Minnesota), St. Paul, MN - Project Engineer.** Developed a campus-wide hydrologic and hydraulic XPSWMM model for the 700-acre campus. The campus experiences a variety of flooding, impacting day-to-day operations. The model was developed to identify undersized pipe segments and develop alternatives to mitigate downstream flooding. Inundation mapping was prepared detailing the benefits of the various alternatives evaluated.
- **Greenwood at Carlos Avery 2-Dimensinoal Floodplain Analysis, Wyoming, MN - Project Manager.** A development was proposed adjacent to the Carlos Avery State Wildlife Management Area which is a complex wetland system spanning over 15,000 acres. Developed the work plan to analyze the FEMA Zone A floodplain to accurately determine the 100-year flood elevations along the development to meet all local, state, and federal building requirements. The MnDNR was engaged at the onset of the project to obtain buy-in on the modeling approach and it is currently in process to be the first 2-Dimensional floodplain model utilizing the rain on grid hydrologic approach to be approved by FEMA in Minnesota.
- **County Ditch 12 Flood Mitigation Improvements, Worthington, MN - Project Manager.** The complex watershed improvement project included the design of two box culverts under arterial roadways and a flood storage basin along I-90 within the City. The project included XPSWMM watershed modeling for County Ditch 12, land acquisition on over 15 acres of property, reconstruction of arterial and local roadways, utility replacement, and construction document preparation. The project was funded as part of a FEMA HMGP grant which required a Benefit-Cost-Analysis prepared in accordance with FEMA requirements to ensure the project is beneficial and can be approved for construction. In addition, the project was permitted through the local Ditch Authority board under Mn Statue 103E, as well as through the DNR hydraulics team for CLOMR approval.
- **Hydrologic and Hydraulic Analysis and Inundation Mapping for Haines Avenue, Robbinsdale Drain, and South Canyon Creek, Rapid City, SD - Project Engineer.** Development of hydrologic models for over ten square miles of Rapid City and inundation mapping for over six miles of flooding sources. HEC-HMS and SWMM hydrologic models were developed, as well as SWMM and HEC-RAS hydraulic models for three drainages.
- **Brown Ditch, Lake Eliza & 700N Hydraulic Analysis, Porter County, IN - Project Engineer.** Hydraulic analysis of watersheds consisting of urban and rural land. Developed an XPSWMM 1 D/2-D model for each area to analyze the hydraulic conditions of the stream. The model combined the traditional 1-D (cross-sections, channels, pipes, and culverts) analysis with a 2-D (grid to represent the topography) surface. This approach enabled graphical display of flow patterns, velocity, and inundation depths along the flood risk areas. Alternatives were developed to reduce the flood risk areas.

EDUCATION
Bachelor of Science, Civil Engineering, University of North Dakota

REGISTRATIONS
Professional Engineer: Minnesota
Certified Floodplain Manager (CFM)

CONTACT
Justin.Klabo@ae2s.com
T: 763-463-5036

WHY JUSTIN?

Justin brings a keen eye for detail and creative solutions, and excels at stormwater modeling.

Kevin Smith, AICP

Municipal Management Specialist

Mr. Smith has over 20 years of experience and a broad background in municipal government, including specific experience in the fields of public works and planning. He has managed the development and administration of capital and operating budgets for various city functions including street, water, engineering, water reclamation, storm drainage, landfill, and electric light operations. Prior to working for AE2S, Kevin worked as the Assistant Director of Public Works in Sioux Falls, SD.

SPECIFIC RELEVANT EXPERIENCE

- **Comprehensive, Growth, and Financial Planning, Williston, ND - Municipal Management Specialist.** Responsible for overseeing the development of a 6-year growth projection forecast associated with capital improvement plans and financial analysis related to growth impacts. Other responsibilities included identifying strategic initiatives needed to support present and future growth, quantifying capital investments required to manage growth, and implementing initiatives as directed by City leaders. Initiatives have included coordinating the implementation of an asset management program in the Public Works Department, administering a capital improvements program, procuring consultant services for selected capital projects, managing an IT needs assessment, facilitating a stormwater utility research plan, and coordinating various inter-agency meetings.
- **Water System Master Plan, Chadron, NE - Technical Resource.** Project includes development of a formal Capital Improvements Program and establishment of growth-related policies to plan for the expansion of the municipal water system. Key planning assumptions for the 20-year planning horizon include population, service area, and anticipated land use changes for the project area.
- **Public Works CMMS Implementation Phase 1, Williston, ND - Project Manager.** Project to implement an asset management system for the City Public Works Department, including development of work order protocols, software configuration, and GIS integration for the Water Resources Recovery Facility, water distribution system, and sanitary sewer collection system.
- **CMMS Implementation Phase 4, Fargo, ND - Municipal Management Specialist.** Development of training materials for Azteca Cityworks, training end users and administrators on functions and capabilities of Cityworks, and providing on-going support during Go-Live of the software. AE2S also assisted the City in developing custom reports to be used within Cityworks.
- **Stormwater Utility Feasibility Study, Jamestown, ND - Municipal Management Specialist.** Project consists of an analysis to determine the feasibility of establishing a stormwater utility to fund the City's stormwater management program, including the crafting of a strategic communications plan and accompanying material to convey the project to all of the stakeholders involved.
- **Stormwater Utility Feasibility Analysis, Williston, ND - Lead Analyst.** Project to assist the City of Williston with examining the feasibility of implementing a fee-based stormwater utility to more equitably distribute the cost of providing stormwater management services to its utility user base and establish a stable revenue stream to fund their stormwater program.

EDUCATION

Master of Arts Degree in Geography, Emphasis on Regional Planning, Western Illinois University;
Bachelor of Science, Geography, South Dakota State University

REGISTRATIONS

American Institute of Certified Planners (AICP)

CONTACT

Kevin.Smith@ae2s.com
T: 605-275-5620
C: 605-261-8926

WHY KEVIN?

Kevin is an experienced Municipal Management Specialist who played a key role in infrastructure planning projects.

Carol Wickenheiser, GISP

GIS Specialist

Ms. Wickenheiser has 25 years of GIS experience in local government, having previously worked at Clay County as a GIS Database Administrator. She has experience using GIS for land records in relation to creating, editing, and researching parcels; SQL database administration and querying; cartographic production; and GIS analysis.

