



TECHNICAL COMMITTEE MEETING MINUTES

Tuesday November 10, 2015

2nd Floor Conference Room

Building 11, 111 Harbor View Avenue

Stamford CT 06902

5:00 pm

Daniel Capano	Chairman, Technical Committee
Edward Kelly	Committee Member
Merritt Nesin	Committee Member
William Brink	Executive Director, WPCA
William Degnan	Plant Supervisor, WPCA
Prakash Chakravarti	Supervising Engineer, WPCA
Christopher Pierce	Wright-Pierce
Bhavani Rathi	Wright-Pierce

1. Call to Order and Roll Call

D Capano called the meeting to order at 5:00 pm.

2. Approval of October 7, 2015 Technical Committee Meeting Minutes

E Kelly made the motion to approve the minutes of the meeting for October 7, 2015. Seconded by M Nesin. The motion carried 3-0-0

3. Upgrade of Raw Sewage Pump Station, Aeration Blowers and Emergency Power Generator

Christopher Pierce of Wright-Pierce presented the recommendations for improvements to the Preliminary & Secondary Treatments. (Powerpoint presentation is attached herewith)

a. The basic improvements that were explored are as follows:

- i. Install new multi-rake screens with ¼-inch bar spacing.
- ii. Install five larger pumps, all with variable speed controls.
- iii. Move septage receiving into a new building addition.
- iv. Miscellaneous improvements to the structure, odor control and ventilation systems
- v. Enclose all the electrical equipment in a separate room to comply with fire code.
- vi. Relocate existing standby power generator to the blower building or install a new self-contained generator near the blower building.
- vii. Increase the pre-anoxic zone to gain additional denitrification.
- viii. Provide additional mixers
- ix. Provide high efficient blowers
- x. Provide new air control valves.

b. Proposed scope of work and fee for Design and Bid Phase Services by Wright-Pierce – Chris Pierce, W.Brink

C Pierce also presented their scope of work and fee for their design services for the items listed above. The total project is estimated at \$19.8 million and the engineers' fee is \$1.44 million

4. Proposed scope of work and fee by Tighe & Bond for Arc Flash Analyses, Develop RFP for Electrical System Preventive Maintenance, and Electrical Design at Pumping Stations

W Brink stated that Ken Slater of Halloran & Sage has prepared Amendment 1 for the proposed scope of work and fees. Tighe & Bond Engineers were hired to provide electrical engineering services to do arc flash analysis and electrical system preventive maintenance to meet National Fire Protection Association's (NFPA) Standard for Electrical Safety in the workplace. This is a continuation (Phase II) of their work related to arc flash analyses

The scope of work is described in the proposal letter dated October 24, 2015 includes:

Task 1 - Perform Arc Flash Analyses for all the electrical switch gear at the Treatment Plant and 6 pumping stations that have 480 V power. (Dyke Lane PS and Greenwich Ave PS were excluded as the electrical equipment is to be upgraded/replaced at these PS).

Task 2 – Prepare technical specifications to be included in a RFP for contractors to perform Electrical Preventive Maintenance (EPM) for the 480 V electrical equipment at the Treatment Plant and 4 pumping stations.

Fees for the above are a lump sum of \$85,175. Services during bidding and the EPM will be billed based on hourly rates plus expenses with a not to exceed amount of \$6,234 and \$19,220, respectively.

The Phase I study recommended replacement of electrical panels at a number of our pump stations that are aged and do not meet current electrical code. The scope of work described in the proposal letter dated October 2, 2015 is to develop a standard design for replacement of the electrical panels at six pump stations. The standard design will be used to solicit bids for construction. The fees for the electrical design services are a lump sum of \$24,950. (Proposal & the amendment is attached herewith). The Committee will be recommending approval of the Amendment I by the SWPCA Board of Directors.

5. Update on Odor Control,

W Degnan stated that Indusco personnel will be site to move the ORP & the pH probes to the sump of the scrubbers on Saturday Nov 14, 2015. He is trying to get various things winterized before the freeze sets in. W Brink further explained that the plan is to move the ORP probes to the sump so that they measure the concentrations in the sump and not at the discharge of the re-circulating pump. This would allow for stable ORP reading at around 800 and pH reading at 9. The media will be checked and acid cleaned if necessary to curb the depletion of hypochlorite. A set point will be determined for optimum removal of hydrogen-sulphide then switch to automatic dosing of chemicals via the SCADA. D Capano commented that the sludge drier odors have been minimized and praised the operators, lab staff and the mechanics for diligently working to contain the odors.

6. Update on UV System,

W Degnan said that the UV system was serviced by WEDECO technicians on Oct 27, 2015 and it has been running well, but has yet to receive a report from WEDECO. The electrician installed the power backup the same day and we have not had any incident yet.

W Brink added that we will be installing the circuitry Watch-dog to monitor and control the UV dosing.

7. Update on engineering studies and designs

P Chakravarti had the following update:

a. Dyke Lane pumping station upgrade.

