FINAL
Technical Report

Water System Rehabilitation Construction at Camp Stanley Storage Activity

Prepared for:

Camp Stanley Storage Activity
Boerne, Texas

February 2009

FINAL
TECHNICAL REPORT

WATER SYSTEM REHABILITATION CONSTRUCTION AT CAMP STANLEY STORAGE ACTIVITY

BOERNE, TEXAS

PREPARED FOR:

CAMP STANLEY STORAGE ACTIVITY
BOERNE, TEXAS
AFCEE/ERD QAE
BROOKS AFB, TEXAS

FA8903-04-D-8675-0022
(CDRLS A001E, A001F, A010, A011, A014, B009, B010)

AND

CSSA PO# W45PVN-08-P-0033

FEBRUARY 2009

TABLE OF CONTENTS

SECTION 1 INTRODUCTION.....1-1
1.1 Project Objectives.....1-1
1.2 Background.....1-2
1.3 Organization of the Report.....1-2
1.4 Water System Evaluation.....1-3
1.4.1 Water System Survey and Inspection.....1-3
1.4.2 Water System Modeling.....1-3
1.5 Environmental Impact, Analysis & Permitting.....1-4
1.6 Rehabilitation Construction.....1-5
1.7 Ancillary Component Installation.....1-5
1.8 Inspections and Testing of Constructed Systems and Components.....1-5
1.8.1 Daily Records.....1-6
1.8.2 Testing Records.....1-6
1.9 Final Reporting.....1-6
SECTION 2 TECHNICAL APPROACH.....2-1
2.1 Design Approach.....2-1
2.2 Primary Design Criteria.....2-1
2.3 Construction Approach.....2-2
2.4 Cost Approach.....2-2
2.5 Inspection and Testing Approach.....2-2
2.5.1 Field Instrumentation.....2-3
2.5.2 Instrument Integration into the SCADA System.....2-3
2.6 Final Reporting.....2-3
SECTION 3 SUMMARY.....3-1
3.1 Completed Installation.....3-1
3.1.1 Piping, Fittings, Valves.....3-1
3.2 Future Work.....3-1
3.3 Warranty.....3-2

APPENDICES

APPENDIX A

Government Acceptance Forms
Bacteriological Test Reports
Pressure Test Reports
Photo Log

APPENDIX B

As-Built Drawings
Specifications

APPENDIX C

Equipment and Material Submittals
Instrument Calibration Records

APPENDIX D

Warranty Information
Operation and Maintenance Manual

APPENDIX E

Electronic Documentation (DVD Only)
Daily Field Records
Photographs
As-Built Drawings

ABBREVIATIONS AND ACRONYMS

ACC	Alamo City Constructors
ACP	asbestos cement pipe
AFCEE	Air Force Center for Environmental Excellence
AWWA	American Water Works Associations
CSSA	Camp Stanley Storage Activity
GIS	Geographical Information System
GPS	Global Positioning System
IWP	Implementation Work Plan
NFPA	National Fire Protection Association
O&M	Operating and Maintenance
PVC	polyvinyl chloride
RAI	Ramos & Associates, Inc.
RTU	remote terminal units
SCADA	Supervisory Control and Data Acquisition
SCI	System Controls and Instrumentation, Ltd.
SWPPP	Storm Water Pollution Prevention Plan
TCEQ	Texas Commission on Environmental Quality

SECTION 1
INTRODUCTION

1.1 PROJECT OBJECTIVES

This report prepared under the Air Force Center for Environmental Excellence (AFCEE) Contract FA8903-04-D-8675 (Task Order 0022) documents the activities associated primarily with the installation, oversight, inspection, testing and commissioning of the Water System Rehabilitation project at Camp Stanley Storage Activity (CSSA). Work under purchase order W45PVN-08-P-0033 is also included.

Parsons provided a full range of engineering services to evaluate the existing water and wastewater systems at CSSA and design a rehabilitated water system. Subsequently, Parsons subcontracted Ramos & Associates (RAI) and Alamo City Constructors (ACC), who retained various other subtier contractors) to implement the rehabilitation of the water system while Parsons provided construction oversight, quality assurance and control by inspecting and testing the construction to assure the rehabilitated system would meet quality objectives.

The overall objectives of this project were:

1. Work with CSSA engineers, environmental program staff and operations personnel to develop detailed knowledge of the existing system and to determine requirements for future needs;
2. Perform engineering analysis and evaluation of the existing water system, and provide recommendations for improvements, rehabilitation and component upgrades;
3. Prepare Implementation Work Plan (IWP) that addresses CSSA requirements for the water system rehabilitation and provides engineering analysis of the requirements to be constructed. Included in the IWP were design drawings and specifications to detail the rehabilitation requirements;
4. Perform construction activities to implement the improvements and rehabilitation activities described in the Water System IWP and thereby rehabilitate the water system, which included replacement of existing water lines, installation of new lines, and installation of new equipment;
5. Conduct sufficient quality control and testing of improvements and new components to certify that the final constructed system meets applicable safety, performance, regulatory and statutory requirements for Public Water Systems in the State of Texas; and
6. Prepare a technical report of completed construction activities including as-built and operating and maintenance (O&M) documentation. Incorporate CSSA GIS

data into documentation to provide appropriate information for future maintenance of the water system and its new components.