SPECIFIC RELEVANT EXPERIENCE

- **Stormwater Utility Implementation, City of Jamestown, ND - GIS Specialist.** Used existing AutoCAD data to create property parcels, use property types to determine impervious surface estimates to assist with benefit areas.
- **Flood Prevention/Mitigation support, FM Area Diversion Project - GIS Specialist.** Provided mapping support for land acquisition team for FM Area Diversion Project, including workflow manager program, parcel maintenance, and flood plain impact analysis.
- **GIS Tax Parcel Maintenance, Clay County, MN - GIS Database Administrator.** Responsible for maintaining tax parcel boundaries in the County's GIS system. Worked with surveys, plats, and deed documents to create new parcel boundaries as properties were split. Using SQL query language, extracted and compiled tax, value, and property description data from the County tax system and other sources to join with parcel geometry for use among county departments and in online mapping.
- **Workflow Coordination, Clay County, MN - GIS Database Administrator.** Collaborated with County and City departments to devise an efficient workflow process for handling property splits and parcel boundary change information. Provided a better understanding for all interested parties of how a plat or split flows through appropriate channels within County and City departments, from landowner through official recording to display on a map. Worked with a third party vendor to create a software program that would automatically track and email appropriate departments throughout the workflow process.
- **County Road Maintenance District Mapping, Clay County, MN - GIS Database Administrator.** Clay County's highway department maintains many miles of county and township roads year around. Provided highway department staff with maps showing each driver's responsibility area for both summer and winter maintenance. Several meetings were held with the drivers and their supervisor to distribute the workload more equitably, utilizing GIS mapping capabilities. In addition, performed analysis of route miles and available property on which a new highway department garage would best be located that could take the place of two to three existing older garages.
- **School District Boundary Relocation, Clay County, MN - GIS Database Administrator.** Relocation of school district boundaries requires legislative action. Two school districts within the County recently agreed upon property swaps within the districts to make the boundaries more closely match the jurisdictional boundaries. Prior to the proposed land swaps, gathered data for use in maps showing valuation information and referendum values which were analyzed to make the land swap as equitable as possible.

EDUCATION

Bachelor of Arts, Business Administration and Spanish, Concordia University

REGISTRATIONS

GISP (Geographic Information Systems Professional)

CONTACT

Carol.Wickenheiser@ae2s.com
T: 701-364-9111

WHY CAROL?

Carol brings a strong background with integration of information with existing GIS systems.

Dan Lissick
GIS Specialist

Mr. Lissick has experience in GIS data creation and infrastructure surveying for highway, agriculture drainage, and county GIS systems. Dan previously worked for the Stevens County Highway Department in Morris, MN as an Assistant Ditch Inspector/GIS Technician.

SPECIFIC RELEVANT EXPERIENCE

- **Downtown Master Plan, Fargo, ND - GIS Specialist.** Created a series of maps depicting utility diameter, material, and main breaks for water, storm sewer, and sanitary sewer utilities. Analyzed available fire flows and compared values to require fire flows to determine areas in need of improvement. Using 2014 average-day water demands, peak-day water demands, and average-day wastewater flows as a base line helped to analyze potential medium- and high-density scenarios for each utility type described above for the downtown study area.
- **South Side Master Plan, Fargo, ND - GIS Specialist.** Mirrored existing zoning information and applied it to a designated planning boundary based on similar land use corridors and ratios for water and sanitary sewer modeling. Developed a series of maps displaying the new land use ratios per section and existing utility locations based on diameter. Created a second land use scenario factoring in the FM Diversion not being developed.
- **Water Systems Master Plan, Bozeman, MT - GIS Specialist.** Spatially joined water meter data to parcel, land use, zoning, and subdivision datasets for the purpose of further analysis of water characteristics. Displayed available fire flow, water meter, and land use data sets on a variety of map templates.
- **Water Facility Plan Update, Kalispell, MT - GIS Specialist.** Analyzed water demands from water meter data to project water use for future land use and population growth. Map figure creation of current and future water system master plan.
- **FM Diversion, Fargo, ND and Moorhead, MN - GIS Specialist.** Creation of property maps showing land exchange between landowners and Diversion Authority. Reproduced overall project maps with updated design and parcel statutes for organizational purposes. Used model builder to automate extraction of tabular information from GIS attribute table to Excel format. Created standard operation procedure documents for easy-to-follow instructions on document extraction, model building, and general processes.
- **GIS Upgrades, Mandan, ND - GIS Specialist.** Attached scanned as-built utility plans for Mandan's water, sanitary sewer, and storm sewer GIS feature classes. Using the as-built plans determined the proper material, size, and pipe status of the utility segments. Transferred survey data of storm sewer and sanitary manholes to GIS feature classes for invert depth, material, diameter, and pipe flow.
- **Infrastructure Loan Maps, Grand Forks, ND - GIS Specialist.** Supported engineering staff with a series of maps depicting municipal infrastructure and cadastral GIS information for site referencing.

EDUCATION
Bachelor of Science, Geography, University of North Dakota

CONTACT
Dan.Lissick@ae2s.com
T: 701-364-9111

WHY DAN?

Dan has a variety of field and office mapping experience. He has incorporated plat information into a coordinate-based mapping system.

Shawn Gaddie, PE

Funding/Financial Services

In addition to providing traditional water, wastewater, and stormwater professional engineering services, Shawn has spent a good portion of his career focusing on infrastructure asset management and municipal and utility enterprise financial planning. Shawn has helped a number of clients procure funding, conducted multiple cost of service, rate design, and revenue adequacy analyses for a number of utility enterprises throughout the region. This work has included water, wastewater, and stormwater utilities.