Attorney Kenneth R. Slater, Jr. of Halloran & Sage has prepared the amendment to

Stantec's contract for design of pump station improvements which will be presented to the SWPCA Board of Directors on Monday Nov 16, 2015 for approval

- b. Flow Distribution Improvements to Final Clarifiers**
The design contract with Hazen & Sawyer has been signed and a kickoff meeting has been scheduled for Friday, Nov 13, 2015.
- c. Sludge Degritting Study.** Gannett Fleming has been doing preliminary data gathering from the WPCA for study and they plan on a site visit for the project Kick Off meeting on Nov 18, 2015.
- d. SCADA System Upgrade.** ARCADIS has developed the scope of services to be provided by the integrators. RFP will be sent out to them and we will be scheduling the interviews after we receive the responses. The RFP will be discussed by ARCADIS on Nov 11, 2015
- e. Infiltration and Inflow (I/I) Analyses.** CDM Smith has been monitoring the flows, unfortunately there has not been any significant rain events. The flow monitoring may have to be extended. They will be teleconferencing on Nov 12, 2015 to present the options.
- f. Wedgemere Road Area Sewers.** P. Chakravarti be meeting with the engineers on Nov 11, 2015, on site at 267 Eden Road to explore the homeowner suggested alternate routing for the sewers to save some trees.
- g. Perna Lane Area Sewers**
The plans have been reviewed and will be meeting with Engineers from Tighe & Bond on Nov 13th 2015 to discuss the comments
- h. Shed for the sludge trailers.**
We will explore the option utilizing the shed that has been purchased by the Fire department which may be available.

8. Update on construction projects, P Chakravarti|

- a. Sludge transfer pumps**
Contractor was on site to fix the leaking packing issue and install the pressure sensors.
- b. WPCA Brick Wall Repairs**
The contractor Connerstone Restoration Inc. is expected to start work on rebuilding the brick wall at Magee Ave on Thursday Nov 12, 2015

9. Old Business

- M Nesen asked if the cap for waterline had been installed. P Chakravarti said that the cap has been installed.

10. New Business

There was no new business items to be included in the next month's agenda.

There being no other issues to discuss M Nesen made a motion to adjourn the meeting, seconded by E Kelly, motion carried 3-0-0. The meeting was adjourned at 7:05 pm.

Stamford Water Pollution Control Authority Preliminary and Secondary Treatment Improvements

Presented by:

Christopher N. Pierce, PE
November 10, 2015



Presentation Overview

- ü Project objectives
- ü Project approach
- ü Evaluation of alternatives
- ü Preliminary project cost
- ü Implementation



Project Objectives



- Raw Sewage Pump Station
 - § Meet peak flows with one pump out of service
 - § Improve screenings capture
 - w Reduce impact to downstream equipment
 - w Address flooding issues
 - § Improve screenings handling
 - w Reduce odors
 - w Eliminate Special Waste category
 - § Replace aging equipment
 - § Improve/automate septage receiving



Project Objectives

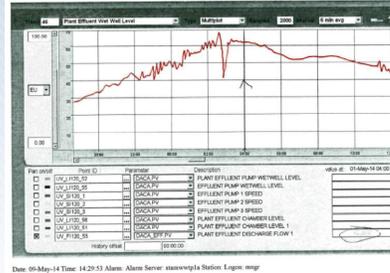


- Aeration Blower Replacement & D.O. Control System
 - § Replace aging aeration blowers
 - § Provide modern dissolved oxygen controls
 - § Minimize over-aeration/mixing limitations
 - § Improve process control/air flow control
 - § Improve energy efficiency
 - § Minimize supplemental carbon addition
- Standby power for secondary treatment systems



Project Approach

- Design flow
 - § Establish basis for evaluation
 - § Reviewed historical data/design reports
 - § May 1, 2014 storm event
 - § Design flows
 - w Min 4.3 MGD
 - w Avg 16.6 MGD
 - w Peak 68 MGD



Date: 01-May-14 Time: 14:29:53 Alarm: Alarm Server staawrtp1a Station: Login: mng



Project Approach

- BioWin Computer Modeling
 - § Supplemental sampling
 - § Calibrate/verify model using WPCF data
 - § Evaluate process modifications
 - § Modeling goals
 - w Minimize aeration requirements
 - w Minimize supplemental carbon
 - w Maintain current level of treatment



Evaluation of Alternatives

- Existing system evaluation/modeling
 - § Blowers aging/more efficient technology available
 - § No D.O. control – manually adjust inlet valves
 - § Can't operate just one blower
 - w Air piping doesn't allow balancing flow
 - w Butterfly valves leak
 - w Only manual valves at the drop legs
 - § Pre-anoxic zone too small
 - § Oxidic zone too large/mixing limitations
 - § High D.O. in NRCY results in high methanol



Evaluation of Alternatives

- Aeration tank configuration
 - § Oxidic zone is too large
 - § Divide oxidic zones into four parallel trains
 - w Allow one train to be taken off line/reduce volume
 - w Allow for maintenance
 - § Turn air off in first third of oxidic zone
 - w Expand pre-anoxic zone
 - w Provide mixers
 - w Operate as swing zone (anoxic or oxidic)