This technical report addresses the requirements of objective 6 above. This objective is further discussed in Section 2, Technical Approach.

1.2 BACKGROUND

The water system at CSSA is classified as a community water system and is identified by the State of Texas as Public Water System Number 0150117. Groundwater is currently supplied by three wells developed in water-bearing limestone strata, which is the sole water source at the site (other than bottled water used for drinking purposes). The overall system consisted of five water wells (three in-service), an in-ground storage tank, a piping network containing approximately 69,000 linear feet of pipe, about 50 fire hydrants, and 63 service connections providing potable water and fire water to most of the developed areas on Post. This system supplies potable water to most areas of the Post meeting domestic and light industrial use, as well fire protection requirements at the site. Water distribution is primarily by gravity pressure from the storage tank, which is located at a high point on the site. However, because of its elevation and proximity to the storage tank, there is a booster pump for the fire water line around the housing area and several hydropneumatic tank systems for residential domestic water. There is also a fire booster system for the warehouse area.

CSSA maintains onsite water production equipment and operations personnel (Public Works group) to oversee production, disinfection, storage, and distribution.

The water system was constructed over many decades, but had significant work done during the 1980s. Prior to the 2008 rehabilitation, the water system's piping network was a mix of cast iron, ductile iron, polyvinyl chloride (PVC) pipe, and a small amount of asbestos cement pipe (ACP).

The facility's typical domestic production is approximately 8 to 10 thousand gallons of well water per day. However, well production flowrates can often exceed 30 thousand gallons per day as a result of intermittent uses such as irrigation, water used for construction activities, and line flushing.

1.3 ORGANIZATION OF THE REPORT

This Technical Report has been prepared to incorporate several final deliverables. The overall technical approach prior to rehabilitation activities is provided in Section 2. The rehabilitation, inspection and testing approach and results are presented in Section 3, and the project summary is provided in Section 4.

The acceptance documentation: hydrostatic pressure test results, bacteriological test results, as-built drawings and photo log are attached in Appendix A. As-built drawings are provided in Appendix B, and Appendix C provides the equipment and materials submittal information for all items that were installed. Copies of the 12-month warranty letters from RAI and ACC are provided in Appendix D. Finally, a DVD is included as

Appendix E, and contains copies of all the daily field reports and photographs from the construction effort.

1.4 WATER SYSTEM EVALUATION

The water system evaluation included review of the water supply, storage, fire protection, treatment and distribution systems for adequacy with respect to site requirements as well as regulations. The field assessment was limited to the primary distribution system (lines of 4 inches in diameter or larger). Because no construction drawings of the existing system were available, data were collected from field inspections and data exchanges and reviews with the Environmental group and operations personnel.

1.4.1 Water System Survey and Inspection

Operational parameters of the water distribution system were surveyed by ADS Environmental Services of Huntsville, Alabama during a several week period to collect the desired system information. Targeted parameters include pressure and flow along with chlorine residual concentrations at various points in the system, water level elevation in the storage tanks, and water production flows. Flow, pressure and chlorine residual were measured at various locations in the distribution system to monitor system-wide operating conditions. Pressure gauges and flow meters were temporarily installed in the system to assess the system performance. These data were used to determine the quantity of water being pumped into and taken out of the distribution system, operating levels, and flow and pressure at key nodes. The data collection recorded such data as material of construction, condition of the structure, diameter and type of pipe and fittings, condition of pipes and valves, types of valves, and other notable observations such as leaks or visible corrosion.

Information from the survey was used in a diagnostic model of the water distribution and pumping system. Conditions of production wells and other existing facilities were evaluated and performance measured. CSSA personnel provided assistance in preparing drawings containing information about the physical layout of the water system for the development of the hydraulic computer model.

Parsons prepared an IWP following completion of the survey. The comprehensive design IWP describes the methods and procedures employed for the water system rehabilitation work, defined the design bases, and established contingencies for surface water management, erosion controls, transportation and materials control, and management of excavated materials.

1.4.2 Water System Modeling

Software programs H2OMAP by MWH Soft and WaterGems by Haestad Methods were used to build a computer model of the existing water distribution system. The model included the wells, pumps, the storage tank and the active pipes in the system, primarily those 4 inches in diameter and larger.

The model was calibrated by matching the simulation outputs to typical 24-hour pressure patterns measured during the data surveys of pressure, level, and flowrates. Simulations were performed using domestic and fire flow demands. The domestic demands were estimated from the building water use survey that was conducted, while fire flow demands were based on U.S. Army technical guidance as well as design criteria provided by CSSA derived from a fire protection survey authored by a U.S. Army Corps of Engineer employee.

The data obtained for the existing system, in conjunction with the field survey data, were used to construct a computer model of the water distribution system including pumps, tanks, valves, meters, fire hydrants and lines. The model incorporated the required pipe information: lengths, elevations, diameters, slopes, and roughness factors, to compensate for materials of construction, corrosion and deposits. The data for existing populations, and population and land use projections were provided by CSSA. Per capita demand factors and industrial demand factors were developed based on information collected.