SPECIFIC RELEVANT EXPERIENCE

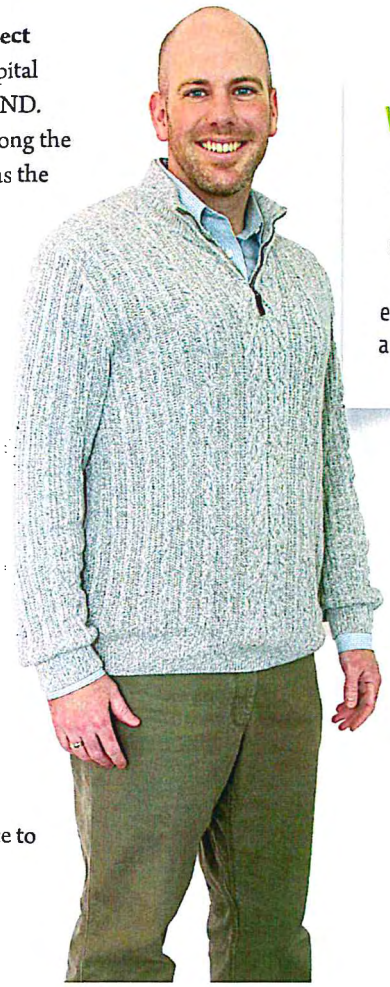
- **Multi-Year Infrastructure Planning, Grand Forks, ND - Project Manager.** Study that addressed the needs of the City's water, wastewater, and stormwater utilities, developed a prudent operating and capital plan for each, analyzed potential revenue sources beyond traditional utility rate revenue to fund the City's multiple needs, performed a revenue adequacy analysis to determine the City's funding gap, and made recommendations regarding funding scenarios to fill the identified funding gaps and ultimately achieve the long-term financial objectives of the City.
- **Water System Financial Planning, Fargo, ND - Project Manager.** Multi-year revenue adequacy analysis of the City's water enterprise fund. Analysis included a comprehensive look at annual revenues and revenue requirements including capital improvements planning and consideration for service to various consecutive outside city users.
- **Growth Planning and Financial Gap Analysis, Williston, ND - Project Manager.** Comprehensive level of service analysis to determine the capital and operational needs of this fast-paced growth community in western ND. The project included a broad benchmarking analysis of communities along the projected growth path of the City to establish consistent service levels as the City grows. The final component of the project was a comprehensive financial analysis of all growth impacted revenues and expenses for the key City funds analyzed to determine the outside State funding needs of the City.
- **Asset Management Program Development and Software Selection, Fargo, ND - Project Manager.** Study that assisted the City in laying the ground work for City-wide Asset Management Program. The project consisted of an evaluation to select an asset management software that will be initially integrated into the City's public works department with an eye toward broader integration to meet the long-term goals of applying asset management program initiatives across the entire City.
- **Water Utility Revenue Adequacy Model Update, Fargo, ND - Supervisor.** Update to the City's existing Water Revenue Adequacy model with current budget information and development of a 20-year proforma of projected revenues and revenue requirements. Scenario evaluations including rate adjustment scenarios, capital prioritization scenarios, and a scenario incorporating the anticipated revenue requirements and revenues associated with water and wastewater service to the City of West Fargo.

EDUCATION
Bachelor of Science, Civil Engineering, North Dakota State University

REGISTRATIONS
Professional Engineer: North Dakota
SEC Series 50 Municipal Advisor

TRAINING
AWWA Financial Management Training: Cost of Service Rate-Making

CONTACT & LOCATION
Shawn.Gaddie@ae2s.com
Grand Forks, ND
T: 701-746-8087
C: 701-866-3639



WHY SHAWN?

Shawn leads AE2S' financial division and has the perfect combination of engineering expertise and financial acumen.

6
SIMILAR PROJECT EXPERIENCE

Our team's experience with the City of West Fargo and the region provides the confidence that the best available technologies, models, and financial analyses are being incorporated to maximize its operational effectiveness, minimize operator obligations, and reduce user costs.

The projects showcased in this section demonstrate our ability to provide responsive service. For each project listed in this section, we include a project reference. We invite you to call these individuals to discuss our project performance, the solutions we provided to resolve unique issues, and our level of client service.

SNAPSHOT OF RELEVANT EXPERIENCE	MASTER PLANNING			MODELING			ADDITIONAL SERVICES			
CLIENT	WATER	WASTEWATER	STORMWATER	WATER	WASTEWATER	STORMWATER	ASSET MANAGEMENT	FUNDING/FINANCIAL SERVICES	GIS	SURVEYING
City of West Fargo, ND	X			X						
City of Fargo, ND	X	X	X	X	X	X	X	X	X	X
City of Grand Forks, ND	X	X	X	X	X	X	X	X	X	X
City of Jamestown, ND			X	X		X		X		
City of Bismarck, ND	X		X	X		X				X
City of Mandan, ND	X	X		X	X			X	X	X
City of Williston, ND	X	X	X	X		X	X	X		X
City of Wahpeton, ND		X			X					
City of Watford City, ND			X			X		X		X
City of Sioux Falls, SD			X	X		X		X		
City of Rapid City, SD			X	X		X		X		X
City of Spearfish, SD			X			X				
City of Sturgis, SD		X				X	X			
City of Eagle Lake, MN	X	X			X			X		
City of St. Cloud, MN	X									
City of Bemidji, MN	X	X		X	X					
City of Minnetonka, MN			X			X				
City of Worthington, MN			X			X				
City of Otsego, MN		X					X	X		
City of Grand Marais, MN		X			X		X			
Grand Rapids Public Utilities, Grand Rapids, MN							X			
City of Helena, MT			X			X				
City of Bozeman, MT	X			X			X			
City of Kalispell, MT	X	X		X	X		X			
City of Havre, MT		X			X			X		
City of Great Falls, MT	X			X				X		
City of Whitefish, MT	X			X				X		
City of Chadron, NE	X			X						

Fargo, North Dakota

FARGO WATER SERVICE TO WEST FARGO

Background

The City of West Fargo is a growing and prospering community that relied on multiple groundwater wells to provide water to its residents. The reliability and sustainability of their aquifer was uncertain, and with limited water treatment West Fargo had fielded water taste, odor, and color concerns from its residents. As a way to address aquifer limitations and water quality concerns, West Fargo explored alternate water supply options, one of which included purchasing treated water from the City of Fargo as a possible solution to their concerns.

Connecting the Two Cities

To analyze the possibilities for connection between these two systems, the hydraulic models from each City were utilized to determine the ability of the existing Fargo distribution system to supply water to the West Fargo distribution system. This analysis consisted of modeling the average, peak, and diurnal flow characteristics of the two systems. This analysis resulted in the conclusion that booster pump stations would be necessary to provide adequate water flows to the City of West Fargo.

Booster Pump Stations Design

AE2S, in association with B&V, designed two booster pump stations to allow for balanced water pumping into the West Fargo system. A third future pump station location was also identified to allow for future West Fargo growth. Each pump station includes three vertical end suction pumps with a total pump station capacity of 3.5 MGD and an on-site natural gas generator to ensure uninterrupted water supply to West Fargo.