Evaluation of Alternatives

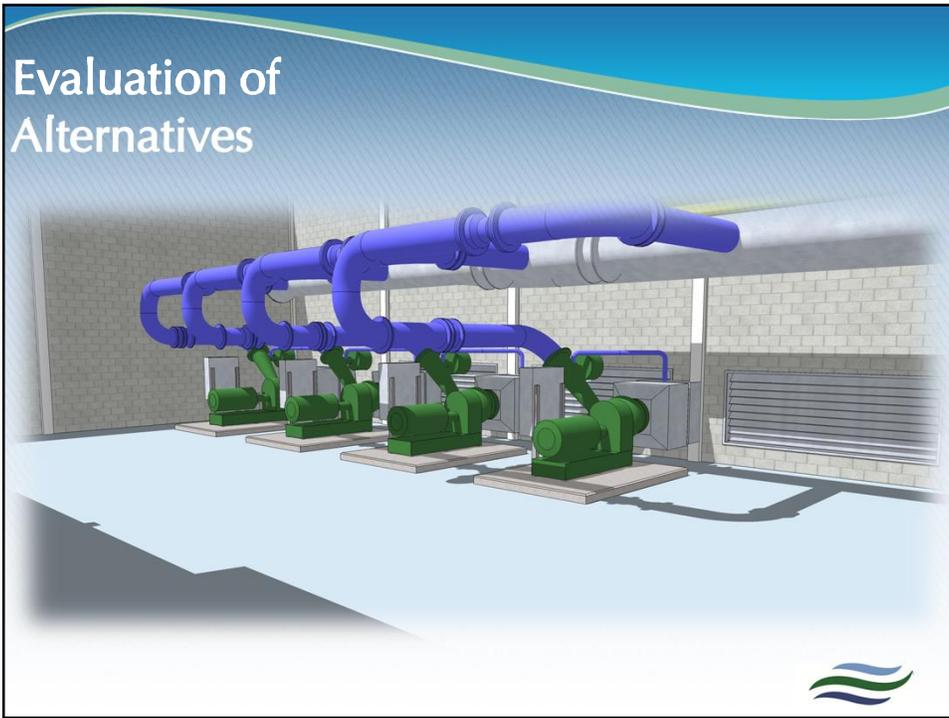
- Aeration tank configuration
 - § Four parallel trains
 - w Too costly – reconstruct baffle walls
 - § Expand pre-anoxic zone
 - w Reduce aeration volume by 33%
 - w Reduce diffusers by 33%
 - w Reduce mixing air requirement by 33%
 - w Install hyperbolic mixers
 - § Reduction in methanol consumption from 520 gpd to 125 gpd.



Evaluation of Alternatives



Evaluation of Alternatives



Evaluation of Alternatives

- D.O. control system
 - § Reuse existing piping
 - § Replace valves
 - § New air flow meter/control valve/D.O. probe
 - w At each zone in oxic/swing zones
 - w Total of 16
 - § Butterfly valve vs. iris valve
 - w Iris valve – higher capital cost/lower life cycle



Evaluation of Alternatives

- Standby power generator



Equipment	Number of Units			Total Horsepower		
	Total	Operating	On Standby Power	Each	Operating	Standby Power
Aeration Blowers	4	3	2	250	750	500
Nitrate Recycle Pumps	4	2	2	40	80	80
Nitrate Recycle Pumps	4	2	0	27	54	0
Submersible Mixers	18	18	18	15	270	270
Methanol Feed Pumps	6	4	2	1	4	2
Waste Mixed Liquor Pumps	4	2	1	53.6	107.2	53.6
TOTAL					1,265	905

- Replace existing 900 kW with 1,200 kW
- Locate outside with walk-in enclosure
- Locate in new Generator Room in Blower Bldg.



Recommended Plan

- Preliminary Treatment Improvements
 - § New ¼-inch multi-rake bar screens
 - § New screenings grinder/wash press
 - § New extended shaft pumps
 - § New automated septage receiving station
 - w New building addition
 - § Upgrade odor control systems
 - § General RSPS building system improvements



Recommended Plan

- Secondary Treatment Improvements
 - § Expand pre-anoxic zones/hyperbolic mixers
 - § Replace existing blowers
 - w New integrally-gear centrifugal
 - w Four 250-hp units
 - § New air flow meter/control valve/D.O. probes
 - § Reuse air piping/replace valves
 - § Header pressure or air flow control scheme



Recommended Plan

- Standby power generator
 - § New 1,200 kW generator
 - § Location alternatives
 - w Walk-in enclosure near blower building
 - w New Generator Room in blower building
 - § Power much of secondary equipment



Opinion of Project Costs

CITY OF STAMFORD WATER POLLUTION CONTROL AUTHORITY
 PRELIMINARY TREATMENT & SECONDARY TREATMENT IMPROVEMENTS PROJECT
 W-P PROJECT NO. 13059A
 FACILITIES PLANNING PHASE - EXCLUDING GRIT REMOVAL
 OCTOBER 2015 (ENR INDEX 10037)
 PROJECT COST ESTIMATE

