

Houston  
Engineering  
Contract

P# 3701

CITY OF MINOT, ND

ENGINEERING SERVICES

SPECIFIC AUTHORIZATION NO. 6

## WATER DISTRIBUTION SYSTEM MODELING AND MASTER PLAN

Pursuant to Exhibit A of the Agreement for Engineering Services, dated September 20, 2006, by and between the City of Minot, ND (OWNER) and Houston Engineering, Inc. (ENGINEER), Specific Authorization No. 6 is hereby provided to the ENGINEER. The description of tasks herein supplements that within the Agreement for Engineering Services.

### OBJECTIVE

This Specific Authorization covers Study and Report Services for City system-wide water distribution system modeling and master planning to assist in recovery from impacts of the 2011 Mouse River flood.

### SCOPE OF WORK FOR STUDY AND REPORT SERVICES

The Study and Report scope of work consists of seven phases related to water distribution system hydraulic modeling and master planning. Each phase is further described as follows:

**PHASE 1 – DATA COLLECTION AND REVIEW:** This task includes review of previous modeling work and reports completed, including the 2004 comprehensive update for NAWS system integration (HEI/MWH), South Hill Water Distribution Report and South Hill 24 inch Line Preliminary Report (Ulteig, 2005), East Side – Valley Zone system expansion (HEI/MWH, 2006), and Northeast Industrial Park modeling updates (HEI/MWH, 2013).

Phase 1 also includes meetings to be held with City Staff including Public Works, Engineering, and Planning, to review current operational practices and issues, and to obtain land use and land planning information.

**PHASE 2 – CRITERIA DEVELOPMENT AND DEMAND PROJECTIONS:** Phase 2 consists of five tasks. Each task is further described as follows:

**Task 2.1 – Review and Prepare Land Use/Zoning Classifications and Mapping:** This task includes a review of land use/zoning to assess the existing and future zoning and land use within the City service boundaries. Land use, occupancy densities, water consumption billing data, and water production data will be reviewed to assess land use groupings, demand criteria, and appropriate peak demand ratios. The existing and future land use/zoning areas will be shown on a GIS base map to be used for subsequent modeling tasks. Areas will be identified as existing developed areas, potential developed areas, or permanent open space.

**Task 2.2 – Review Population Projections:** Population projections and land use data will be documented through discussions with City Planning. ENGINEER will meet with City staff to obtain input regarding projected growth and future land use for inclusion in the GIS map as previously described.

**Task 2.3 – Develop Model Calibration Plan:** ENGINEER will develop a model calibration plan to gather the necessary field data, in the form of fire hydrant flow and pressure data, to support model calibration. In conjunction with City staff, ENGINEER will prepare a map showing the locations of the fire hydrants to be field-tested. ENGINEER will accompany City staff for field data collection. ENGINEER will prepare and submit a calibration plan to the City for review and approval. Fire hydrant flow data in conjunction with pump status and tank levels from the City SCADA system will be provided by OWNER.

**Task 2.4 – Develop Water Demand Criteria and Demand Projections:** ENGINEER will prepare an analysis of the existing water system demands by user class including average annual, seasonal, maximum day/peak hour factors, bulk meter use (North Prairie Rural Water District and NAWS), and unaccountable water losses. The analysis will incorporate a 25-year planning horizon.

**Task 2.5 – Develop Design Criteria and Planning Level Unit Costs:** ENGINEER will work with City staff to develop design criteria comprised of the pipeline use (transmission vs. distribution), minimum/maximum velocities, head-loss criteria, fire flow requirements, reservoir storage, pressure reducing valve stations, booster pump station operating guidelines and requirements, and water quality guidelines. Planning level unit cost estimates will be prepared and reflected on a cost per inch diameter for the design and construction of underground facilities. Separate unit costs will be prepared to integrate the consequences associated with the existence or absence of pavement.

**PHASE 3 – MODEL DEVELOPMENT:** Phase 3 consists of two tasks. Each task is further described as follows:

**Task 3.1 – Derive Water System Operational Criteria:** Operating system information shall be derived by ENGINEER from interviews with City Public Works staff. Operating conditions will consist of control settings for reservoirs, booster pump stations, sources of supply, pressure zones, and pressure reducing valve features.

**Task 3.2 – Model Construction, Demand Development, and Mapping:** ENGINEER will develop a hydraulic model of the existing water distribution system, which will interface with GIS. The Innovyze InfoWater® hydraulic model developed and calibrated for the East Side Valley Zone projects will be utilized for analyzing water demands. The model output will be calibrated against the hydrant and system operational information gathered under previous phases.

ENGINEER will develop the model on a GIS base compatible with AutoCAD Map. OWNER will provide facility maps as as-built drawing files or shape files. ENGINEER will align the pipelines and other facilities in the model so that they match the locations in OWNER's drawing and shape files.