An evaluation of the fire hydrant system was based on requirements of the Uniform Fire Code for standard commercial buildings and included National Fire Protection Association (NFPA) standards for the installation and operation of fire hydrants. The goal was to have all buildings at CSSA protected in accordance with NFPA recommendations. Both the existing and designed water distribution systems were evaluated for their ability to supply water for fire protection to meet minimum pressure requirements at each fire hydrant.

The model simulated steady-state flow conditions and aided the determination of pipe sizes needed for the future. The model was by calibrated by comparing computer routed flows to the design hydrographs developed. Once the model was calibrated, various scenarios were developed and evaluated using established implementation criteria. The model scenarios were:

1. The existing condition of the water system; and
2. A future condition of the proposed rehabilitated system at the fire flow rates.

1.5 ENVIRONMENTAL IMPACT, ANALYSIS & PERMITTING

A categorical exclusion with supporting documentation was prepared to provide the environmental impact analysis. No public involvement, phase 2 cultural resources investigations or site assessment reports were required for completion of the standardized Categorical Exclusion checklist documentation.

No Edwards Aquifer Protection Plan was required since there is a specific exemption in Chapter 213 for construction of water lines that are underground utilities. A Storm Water Pollution Prevention Plan (SWPPP) was prepared to comply with the Texas Commission on Environmental Quality (TCEQ) construction stormwater general permit TXR150000 and Best Management Practices from the SWPPP were implemented to prevent stormwater related erosion and pollution during construction activities.

Following completion of the design documents, a TCEQ Public Water System Plan Review Submittal Form was sent to the Agency requesting a determination on whether plan review was required. The TCEQ responded with a letter indicating that plan review for this project was not required.

1.6 REHABILITATION CONSTRUCTION

Construction began in December 2007 with a section of piping about 400 feet in length, south of Warehouse 96 constructed by Alamo City Constructors (ACC) of San Antonio, Texas. Ramos & Associates, Inc. (RAI) of San Antonio, Texas constructed the balance of the system rehabilitation with substantial completion in September 2008. Installation and integration of the new instrumentation was done by RAI's subcontractor System Controls and Instrumentation, Ltd. (SCI) of Converse, Texas.

Parsons provided construction management and quality oversight during the construction phase. Inspections and testing by Parsons or independent testing subcontractors were ongoing as each sequence was installed. Corrective actions were implemented by RAI on an on-going basis until completion in September 2008. The final inspection occurred with CSSA personnel in September 2008.

Construction of the water system included demolition and replacement of old pipe with new pipe, installing new distribution mains, valves, fittings, service connections, fire hydrants, instrumentation and other ancillary equipment.

1.7 ANCILLARY COMPONENT INSTALLATION.

Ancillary components include construction of SCADA monitoring components for the water service distribution lines. The IWP and engineering specification identified suitable locations for the installation of each component. All new instrumentation was consolidated into existing remote terminal units (RTUs) by SCI.

SCADA system compatible equipment was installed to monitor the flow and chlorine residual at selected locations in the existing water distribution system. Installation of bi-directional flow meters report the measured flow volume and the direction of flow within the large diameter mains of the water system. These water distribution monitoring stations transmit real-time data back to the SCADA master workstation via existing infrastructure. SCADA subcontractor SCI integrated these locations into the SCADA network and incorporated all the software and programming adjustments necessary to make the new monitoring devices visible to the user.

1.8 INSPECTIONS AND TESTING OF CONSTRUCTED SYSTEMS AND COMPONENTS

Hydrostatic pressure testing of all installed pipelines, commission and flow testing of fire hydrants was conducted to certify that the constructed system meets all operational performance standards. Disinfection of all newly commissioned water lines was performed and tested in accordance with American Water Works Associations (AWWA)

C651 Disinfecting Water Mains and TCEQ Chapter 290 Public Drinking Water. Records of all testing are included in Appendix A.

The design requirements have been fully implemented, construction and all corrective actions are complete and all new components are fully operational.

1.8.1 Daily Records

Daily inspection records are provided in the document Daily Field Reports for Water System Rehabilitation, which can be viewed on the CD included as Appendix E.

1.8.2 Testing Records

All testing records are provided in the Appendix A under the section Bacteriological Testing or the section Pressure Test Reports.

1.9 FINAL REPORTING

This Technical Report is a compilation of the following required Contract Data Requirements List (CDRL):

Pre-final Inspection Report (CDRL A001E);

Final Inspection Report (CDRL A001F);

O&M Manual (CDRL A010);

Technical Field Activities Report (CDRL A011);

As-built Drawings (CDRL A014);

GIS Updates (CDRL B009); and

Photo Log (CDRL B010).

All construction documentation is discussed in this report to meet the contract requirements of the aforementioned CDRLs. Project information includes as-built drawings, Global Positioning System (GPS) locations of specific components, test records, calibration records, warranty information and all other manufacturers' documentation needed to create O&M and as-built record information. This information has been used to update the CSSA Geographic Information System (GIS) database and provides comprehensive documentation of all rehabilitation construction activity.