PROJECT COMPONENT		COST
CONSTRUCTION		\$16,240,000
CONSTRUCTION CONTINGENCY	5.0%	\$810,000
TECHNICAL SERVICES		\$2,598,000
MATERIALS TESTING	1.0%	\$162,000
ASBESTOS & LEAD PAINT ABATEMENT		\$0
DIRECT EQUIPMENT PURCHASE		\$0
LAND ACQUISITION/ EASEMENTS		\$0
LEGAL/ ADMINISTRATIVE	0.0%	\$0
	SUBTOTAL	\$19,810,000
FINANCING	0.0%	\$0
ENGINEER'S ESTIMATE OF PROJECT COST		\$19,800,000



Opinion of Project Costs

CITY OF STAMFORD WATER POLLUTION CONTROL AUTHORITY
 PRELIMINARY TREATMENT IMPROVEMENTS PROJECT
 W-P PROJECT NO. 13059A
 FACILITIES PLANNING PHASE - RAW SEWAGE PUMPING STATION
 OCTOBER 2015 (ENR INDEX 10037)
 PROJECT COST ESTIMATE

PROJECT COMPONENT		COST
CONSTRUCTION		\$9,070,000
CONSTRUCTION CONTINGENCY	5.0%	\$450,000
TECHNICAL SERVICES		\$1,451,000
MATERIALS TESTING	1.0%	\$91,000
ASBESTOS & LEAD PAINT ABATEMENT		\$0
DIRECT EQUIPMENT PURCHASE		\$0
LAND ACQUISITION/ EASEMENTS		\$0
LEGAL/ ADMINISTRATIVE	0.0%	\$0
	SUBTOTAL	\$11,062,000
FINANCING	0.0%	\$0
ENGINEER'S ESTIMATE OF PROJECT COST		\$11,100,000



Opinion of Project Costs

CITY OF STAMFORD WATER POLLUTION CONTROL AUTHORITY
 SECONDARY TREATMENT IMPROVEMENTS PROJECT
 W-P PROJECT NO. 13059A
 FACILITIES PLANNING PHASE - BLOWER BUILDING AND AERATION TANKS
 OCTOBER 2015 (ENR INDEX 10037)
 PROJECT COST ESTIMATE

PROJECT COMPONENT		COST
CONSTRUCTION		\$6,170,000
CONSTRUCTION CONTINGENCY	5.0%	\$310,000
TECHNICAL SERVICES	16.0%	\$987,000
MATERIALS TESTING	1.0%	\$62,000
ASBESTOS & LEAD PAINT ABATEMENT		\$0
DIRECT EQUIPMENT PURCHASE		\$0
LAND ACQUISITION/ EASEMENTS		\$0
LEGAL/ ADMINISTRATIVE	0.0%	\$0
	SUBTOTAL	\$7,529,000
FINANCING	0.0%	\$0
ENGINEER'S ESTIMATE OF PROJECT COST		\$7,500,000



Opinion of Project Costs

CITY OF STAMFORD WATER POLLUTION CONTROL AUTHORITY
 STANDBY GENERATOR IMPROVEMENTS PROJECT
 W-P PROJECT NO. 13059A
 FACILITIES PLANNING PHASE - STANDBY POWER GENERATOR IN BLOWER BUILDING
 OCTOBER 2015 (ENR INDEX 10037)
 PROJECT COST ESTIMATE

PROJECT COMPONENT		COST
CONSTRUCTION		\$1,850,000
CONSTRUCTION CONTINGENCY	5.0%	\$90,000
TECHNICAL SERVICES	16.0%	\$296,000
MATERIALS TESTING	1.0%	\$19,000
ASBESTOS & LEAD PAINT ABATEMENT		\$0
DIRECT EQUIPMENT PURCHASE		\$0
LAND ACQUISITION/ EASEMENTS		\$0
LEGAL/ ADMINISTRATIVE	0.0%	\$0
	SUBTOTAL	\$2,255,000
FINANCING	0.0%	\$0
ENGINEER'S ESTIMATE OF PROJECT COST		\$2,300,000



Engineering Scope & Fee

City of Stamford Water Pollution Control Authority
PRELIMINARY AND SECONDARY TREATMENT AND STANDBY POWER IMPROVEMENTS
SUMMARY OF ENGINEERING FEES

<u>Task Description</u>	<u>Total Estimated Compensation</u>
PRELIMINARY TREATMENT IMPROVEMENTS	
- Phase A - Preliminary Design	\$199,398
- Phase B - Final Design	\$540,404
- Phase C - Bidding	\$27,020
Preliminary Treatment Design & Bidding Maximum Fee	\$766,823
SECONDARY TREATMENT IMPROVEMENTS	
- Phase A - Preliminary Design	\$124,165
- Phase B - Final Design	\$340,225
- Phase C - Bidding	\$43,727
Secondary Treatment Design & Bidding Maximum Fee	\$508,117
STANDBY POWER IMPROVEMENTS	
- Phase A - Preliminary Design	\$30,043
- Phase B - Final Design	\$119,644
- Phase C - Bidding	\$16,204
Standby Power Design & Bidding Maximum Fee	\$165,890
TOTAL FOR ALL THREE BID PACKAGES	\$1,440,830