Water Quality Changes and Public Outreach

Precautions were taken to minimize the impacts of changing water quality within the West Fargo system during the transition to Fargo water. Phosphate was temporarily dosed at the booster stations to minimize corrosion concerns. A unidirectional flushing plan was developed to allow the West Fargo system to be completely flushed before Fargo water was introduced. This process involved dividing the City into 20 flushing zones, working with the City to accomplish the flushing, and using an extensive public outreach effort (with online flushing progress maps, website updates, flyers, and phone calls) to let citizens know when they were receiving Fargo water and how to flush their in-home piping.

Timely Delivery and Financial Success

The project was delivered on a very tight schedule to meet a strict operational completion date to ensure West Fargo had adequate water supply to meet summer demands. The project received 60 percent grant funding from the SWC. The project's construction cost was under the budgeted estimate and the project has been a financial success for the City of Fargo, providing roughly a 20% increase in annual water sales revenue.

CLIENT
City of West Fargo

CLIENT CONTACT
Chris Brungardt
Public Works Director
701-433-5400

DATE
2016

PROJECT COSTS
$4.1 Million

CLIENT
City of Fargo

CLIENT CONTACT
Troy Hall
Water Utility Director
701-476-6741

KEY PROJECT ELEMENTS

- Hydraulic Modeling
- Booster Stations
- Unidirectional Flushing Plan
- Financial Planning and Grant Funding
- Corrosion Inhibition
- Public Outreach

Fargo, ND

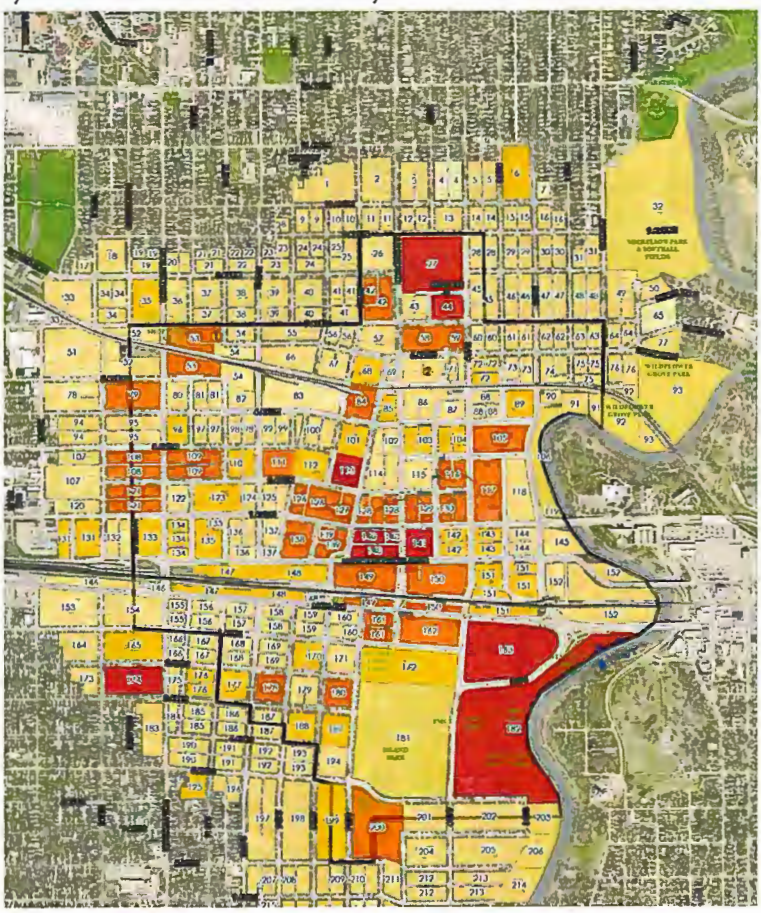
DOWNTOWN WATER AND SEWER MASTER PLAN

The City of Fargo has seen extensive growth and redevelopment within its downtown area. With growth and redevelopment comes increased strain on the City's water distribution and wastewater collection infrastructure. The City retained AE2S to study and assess the capabilities and limitations of the existing water distribution and wastewater collection systems located downtown. The study included identifying system deficiencies and prioritizing improvements necessary to meet current and future water distribution and wastewater collection needs caused by the growth and redevelopment of the downtown area.

The analysis of the water distribution system included utilization of the City's existing water distribution hydraulic model. The focal point of the analysis included evaluating fire flow requirements for existing conditions as well as for multiple redevelopment scenarios. The water distribution hydraulic model was utilized to determine appropriate pipe sizes in order to accommodate existing and projected fire flow, pressure, and capacity needs.

The analysis of the wastewater collection system included expansion of an existing wastewater system hydraulic model. The model was expanded by gathering existing collection system manhole invert and pipe information. Once the hydraulic model was updated, the model was calibrated by installing flow meters in various locations on the collection system to monitor normal flows and peak flows caused by rain events. The flow meter data allowed the model to simulate dry and wet weather events under existing conditions and for various redevelopment scenarios.

The Downtown Water and Sewer Master Plan resulted in a comprehensive water and sewer infrastructure improvements plan which included recommended improvements according to priority ranking. The priority ranking was developed for water and sewer infrastructure components based on infrastructure material, infrastructure age, maintenance history, capacity and pressure limitations, and street condition. The City can utilize the Master Plan to determine if redeveloped areas can be sufficiently serviced by existing infrastructure, or if the redevelopment will require replacement of existing water and wastewater infrastructure.



DATE
2015 - 2017

PROJECT COSTS
$237,500

CLIENT
City of Fargo

CLIENT CONTACT
Bruce Grubb, PE
City Administrator
701-241-1525

KEY PROJECT ELEMENTS

- Condition Assessment
- Future Infrastructure Planning
- Distribution System Modeling
- Collection System Modeling
- Infiltration and Inflow Analysis

Fargo, ND

LIFT STATION ASSESSMENT - PHASE I

Defining the Problem

As the City of Fargo continues to provide service to more customers, grow beyond their current city limits, offer wastewater service to outside municipalities and entities such as West Fargo and Horace, and expand service to Cass County rural customers, the wastewater system will experience more strain, requiring increased inspections and maintenance. In addition to additional maintenance, it is likely that the City will add new sanitary lift stations as needed, requiring significant time, staffing, and financial resources (both capital and operational) investments. To help manage these investments, the City retained AE2S to develop a methodical risk and prioritization tool in order to minimize investments and maximize benefits.

