Engineering Report

South and Center Chautauqua Lake Sewer Districts (S&CCLSD)
Chautauqua County, NY

Supervisory Control and Data Acquisition (SCADA) System and Stand-By Power
March 2009

General

The South and Center Chautauqua Lake Sewer Districts (S&CCLSD) owns and operates twelve major and twenty minor duplex pump stations within its service area around the eastern end of Chautauqua Lake. Their purpose is to lift and convey sanitary sewage from homes and businesses to the treatment plant. The names and locations of the twelve major pump stations are shown on the attached map dated February 2, 2009.

All major stations and several minor stations as well as the WWTP are equipped with an alarm and monitoring system that will notify the operators when there is some type of malfunction at any one of these facilities. In addition, all major pump stations except one are equipped with a stand-by generator to maintain electric service in the event of a power outage. Currently a twenty five year old trailer mounted generator provides back up power for the Cummins station as well as any of the other (20) minor stations. Stand-by power is vital to maintaining the flow of waste to the treatment plant and to avoid the overflow of waste onto properties adjacent to the pump stations and into the Lake's watershed.

The proposed SCADA work was originally budgeted in the S&CCLSD 2009 maintenance program to replace 25 to 30 year old remote emergency alarms. With the recent passing of the American Recovery and Reinvestment Act (ARRA) of 2009, whose intent it is, in part, to immediately create employment, the S&CCLSD has submitted this application. The SCADA system, described herein, is expanded to include features not otherwise affordable by S&CCLSD. This is to integrate the SCADA system with our recently acquired Computerized Maintenance Management System (CMMS) and provide direct notification of emergency alarm specifics to 24/7/365 responders. Those features, at an additional 125% cost to our original $200,000 SCADA budget, will have an ultimate payback in 7 to 9 years.

The SCADA portion of the SCADA/Stand-by Power project requires no NYSDEC or other agency permits as documented in S&CCLSD files. Furthermore, it is a SEQR Type II Action (no further environmental/agency review required) as classified 3/13/09.

The Stand-by Power portion of the project also does not require a NYSDEC permit pursuant to DEC correspondence of 3/19/09. It is, however, a SEQR Unlisted Action and the protocols necessary for SEQR compliance are underway. The SEQR Project Notification to Agencies and Short Form Assessment are being prepared with a target date to mail 4/6/09 requesting the S&CCLSD be designated as lead agency. SEQR

formal action is required because the earth disturbance is nearby, but not within, the stream channel or floodway of a small, north flowing tributary of Chautauqua Lake and because of the proposed pole barn enclosing the generator from view.

The overall schedule for this $630,300 project includes additional engineering services that can begin immediately upon an ARRA funding commitment. An engineering contract for the project has been approved by the Administrative Board of S&CCLSD on 3/3/09. The target date to begin the physical construction is 10/20/09 to put manufacturing and construction personnel to work. The project is labor intensive for the manufacture of products and field construction as well as computer programming of the SCADA/CMMS integration.

Project Planning Area

This project entails the replacement of all original alarm and monitoring systems at each major pump station and 2 minor pump stations (14 alarm systems total) currently served within the Districts, and at the treatment plant. The original installation of these systems dates back to 1979 through 1984, so this electromechanical equipment is well beyond its practical service life of 20 years. This project also includes the installation of a new standby power generator at the Cummins location. The Cummins location is especially critical since it provides service to three industrial customers that are vital to the livelihood of many area residents and it pumps a significant flow, pretreated by industry, to the treatment works.

To control ever increasing maintenance costs it is the intent that the replacement alarm and monitoring equipment will communicate wirelessly via recently installed new radio equipment to a proposed new central station based at the treatment plant in Celoron. It is the intent to provide an alarm system that has expansion capabilities to serve additional facilities within the Districts in the future.

Existing Facilities

The names and locations of the twelve major sewage pump stations are shown on the attached map of the eastern portion of Chautauqua Lake. As multiple Village and Town sewer systems were consolidated into the S&CCLSD in 1969 with its central treatment facility put on line in 1980, the 2 existing treatment plant locations were converted to pump stations in order to convey the waste to the District's new treatment plant at the extreme east end of the Lake. Significant sewer extensions completed in 1984-85 required numerous additional pump stations due to the flat topography around the lakeshore.