Potential Funding Sources

- CT DEEP Clean Water Fund
 - § Potential for 20% grant/80% loan
 - § Unsure of set asides on next priority list
- Eversource Energy Incentives
 - § Aeration blowers/D.O. Control
 - § Other VFDs/controls
 - § Potential odor control improvements
 - § Other (HVAC, lighting, motors)
 - § \$0.35/annual kW-hr saved or 40% of eligible costs



S-2087-0-035
October 2, 2015



Mr. William P. Brink, P.E., BCEE
Executive Director
Stamford WPCA
111 Harbor View Avenue
Stamford, CT 06902-5913

Re: Electrical Design Proposal for Bonner Street PS, Carter Drive PS, Commerce Road PS, Knapp Street PS, Saddle Rock Road PS and Bennet Street PS

Dear Mr. Brink:

In response to the Stamford WPCA's request, Tighe & Bond is pleased to submit this proposal to provide engineering services for the referenced task:

Background

During the Phase 1 services of the Arc Flash Analysis and Training Services project Tighe & Bond evaluated existing condition and installation of the WCPA waste water pump stations. As a result of these evaluations, we recommended replacing the power distribution equipment and pump control panels in the above ground installed cabinets at Bonner Street PS, Carter Drive PS, Commerce Road PS, Knapp Street PS, Saddle Rock Road PS and Bennet Street PS.

We understand that the Stamford WPCA would like to standardize the electrical design and bidding documents for the pump stations in order to the simplify operations, facilitate the interchangeability of parts, reduce the need to stock additional spare parts, and to standardize on remote communications. The standard electrical design would include an exterior concrete pad mounted or a unistrut mounted electrical enclosure containing the following electrical equipment:

- Main/Utility Disconnect Switch and Exterior Mounted Utility Meter
- Generator Main Disconnect Switch
- Manual Transfer Switch
- Portable Generator Plug
- Power Distribution Panel (240V single phase or 208V three phase) with connections for the following:
 - Enclosure Light
 - Enclosure Receptacle
 - Enclosure Heaters
 - Pump Control Panel
 - Chamber Sump Pump (where applicable)
 - Chamber Lift (where applicable)



- Chamber Dehumidifier (where applicable)
- Chamber Exhaust Fan (where applicable)
- Lockable E-stops for Pumps
- Pump Control Panel with a standardized layout including the following components
 - Motor Starters and Panel Mounted Disconnects for each pump (VFDs are not planned for the small pump stations) – While starter sizes will vary, we will recommend that up to a size 1 starter be accommodated in the standard panel which should be sufficient these pump stations.
 - Hand-Off-Auto switches, Start/Stop pushbuttons and run lights for each pump.
 - Pump Controller (capable of setting lead, lag, alternate pumps and controlling pumps to maintain wet well levels based on a level sensor signal and backup floats with intrinsically safe barriers and wiring where required.)
 - An operator interface panel to the pump controller (to allow operator to review and adjust setpoints for pump start stops and alarms)
- Remote telemetry device – radio, telephone or cellular type modem with Battery Backup UPS. Device capacity of indicating various alarms including loss of station power.

Based on the information already collected, it appears that a number of the pump stations have control systems based on a Multitrode MT2PC controller. These stations also appear to have either a telephone based alarm/telemetry system or a radio modem interfaced to the control system via an Allen Bradley Micro Logix controller. The second arrangement appears inefficient as the Allen Bradley Micro logix controller could easily perform the role of the MT2PC controller, however, due to cyber security reasons, it may be appropriate to keep them separate.

Engineering Services

Tighe & Bond proposes the following scope of work to develop this standard design:

1.1 Kick-off Meeting and Pump Station Visit– We propose that a kickoff meeting be held with the Stamford WCPA staff to review the project goals and visit the pumps stations. During the kickoff meeting we will review remote monitoring options and opportunities for standardizing the remote monitoring and pump station controllers. We will also collect O&M manual information and review drawings for the various pump stations to which this equipment would apply.

1.2 Develop Design Documents – We will prepare technical specifications (CSI Format Divisions 1 through 16) and design drawings for the pump stations electrical improvements project. We anticipate that 6 drawings will be developed under this task. A preliminary list of drawings is as follows:

- Sheet 1 – Legend, Wiring Diagrams, Details, and Schedules
- Sheet 2 – Bonner Street PS, Carter Drive PS – Site Plans and Details
- Sheet 3 – Commerce Road PS, Knapp Street PS – Site Plan and Details

- Sheet 4 – Saddle Rock Road PS and Bennet Street PS – Site Plan and Details
- Sheet 5 – Miscellaneous Electrical Details
- Sheet 6 – Structural Details

For purposes of this proposal, we assumed that the 6 pump stations designs would be completed as one contract. We propose to use standard details where appropriate and scope of work construction notes to minimize design costs. Information collected during the field visit in task 1 will be used to develop any necessary base drawings for the respective pump stations. This approach will enable the WCPA to realize design savings due to economies of scale and commonalities in proposed work.