Phase I of the Fargo Lift Station Risk Assessment Project included developing a risk assessment spreadsheet model. The risk assessment spreadsheet model evaluates each individual sanitary lift station based on specific sanitary lift station criteria, which yields a prioritized list of sanitary lift stations according to their calculated risk scores.

Collaborative Effort

AE2S staff worked closely with City of Fargo Wastewater Utility staff to develop and rank specific sanitary lift station criteria through a series of interactive workshops. The sanitary lift station criteria were separated into two categories: **Consequence of Failure** and **Likelihood of Failure**. The Consequence of Failure evaluation provides a better understanding of how critical the sanitary lift station is to the wastewater system, as well as the over-arching consequence that could burden the wastewater collection and pumping system in the event of a failure. The Likelihood of Failure Evaluation provides a better understanding of how susceptible the sanitary lift station is to failure. The focal point of the likelihood of failure criteria was assessing the current condition of various sanitary lift station components.

Looking Ahead

Phase II of the Fargo Lift Station Risk Assessment Project is planned to include the following tasks:

- Sanitary lift station inspections to field verify the condition assessment scores from Phase I.
- Development of a rehabilitation and replacement (R&R) Model to analyze sanitary lift station component failure probability. Also included in the R&R Model will be preliminary opinions of probable cost for sanitary lift station improvements and baseline scenarios of "acceptable risk."
- Cityworks® customization to modify the monthly inspection interface to include the sanitary lift station criteria developed in Phase I, as well as ensure monthly inspections are detailed and returning valuable information.

DATE
2017 - Present

PROJECT COST
$59,000

CLIENT
City of Fargo

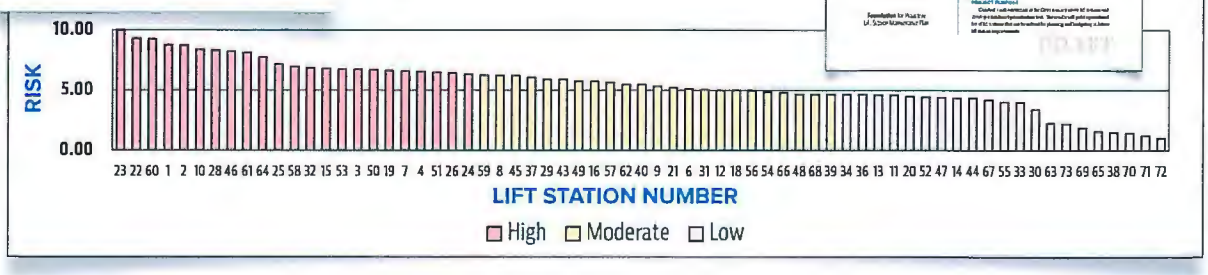
CLIENT CONTACT
Jim Hausauer
Wastewater Utility Director
701-241-1454

KEY PROJECT ELEMENTS

- Systematic Decision Analysis
- Sanitary Lift Station Condition Assessment
- Fully-Customized Risk Assessment Process
- Sanitary Lift Station Improvement Prioritization

The Lift Station Risk Assessment and Improvement Prioritization project compiled operation and condition data and yielded a prioritized improvement list.

RISK ASSESSMENT RESULTS

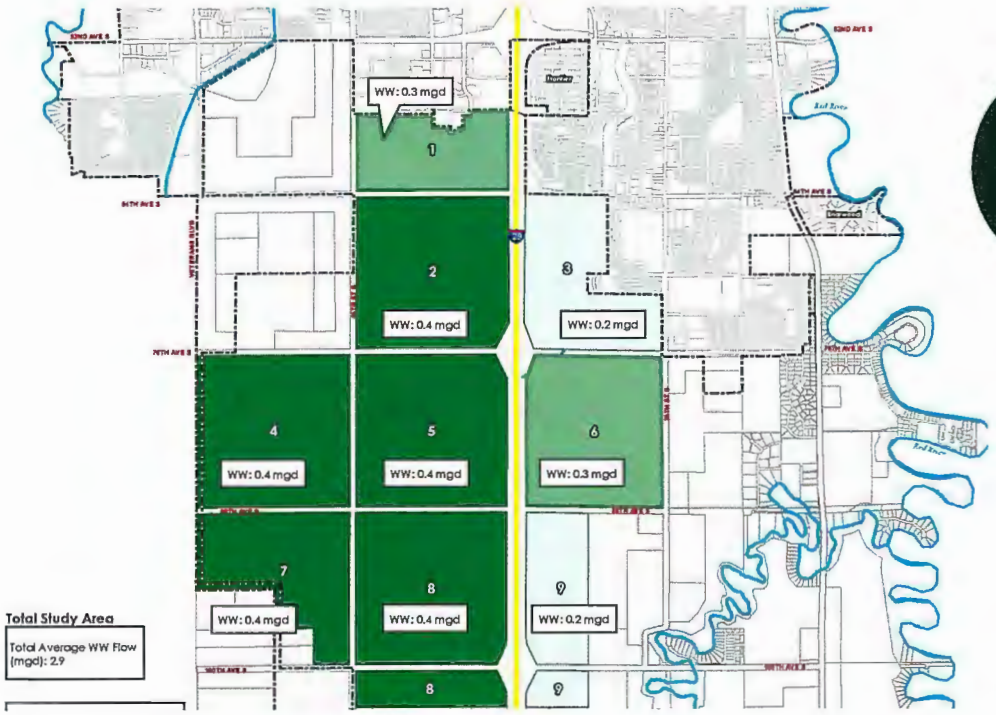


Fargo, ND

SOUTH SIDE WATER AND SEWER MASTER PLANNING

Fargo is a growing, dynamic community that has experienced constant population growth over the last 50 years. Growth is expected to continue, with the majority of the City's growth anticipated to occur south of the current city limits. As such, the City of Fargo retained AE2S to develop the South Side Water and Sewer Master Plan, which will provide a framework for infrastructure implementation to address future water and wastewater system needs in the South Side Study Area.

The project is comprised of various components, including projecting future water demands and wastewater flows for two development scenarios, developing improvement concepts to provide water and wastewater service to future growth areas, modeling water and wastewater system concepts, and producing final recommendations for future infrastructure implementation based on modeling results.