Most of the alarm and monitoring equipment operates through technology typically in use during the time of its installation. The equipment utilizes analog signals with electromechanical switches and contacts and in most instances transmits signals by means of short range radio signals.

Due to the age and technology of the equipment currently in service, the Districts has incurred costs approaching $100,000 since 2001 for maintenance and service contractor repairs of this antiquated equipment and a complete replacement of the original radio signal transmission system.

Need for Project

The South and Center Chautauqua Lake Sewer Districts, with 120 miles of collection mains and more than 30 duplex/triplex pump stations plus the WWTP is maintained by a staff of 7 maintenance technicians. The Districts also have 4 discreet vacuum sewer systems with 850 vacuum valves and 130 simplex grinder pumps together with conventional gravity sewers serving about 5050 customer accounts. Major pump stations are inspected daily by staff.

Given the proximity of all these facilities to Chautauqua Lake and most located in relatively densely developed shore line locations maintaining their proper operation is vital to the protection of the health and safety of the residents as well as proper maintenance of the quality of the water in the Lake and its tributaries. It is important to recognize that more than 90% of flow received at the treatment plant is pumped from the 14 remote locations where the proposed SCADA system shall be installed. Although pump stations are routinely checked and serviced, during a typical year 120 to 150 emergency responses occur, often at night and on weekends when staff are not at work. Such alarms result from clogged pump impellers, control failures, loss of public electric utility power, etc.

Each pump station has its own unique set of circumstances. The benefit of a modern sophisticated SCADA system in place is that it will notify the maintenance personnel directly of any specific problem at the alarmed facility. This will enable staff to respond, at once with qualified personnel, parts and equipment necessary to repair the problem. Presently, emergency alarms report only at the operations control room and field staff must be dispatched during normal working hours. After hours, an answering service reports that an alarm was received by contacting on-call personnel. However, the responder now must drive from home to the WWTP to determine what and where the problem is and then drive to the pump station. Often, this means they drive near the pump station before knowing they must go there, very inefficient. The proposed SCADA system shall be used to remotely monitor the condition of various critical components at each location and enable the operators to anticipate a problem prior to it actually causing a failure and perhaps an illegal discharge of sewage.

Regarding the proposed addition of a stationary generator at the last of the major pump stations, this is necessary as the Districts' current practice is to service this station with a trailer mounted generator. This same generator is used to power some twenty "minor" stations throughout the district during power outages. This requires the District operators to move from station to station, sometimes under adverse travel conditions, and power each station long enough to pump down each wet well.

Alternatives Considered

SCADA or alarm and monitoring equipment typically available today to accomplish the tasks the District deems critical to this project vary greatly in complexity and expense. The equipment and method to accomplish the tasks critical to the operation and maintenance of the District's systems will consider the following attributes:

- Reliability
- Performance
- Cost
- Service
- Parts Availability
- Flexibility
- Ease of Operation
- Expandability

It is also important that the new system be able to interface with the Districts' newly acquired computerized maintenance management system (CMMS). As the design of the project evolves, the large variety of systems currently available will be evaluated for the applicability of the above parameters specific to the Districts' situation. The system that best satisfies these parameters will be used as the basis of design for the purpose of procuring the final system. In accordance with the Districts' procurement requirements, vendor proposed "or equals" will be given adequate consideration.

Alternatives of stand-by power for the conveyance of sewage at the Cummins industrial pump station during times when the main source of power is not available includes 3 considerations. First, is continued use of a portable electric generator to supply energy when public utility power has failed, however, response time may be insufficient to prevent a spill and environmental harm. Second, direct drive fueled pumps are not practical since the Cummins pump station utilizes submersible pumps. Third, is a stationary generator set on site that accomplishes the goal without the drawbacks of the other two alternatives.

Conclusion

To maintain a level of system reliability necessary to protect the health and safety of the operators and the general public as well as the quality of the environment the Districts needs to replace the current thirty year old alarm and monitoring systems in place at its major pump stations as well as to provide a dedicated stationary generator as a means to complete the provision of standby power to all major pump stations. The trailer mounted portable generator should be maintained to continue to serve the less critical "minor" pump stations

The Districts should take advantage of the advances in technology, since the original systems design and installation, to provide more sophisticated equipment to enable the

operators to more efficiently operate these remote facilities and conserve District resources.

Steven Vanderbrook, P.E.
Stearns & Wheler, LLC

James E. Murphy, P.E.
Director, S&CCLSD