- 1.3 Develop Opinion of Probable Construction Cost** – We will develop an opinion of probable construction cost for the project. This opinion of probable construction cost will be used as the basis of comparison for the bids received from contractors.
- 1.4 Design Review Meeting** – Prior to completing the design we will meet with the SWPCA to review the design and address comments or questions.
- 1.5 Respond to Requests for Information** – We will respond to requests for information during the bidding and construction of the improvements to the pump stations. We have included an allowance of \$2,500 for this effort to assist the SWPCA.

The following items are not included in our scope of work:

- Survey
- Hazardous materials survey prior to any demolition work
- Upfront sections of the Project Manual – Division 0 We assumed that the SWPCA will provide and include its front end agreements, terms and conditions, bid forms, and instructions to bidders
- Permitting
- Bidding and Services During Construction – We assumed that the SWPCA will bid the project to respective contractors using their internal procurement procedures. The SWPCA will also review the submitted bids and award the project to the most qualified and responsive bidder. The SWPCA will oversee the construction activity and review the submitted shop drawings. We have included an allowance (\$2,500) to respond to requests for information during bidding and construction activity.

Schedule/Budget

We are prepared to begin the design of the pump stations improvements immediately for the SWPCA. The design drawings and technical specifications can be completed within 12 weeks after we receive the Notice to Proceed.

Tighe & Bond will perform these services for a lump sum fee of \$24,950, invoiced monthly based on percentage complete. In the event that the scope of work is increased for any reason, the lump sum fee to complete the work shall be mutually revised by written amendment. Our attached Terms and Conditions is part of this letter agreement.

Please contact us if you have any questions, comments, or require additional information.

Very truly yours,

TIGHE & BOND, INC.

Stephen E. Seigal

Stephen E. Seigal, P.E., BCEE
Vice President

\\Srv\Projects\S\S2087 Stamford Arc Flash Study\PROP\Pump Station Standard Design\Pump Station Electrical Design Proposal.Docx



S-2087-0-035
October 24, 2015



Mr. William P. Brink, P.E., BCEE
Executive Director
Stamford WPCA
111 Harbor View Avenue
Stamford, CT 06902-5913

Re: Arc Flash Hazard Analysis and Training Services Phase 2 – Arc Flash Hazard Analysis and Electrical Preventative Maintenance (EPM) RFP development for Stamford WCPA facilities

Dear Mr. Brink:

In response to the Stamford WPCA's request, Tighe & Bond is pleased to submit this proposal to provide engineering services for the following two tasks:

Task 1:

Perform a power system study that will include short-circuit, coordination and arc flash hazard analysis for the for the electrical power distribution systems at the Stamford Water Pollution Control Facility (including Sludge Dryer distribution equipment), Alvord Lane PS, Cove Island PS, Highway Garage PS, West Ave PS, Cummings Park PS and Wampanau PS.

Task 2:

Development of a preventative maintenance Request for Proposal (RFP) for electrical distribution system equipment at Stamford Water Pollution Control Facility, Alvord Lane PS, Cove Island PS, Cummings Park PS and Wampanau PS. Provide engineering assistance and coordination for the implementation of the maintenance work.

Scope of Services for Task 1

Tighe & Bond proposes the following scope of work to complete the studies:

- 1. Kick-off Meeting** – Attend one kickoff meeting be held with the Stamford WCPA staff. The kickoff meeting will be held on the first day of data collection and will include a review of our field data collection needs, methods of collection, assistance from facility personnel, the proposed project schedule, and project deliverables.
- 2. Collect/Verify Electrical System Data** - Electrical system data will be collected and verified by conducting field visits to each facility. The need for accurate system and equipment information is crucial to the successful completion of an arc flash hazard analysis. The data collected in the field is entered into the SKM Power Tools arc flash software to determine the incident energy at a given location. Stamford WCPA can use this information to select the correct level of PPE needed to protect worker health and safety. Typical electrical system data to be collected may include but is not limited to utility and generator contributions, generator, transformers, switchgears, switchboards, motor control centers, panel boards, circuit breakers, local disconnect switches, protective relays, fuses, motors, conduits, conductors, etc.

Tighe & Bond will collect the electrical system using experienced Tighe & Bond electrical engineer. Some data collection may need to take place during schedule shutdowns.