DATE
2015 - Present

PROJECT COSTS
$249,000

CLIENT
City of Fargo

CLIENT CONTACT
Bruce Grubb, PE
City Administrator
701-241-1525

KEY PROJECT ELEMENTS

- Future Infrastructure Planning
- Water Usage Analysis
- Collection System Modeling
- Infiltration and Inflow Analysis
- Water Demand Projections
- Wastewater Flow Projections

Grand Forks, North Dakota
INFRASTRUCTURE PLANNING

Water System Planning

AE2S has helped the City of Grand Forks with utility planning since the inception of our firm. In 1997, the City enlisted AE2S to assist with the development of a draft Water System Concept Plan to address various challenges and deficiencies related to the water supply, treatment, and residuals management systems. The plan served as the springboard to more detailed facility planning and led to the implementation of relatively large water infrastructure improvements.

Wastewater System Planning

AE2S has similarly provided Grand Forks with Wastewater System Planning assistance. AE2S developed four planning documents for the Wastewater Utility. The first document provided a planning baseline to establish planning-level guidelines including water demands, wastewater generation rates, land use planning, planning horizons, and population projection considerations. The second document was a Wastewater Collection System Master Plan; the third document was a Wastewater Treatment Plant Concept Plan; and the fourth document compiled the results of the previous documents into a capital improvement plan and rate model for the wastewater system.

Multi-Year Infrastructure Planning

More recently, the City of Grand Forks was facing significant infrastructure needs related to the City's Water, Wastewater, and Stormwater Utilities, as well as impending significant rehabilitation and new capital projects relating to the City's street/transportation infrastructure. The City retained AE2S to complete a Multi-Year Infrastructure Planning and Financial Services Study to help technically and financially quantify their infrastructure needs and develop a plan to best address them.

Developing a Plan

One of the initial steps of the study was a review of existing pertinent information, conducting staff input meetings to ascertain development, estimate growth potential, and identify the needs of the individual utilities. Utilizing the information obtained, Capital Improvement Plans (CIPs) were developed and/or refined for each utility. Potential revenue sources applicable to the respective utilities were identified, including grant funds, property taxes, special assessments, sales tax, access charges/impact fees/cost recovery, and utility fees. A Revenue Adequacy/Gap Analysis was then performed where existing revenue sources were modeled to determine whether the resulting revenues would adequately meet the projected revenue requirements. The revenue adequacy model projected revenues and expenses using information gathered previously. To address the findings of the Revenue Adequacy/Gap Analysis, a series of scenarios were analyzed with the goal of "gap elimination." Based on the results of the scenario analysis, AE2S prepared a study report which documented all findings and presented a recommended plan.

DATE
1997 - Present

CLIENT
City of Grand Forks

CLIENT CONTACT
Todd Feland
City Administrator
701-787-3750

KEY PROJECT ELEMENTS
- Hydraulic Modeling
- Water and Wastewater System Planning
- Development of CIPs
- Revenue Adequacy/Gap Analysis

West Fargo, North Dakota

WATER TREATMENT FACILITY MASTER PLANNING

Growing Pains

The City of West Fargo, North Dakota has had the good fortune of significant growth over the past 20-plus years. This growth symbolizes a bustling economy that would be welcomed by almost any community. The City of West Fargo grew from a population of 15,000 in 2000 to a population of nearly 26,000 people in 2008, making it one of the fastest growing communities within North Dakota. However, due to this growth, the City began to experience significant challenges with its water infrastructure. The ground water supply system (West Fargo aquifer) consisted of a dispersed well system, with seven wells operating under five permits. The limited local ground water resources had prompted the City to hire AE2S to investigate a new surface water source (Sheyenne River) to meet its water demands. The project began in June 2008 with the assessment of the technical feasibility of producing potable water of exceptional quality from the Sheyenne River and/or the West Fargo Aquifer at an economical cost.

Technology Selection Driven By Goals and Regulations

As West Fargo transitioned from a ground water source into a surface water source or a combination of ground water and surface water, the existing treatment would not suffice. Conventional treatment techniques and advanced treatment techniques that could be used to meet the City's desired water quality goals and ensure protection of both surface water and ground water prior to entering distribution were examined. A Master Plan for the future West Fargo Water Treatment Facility (WTF) was the goal of the proposed year-long master planning effort. The report included a verification of the forecasted water demands, a review of the existing water quality and quantity supply plan, establishment of primary and secondary water quality objectives, institution of design standards and objectives, determination of feasible treatment technologies, anticipated water distribution system water quality impacts, identification of water treatment residual impacts, and preparation of preliminary capital, operation and maintenance (O&M), and life cycle costs.

Implementation Plan to Outline Future Direction

A goal of the City of West Fargo is to provide its residents with a high-quality, economical, and reliable supply of drinking water. However, to adequately meet these goals, the water supply, treatment, storage, and distribution infrastructure needed to stay one step ahead on every front. The City recognized that timing and prioritization were essential in the study, piloting, design, and implementation of this project because as demands and regulatory constraints increase, it would be increasingly difficult to continue to meet these challenges and economically provide a reliable quantity of quality drinking water. As part of the master planning effort, an implementation plan outlining the future direction for the City was established. The implementation plan provided the guidance that the City needed to make educated decisions for the future on the City's water system, from both a technical and a financial standpoint.

DATE
2008-2009

PROJECT COSTS
$175,000

CLIENT
City of West Fargo

CLIENT CONTACT
Chris Brungardt
Public Works Director
701-433-5400

KEY PROJECT ELEMENTS
- Master Planning Effort
- Familiarity with West Fargo
- Water Demand Forecasting
- Implementation Plan

Williston, North Dakota

WILLISTON COMPREHENSIVE INFRASTRUCTURE PLANNING

Future Possibilities for the City

In 2010, AE2S assisted the City of Williston with a comprehensive infrastructure planning effort to address significant population and industrial services growth within the City. The project included a review of transportation, water, wastewater, stormwater, solid waste, and institutional services. The project team documented the prioritized needs at projected future population milestones, and summarized the needs and corresponding cost estimates in a document that was subsequently presented to the North Dakota State Legislature in an appeal for assistance in meeting core infrastructure needs in the Williston area. The City was able to convey a compelling argument by illustrating the need to support the expanding oil industry that was fueling the state's economy.