**PHASE 4 – WATER SYSTEM ANALYSIS:** Phase 4 has three primary components: 1) evaluation of transmission/distribution storage adequacy, 2) computerized analysis of the system capacity and identification of deficiencies under various scenarios, and 3) tabulation, prioritization, and cost estimating of all recommended improvements. Phase 4 consists of three tasks, each of which is further described as follows:

**Task 4.1 – Current Demand Analysis:** Once the model has been calibrated, ENGINEER will utilize the model to perform the following simulations:

- a. Static simulations of the current water system for minimum day, maximum day, maximum day plus fire flow, and peak hour conditions under current system demand values.
- b. Extended period simulations of the current system to identify operational deficiencies during wintertime minimum day (24 hour), summertime maximum day (24 hour), and summertime maximum day (168 hours).

**Task 4.2 – Evaluate Water Balance:** ENGINEER will perform a water balance calculation to evaluate the water system production, and storage and pumping requirements, compared to the estimated future demands of each pressure zone. The water balance analysis will assess the adequacy of the City's operational, emergency, and fire storage.

**Task 4.3 – Compile Existing System Deficiencies:** The current condition simulation of the recommended system will provide the basis for the identification of existing deficiencies. ENGINEER will compile and classify these deficiencies as the priority capital improvements required to resolve the current hydraulic and pressure problems of the water distribution system.

**PHASE 5 – DEVELOP CAPITAL IMPROVEMENT AND ASSET MANAGEMENT PROGRAMS:** The information gained through the performance of the previous tasks shall be compiled and consolidated into the development of a comprehensive capital program. Phase 5 consists of two tasks. Each task is further described as follows:

**Task 5.1 – Recommend Capital Improvement Program (CIP):** ENGINEER will prepare estimates of the identified capital improvements according to the anticipated schedule. Capital improvements shall be recommended to address system repair/replacement requirements; existing water system supply, storage, and pumping deficiencies; system improvements required to mitigate local pressure problems, fire flow requirements, and water quality considerations; as well as improvements to serve new development.

**Task 5.2 – Review and Develop an Asset Management Capital Rehabilitation Program (AMCRP):** ENGINEER will collect and review Minot's current practices for asset renewal and refurbishment. ENGINEER will review existing leak records, and recommend replacement and rehabilitation schedules for pipelines, booster pump stations, tanks/reservoirs, and booster pump stations.

**PHASE 6 – FINAL REPORT AND REVIEWS:** The Master Plan Report will summarize and present the results and recommendations for Minot's water distribution system through the following tasks:

**Task 6.1 – Draft Report:** ENGINEER will prepare a draft report (two hard copies and one electronic PDF copy) of all analyses and findings and present it to the Public Works Director for review and comments. It is anticipated that report sections will correspond roughly to the phases and tasks in the Scope of Work, and that the Technical Memoranda will form the basis for relevant report sections. ENGINEER will also prepare a draft Executive Summary report targeted for City Council members.

**Task 6.2 – Final Report:** ENGINEER will review and incorporate comments received on the draft Master Plan Report and Executive Summary. The final report shall be submitted within four weeks after receipt of written comments from the City. Final report submittal shall be by three color spiral-bound hard copies and one electronic copy (PDF).

**PHASE 7 – PROJECT MANAGEMENT, COORDINATION, QA/QC:** Phase 7 consists of project monitoring and management, attendance at regularly scheduled progress meetings with the City, and project quality assurance/quality control activities.

**Task 7.1 – Prepare Project Work Plan and Conduct Kick-Off Meeting:** ENGINEER will conduct a kick-off meeting with key City staff to review the draft work plan, validate project goals, and objectives. The results of the kick-off meeting will be incorporated into the final Project Work Plan.

**Task 7.2 – Progress Meetings:** ENGINEER will meet with Minot Public Works staff on a monthly basis to review project status and discuss project issues. Informal (bulleted) meeting minutes will be prepared and distributed.

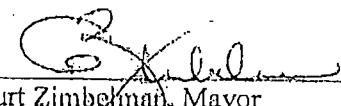
#### **SCHEDULE**

The Study and Report services will begin immediately upon execution of Specific Authorization No. 6 and will be complete upon presentation of the final report to the City of Minot Public Works Director with an anticipated completion date of December 20, 2013.

#### **COMPENSATION**

Compensation for the tasks identified under each part of the scope of services for Specific Authorization No. 6 will be in accordance with the Agreement for Engineering Services Payments to the ENGINEER, hourly rates and expenses, as indicated on Attachment 1 to Exhibit C, with a not to exceed amount of \$150,000 without further written authorization.

**CITY OF MINOT, ND**

By:   
Curt Zimbelman, Mayor  
Date: 6/28/13

**HOUSTON ENGINEERING, INC.**

By:   
Kevin Martin, PE, COO, Principal-In-Charge  
Date: 7/13/13