- 3. Create One-Line Diagram** – Each building will have a unique one-line diagram showing all system busses (equipment) included in the report.
- 4. Model and Perform Electric Power Systems Analysis** – We will develop a software model of the system. This model will be used to perform the following studies:
- A. Short Circuit Current Study (SCCS) in accordance with ANSI Std. C37 and IEEE Std. 141 (Red Book) for all applicable electrical components. This will also include an Equipment Evaluation Study to check the computed available fault current against existing equipment short circuit interrupting ratings.
 - B. Protective Device Coordination & Arc Flash Mitigation Study - We will perform an Overcurrent Protective Device Coordination Study in accordance with IEEE Std. 242 (Buff Book) for all applicable electrical components. The study will analyze and optimize protective device settings and provide the lowest possible incident energy while maintaining selective coordination. The coordination study shall begin with the utility company's feeder protective device and include all of the electrical protective devices down to and including the largest feeder circuit breaker and motor starter in the 480 Volt power distribution panelboards. The study shall also include variable frequency drives, harmonic filters, power factor correction equipment, transformers and protective devices associated with variable frequency drives, emergency and standby generators associated paralleling equipment and distribution switchgear.
 - C. Arc flash hazard analysis to determine incident energy levels, proper ratings of PPE, NFPA 70E shock approach boundary distances at specified equipment locations, arc flash and shock protection boundaries, and warning label requirements. Incident energy and arc flash protection boundaries will be computed using IEEE Std. 1584, "IEEE Guide for Performing Arc Flash Hazard Calculations" and the NFPA 70E Guidelines. We will perform this study on all applicable exposure areas at the facility. The arc flash hazard analysis shall also include identifying the available fault current at equipment buses as well as clearing time for applicable protective devices to determine proper PPE requirements. The PPE determination shall be based upon potential arc flash incident energy exposure levels and shall determine:
 - Proper PPE for each applicable piece of electrical equipment
 - Working distance for each applicable piece of electrical equipment
 - Incident energy level for each applicable piece of equipment
 - Flash protection boundary for each applicable piece of equipment
 - D. Produce Arc Flash Hazard Warning Labels – We will furnish arc flash hazard warning label information for each applicable piece of equipment in accordance with ANSI Z535.4, NEC 110.16 and NFPA 70E 130.3, UL 969 guidelines. The label information shall include:
 - 1. Voltage rating of equipment
 - 2. Arc flash protection boundary (in.)
 - 3. Arc flash incident energy at the working distance (cal/cm²)
 - 4. Working distance (in.)
 - 5. Recommended protection including glove rating
 - 6. Limited, restricted and prohibited approach distances (in.)
 - 7. Bus identification

- E. Arc flash labels should be based upon recommended overcurrent device settings from the Protective Device Coordination & Arc Flash Mitigation Study.
- F. Install Arc Flash Hazard Warning Labels – We will install the generated arc flash warning labels at the applicable equipment locations in accordance with NEC-article 110.16.
- G. Deliver Final Report. We will furnish a complete report for all system studies in both electronic (in Adobe PDF format on compact disk media) and bound, hard copy document form. The report(s) will include the results of the short circuit, coordination, device evaluation, arc flash calculations, the coordination curves and all input data, recommendations for changes to settings or equipment, and conclusions. The report will contain, at a minimum, the following:

- 1. Executive Summary

We will provide a synopsis of the overall findings including but not limited to equipment locations with the highest incident energy levels, total number of overcurrent protection devices with inadequate short circuit interrupting ratings.

- 2. Methodology

We will provide a summary of analysis methodology, explanation of the arc flash hazard analysis and criteria used for the calculations shall be included in the report.

- 3. Assumptions

We will provide a list of all valid engineering assumptions made and why they were made for the study. We will also provide a summary of component input data used to perform the power system analysis.

- 4. One-line Diagram

We will provide a full-sized one-line system diagram that shall be computer generated and will clearly identify individual equipment buses, bus numbers used in the short-circuit analysis, cable and bus connections between the equipment, device numbers used in the time-current coordination analysis, and other information pertinent to the computer analysis.

- 5. Analysis Data and Results

- a. Short Circuit Data:

- i. Source fault impedance and generator contributions
- ii. X to R ratios
- iii. Asymmetry factors
- iv. Motor contributions
- v. Short circuit kVA
- vi. Symmetrical and asymmetrical fault currents

- b. Recommended Protective Device Settings:

- i. Phase and Ground Relays
 - 1. Current transformer ratio
 - 2. Current setting
 - 3. Time setting
 - 4. Instantaneous setting
 - 5. Specialty non-overcurrent device settings
 - 6. Recommendations on improved relaying systems, if applicable

- ii. Circuit Breakers
 - 1. Adjustable pickups and time delays (long time, short time, ground)
 - 2. Adjustable time-current characteristic
 - 3. Adjustable instantaneous pickup
 - 4. Recommendations on improved trip systems, if applicable

- c. Incident energy and fault protection boundary calculations:
 - i. Arcing fault magnitude
 - ii. Device clearing time
 - iii. Duration of arc
 - iv. Arc flash boundary
 - v. Working distance
 - vi. Incident energy
 - vii. Hazard risk category
 - viii. Recommendations for arc flash energy reduction

6. Recommendations

Provide general recommendations to reduce the existing incident energy levels and improve overall future safety for the facility. This section shall include equipment being noted as insufficient or not being installed properly during data collection/equipment evaluation process and associated recommendations for improvements of this equipment.

7. Bibliography

Provide all applicable industry references used to complete the power systems analysis and arc flash hazard assessment.

Scope of Services for Task 2

1. Development of RFP documents will include:

- A. Draft specifications for recommended maintenance for the electrical distribution equipment. The recommended maintenance will be based on NFPA 70B and/or written vendor requirements-
- B. Draft specifications that require the contractor to provide backup or alternate power feeds for certain maintenance activities. This may include temporary feeds for lighting transformers during automatic transfer switch maintenance.
- C. Meet with WPCF staff to review proposed maintenance activities and associated risks, and obtain input regarding proposed activities and the limitations of the system operation such as maximum allowable shutdown periods for specific pieces of the system.
- D. Coordination and/or sequencing procedures to be used during the electrical distribution system maintenance work.
- E. Bid package for the work including the City's standard procurement documents. Tighe & Bond will provide a bid form, scope of work, technical specifications for the maintenance activities, and background information using WPCF record documents. Unit prices will be requested for the various maintenance activities to provide the WPCF with an ability to manage the work over a multiple year timeframe.