Modeling and Evaluations

As part of a larger project team, AE2S was specifically tasked with performing detailed modeling and evaluation of alternatives for the planning for the water, wastewater, and stormwater systems. AE2S completed master planning-level efforts for these utilities and engaged in conversations with the community, developers, and other stakeholders to determine project priority. Through these efforts, the project team developed a list of projects that would most effectively encourage orderly growth while minimizing costs to the City. Once the community stakeholders were in agreement with priorities, AE2S engineering and marketing team members worked together to develop compelling materials to communicate the prioritized needs and costs to policy makers.

A Successful Master Plan

The plans that resulted from the infrastructure planning effort have been extremely successful, and the City continues to update the infrastructure master plan as new developments occur and additional developments emerge. The City has been able to effectively use the master plan to plan for and design infrastructure to appropriately serve both current and anticipated developments. The ability to plan for and appropriately "right-size" infrastructure prevents expensive parallel lines and wasted infrastructure development.

Due to the success of the infrastructure planning effort in 2010, the City of Williston engaged AE2S to update the capital infrastructure plan in 2012 and again in 2014. Efforts made in 2014 resulted in the 2015 state legislative session appropriating funding for the City for critical infrastructure projects.

City Trunk Sewer Projects

Master planning led to three significant trunk sewer projects for the City.

The Williston North Lift Station Sewer Extension included gravity mains (8,000 feet), force mains (9,400 feet), significant directional boring installation (4,900 feet total), and opened nearly 1,000 acres of additional development.

The Williston West Water and Sewer Extensions parallel US Highway 2. The sewer collection system was modeled and sized to serve the entire area on the west side of Williston and has the ability to be expanded.

Sand Creek Trunk Sewer includes services for an 1,800 acre service area.

DATE
2010 - 2014

CLIENT
City of Williston

CLIENT CONTACT
David Tuan
City Administrator
701-577-6368

KEY PROJECT ELEMENTS

- Sanitary Collection System Planning and Design
- Hydraulic Modeling and Water System Planning
- Public Education Program

Watford City, North Dakota

WATFORD CITY INFRASTRUCTURE AND FINANCIAL PLANNING

The City of Watford City and AE2S have collaborated on extensive planning studies over the past three years to identify needed infrastructure upgrades and planning best practices in the face of unprecedented energy-related growth. These efforts resulted in master plans for Growth Management, Proposed Land Use, Wastewater and Water, and Capital Improvements. With the strategic next steps in hand, the City acted to expand its wastewater treatment capacity and authorized design and construction of a new mechanical wastewater treatment facility. As part of the City's due diligence effort, the City asked AE2S to prepare a financial plan and funding options analysis for the new wastewater treatment facility.

One of the key components of financial planning for the City was conducting a revenue adequacy analysis of the City's water, wastewater, and street funds. The analysis reviewed utility operations in light of the upcoming costs associated with building and maintaining a mechanical wastewater facility, as well as the transition from sourcing and producing potable water to purchasing potable water supplied through the Western Area Water Supply Project.

As part of the funding option analysis, the project team, in conjunction with City officials, identified an innovative mix of potential State grants and growth-related fees to offset costs from construction of the new mechanical wastewater treatment facility. Due to the rapidly changing conditions resulting from growth, utility revenues and revenue requirements were forecasted for a three year time period. AE2S used this information, as well as information from the previous master planning efforts, to create materials to update and inform State officials of conditions in the City and reinforce the need for infrastructure improvements. Through these and other efforts, the City has been able to secure over $16 million in infrastructure funding.

CLIENT
City of Watford City

PROJECT COSTS
$41,900.00

DATE
2013

CLIENT CONTACT
Brent Sanford
Watford City Mayor
701-444-2533

KEY PROJECT ELEMENTS
- Financial Planning
- Growth Management Master Planning
- Proposed Land Use
- Water and Wastewater Master Planning
- Capital Improvements

Williston, North Dakota

GIS SURFACE SURVEY

Moving to Asset Management with a GIS-Centric Approach

The City of Williston worked to develop, implement, and establish a long-term preventative and condition-based maintenance program for equipment and infrastructure assets within the Public Works, Wastewater, Water, and Engineering Departments. The City's goal was to implement a Computerized Maintenance Management System (CMMS) to provide a GIS-centric work order management and asset inventory tracking system allowing access to data and reporting for several types of analysis.

The AE2S GIS team led workshops with several City departments, developed an Implementation Plan, and collected utility data in the field to fill in data gaps. Through this partnership, they transitioned from hosting their utility data on CAD layers to a GIS-friendly geodatabase. Data from the geodatabase is published to ArcGIS Online as feature services, which are referenced in web/mobile GIS applications and the asset management software.

Gathering User Input

AE2S' GIS team led workshops with several City Departments to discuss, review, and gain input on expanding the role of GIS to support departments city-wide and transitioning the GIS to be compatible with the City's CMMS. Utilizing input from the intended users of the GIS was crucial to building a GIS meaningful to the end user and able to be incorporated with CMMS.

Putting a Plan Together

The GIS Implementation Plan outlined the existing system and prioritized action items. This included creating objectives, analyzing existing data, and providing recommendations. From the Implementation Plan, the team identified GIS layers with data gaps. Fields were standardized for attributes. To spark conversation and provide a better perspective of the plan, diagrams showing the interaction of software, hardware, applications, and users, as well as anticipated workflow between the database datasets, department responsibilities, and applications used were created. These diagrams display the interaction of software, hardware, applications, and users. The diagrams also showed anticipated workflow between the database datasets, department responsibilities, and applications used.

Implementation

Based on strategies laid out in the Implementation Plan, the team surveyed water, sanitary sewer, and storm sewer system features, organized geodatabase features, updated schema datasets, and realigned system pipelines to corrected locations based on surveyed assets. In the final steps, the team provided the geodatabase to be referenced by GIS applications (desktop and web), and set up improved workflows by working with the City of Williston GIS staff to develop tools that automate repetitive and time consuming tasks.

DATE
2016

PROJECT COSTS
$497,000

CLIENT
City of Williston

CLIENT CONTACT
Bob Hanson
City Engineer
701-577-6368

KEY PROJECT ELEMENTS

- User Input Workshops
- GIS Implementation Plan
- Collection of Utility Data

7
REFERENCES

A good client/consultant relationship is often described by words such as trust, responsiveness, quality, and loyalty. We strive to develop exceptional client/consultant relationships which go beyond the norm by adding the value of knowing that your consultants are an extension of your staff, devoted to the success of your public utilities as a whole. We believe that exceptional relationships are the true measure of client satisfaction.

We have presented a few key references on this page, as well as in our related experience section.

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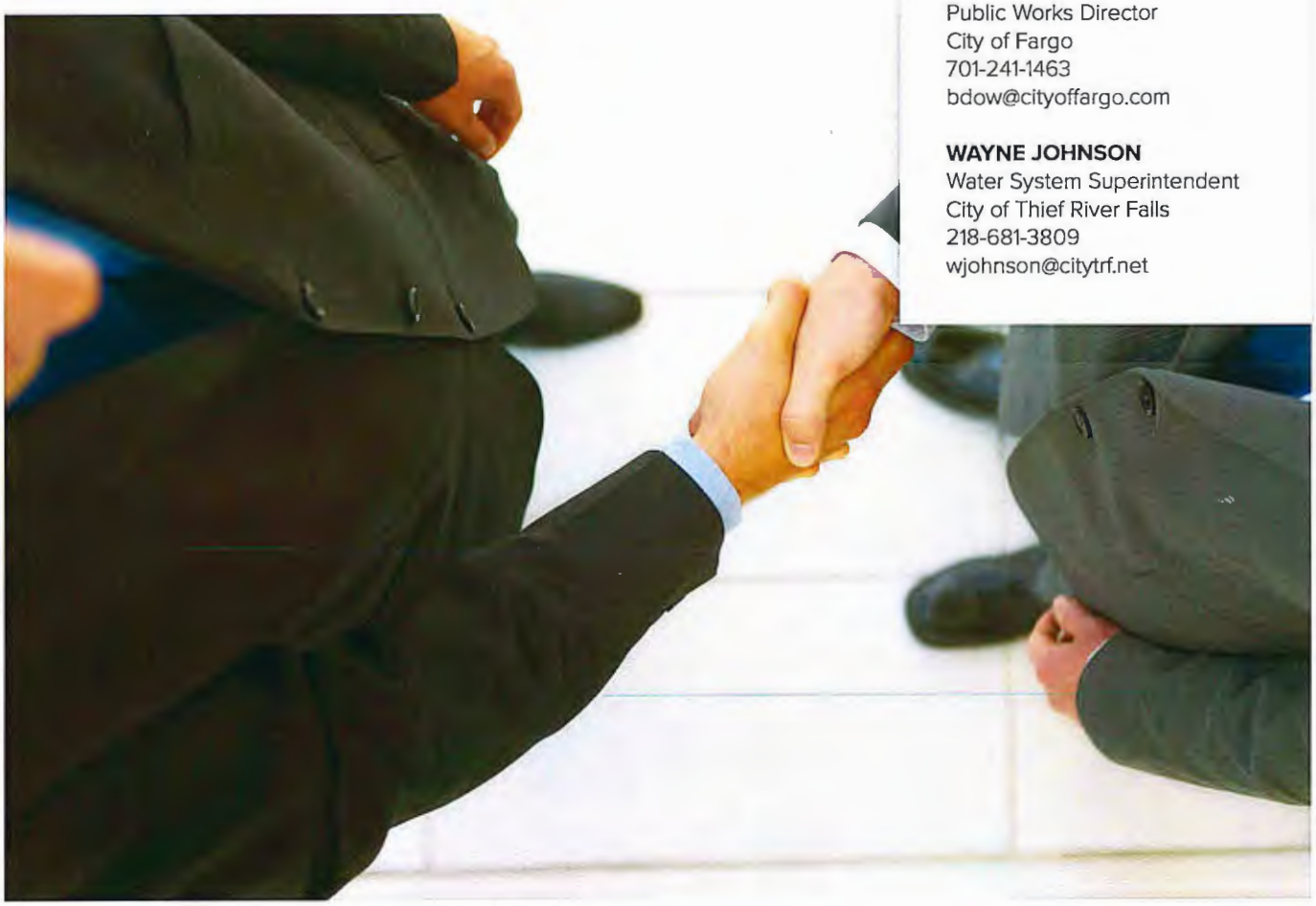
701-476-6741
thall@cityoffargo.com

TODD FELAND
City Administrator
City of Grand Forks
701-787-3750
tfeland@grandforksgov.com

BEN DOW
Public Works Director
City of Fargo
701-241-1463
bdow@cityoffargo.com

WAYNE JOHNSON
Water System Superintendent
City of Thief River Falls
218-681-3809
wjohnson@citytrf.net



A1
COST PROPOSAL

Cost Proposal Form

Core Area Infrastructure Master Plan

Cost Proposals shall be based on fixed fee lump sum but payments will be based on actual hourly rates. Attach basic fee structure and hourly rates for staff included on project.

Project Tasks

1.	Infrastructure Data Collection	$41,600
2.	Water Distribution System Modeling	$39,000
3.	Storm Sewer System Modeling	$43,500
4.	Infrastructure Data Entry	$18,900
5.	Evaluation of Existing Infrastructure	$39,500
6.	Prioritize Infrastructure Improvements	$20,800
7.	Construction Cost Estimating and Financing	$18,300
8.	City Involvement	$16,000
9.	Report Preparation	$57,900
	Project Total not to Exceed	$295,500

Firm: AE2S

Approved: Charlie Vein (Name) President (Title) 12-20-17 (Date)

KEY STAFF HOURLY RATES

Staff Member	Rate/Hour
Charlie Vein, Principal-in-Charge	$236
Brian Bergantine, Project Manager	$212
Ryan Grubb, Project Engineer	$152
Brian Weiss, Water Modeling Engineer	$188
Boone Maruska, Wastewater Modeling Engineer	$152
Justin Klabo, Stormwater Modeling Engineer	$173
Kevin Smith, Municipal Management Specialist	$196
Carol Wickenheiser, GIS Specialist	$122
Dan Lissick, GIS Specialist	$85
Shawn Gaddie, Funding/Financial Services	$212

A2
ACKNOWLEDGEMENT OF ADDENDA

ADDENDUM NO. 1
ACKNOWLEDGEMENT OF RECIPEIPT
Request for Proposals
For
Core Area Infrastructure Master Plan

The City reserves the right to revise the RFP at any time. The Respondent shall acknowledge receipt of an addendum in its Response. If the addendum occurs prior to the closing date for receipt of Response, the City may, in its sole discretion, allow respondents to amend their bid proposals in response to the City's amendment if necessary.

Signed	Charlie S Vein
By	Charlie Vein
Its	President
Company	AE2S
Date	December 20, 2017