2. Assist the WPCA during the bidding process, including:

- A. Attend one pre-bid meeting and conduct a field walk through of the Project locations with the potential bidders.
- B. Respond to bidder questions and prepare addendum documents, if necessary. These documents will be provided to the WPCA for distribution to the bidders.
- C. Tighe & Bond will review the bids, perform a reference check on the low bidder if required, and provide the WPCA with our recommendation regarding award of the project.

3. Services during the electrical preventative maintenance:

- A. Conduct a pre-maintenance conference.
- B. Utility coordination assistance.
- C. Provide submittal (maintenance procedures and maintenance schedule) review and general EPM administration services to support the project as requested by the Stamford WPCA up to the not to exceed fee.
- D. Respond to requests for information during EPM.
- E. Provide review of the EPM and conduct EPM coordination meetings and/or observation services during the course of the field work as requested by the Stamford WPCA up to the not to exceed fee.



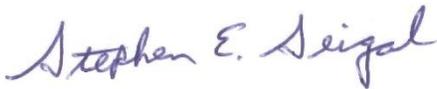
Engineering Budget and Schedule

The services described in Task 1 and Task 2.1 will be performed for a lump sum fee of \$85,175 invoiced monthly based upon the percentage complete. Tighe & Bond will perform services as described in Task 2.2 and Task 2.3 for a not to exceed fee of \$6,234 and \$19,220; respectively. We will undertake this work on an hourly plus expense basis, and you will be billed in accordance with the attached rate schedule. In the event that the scope of work is increased for any reason, the fee to complete the work shall be mutually revised by written amendment.

Please contact me should you have any questions, comments, or require additional information.

Very truly yours,

TIGHE & BOND, INC.



Stephen E. Seigal, P.E., BCEE
Vice President

Attachment: 2015 Fixed Hourly Rate Schedule

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2015 FIXED HOURLY RATE SCHEDULE

TECHNICAL PROFESSIONALS

Principal	\$215.00
Principal Coastal Engineer	\$175.00
Principal Engineer 1	\$165.00
Senior Consultant	\$300.00
Traffic Consultant	\$180.00
Senior Project Manager	\$165.00
Project Manager	\$160.00
Senior Engineer	\$160.00
Project Engineer	\$129.00
Staff Engineer 3	\$120.00
Staff Engineer 2	\$100.00
Staff Engineer 1	\$90.00
Senior Planner	\$125.00
Project Planner	\$95.00
Planner 2	\$85.00
Planner 1	\$75.00
Construction Services Manager	\$138.00
Construction Observer	\$110.00
Principal Compliance Specialist	\$160.00
Senior Compliance Specialist	\$135.00
Project Compliance Specialist	\$96.00
Compliance Specialist 2	\$90.00
Compliance Specialist 1	\$78.00
Principal Environmental Scientist	\$140.00
Senior Environmental Scientist	\$133.00
Project Environmental Scientist	\$100.00
Environmental Scientist 2	\$83.00
Environmental Scientist 1	\$73.00

GIS PROFESSIONALS

GIS Director	\$165.00
Senior Development Engineer	\$150.00
GIS Project Manager	\$120.00
GIS Developer 2	\$95.00
GIS Developer 1	\$85.00
GIS Analyst 2	\$110.00
GIS Analyst 1	\$95.00
GIS Technician 2	\$77.00
GIS Technician 1	\$67.00
GIS Support*	\$55.00

SUPPORT STAFF

Remediation Technician*	\$81.00
Senior Designer/Drafter	\$130.00
Designer/Drafter*	\$91.00
CAD Technician*	\$62.00
Engineering Technician*	\$75.00
Administrative Support*	\$77.00

EXPENSES

1. Automobile transportation expense for employee travel directly related to the project shall be invoiced at the prevailing Federal rate per vehicle mile.
2. Outside reimbursable expenses and services, which are rendered to Tighe & Bond by other than direct employees, and any permitting fees paid by Tighe & Bond on behalf of the Client, shall be invoiced at Tighe & Bond's direct cost plus 10% administrative fee.
3. Reimbursable expenses such as in-house field supplies and equipment rental, tolls and parking, overnight mailings and bulk notification mailings, and in-house printing shall be invoiced at cost or unit costs as applicable.
4. Costs for items such as regular mailings of project documents, telephone or fax communications, computer usage charges, and miscellaneous in-house printing are included in the hourly rates shown above.

PROVISIONS

1. Rates are effective until January 1, 2016 at which time rates will be increased based on annual salary review.
- * For non-salaried personnel (noted above by an "**"), time worked in excess of eight hours in any day or forty hours per calendar week shall be invoiced at 150 percent of the above rate.