ERIE COUNTY WATER AUTHORITY
AUTHORIZATION FORM
For Approval/Execution of Documents
(check which apply)

Contract: MP-086 **Project No.:** 202000177
Project Description: Ball Pump Station Phase-1 Rehabilitation

Item Description:

- [ ] Agreement
- [X] Professional Service Contract
- [ ] Amendment
- [ ] Change Order
- [ ] BCD
- [ ] NYSDOT Agreement
- [ ] Contract Documents
- [ ] Addendum
- [ ] Recommendation for Award of Contract
- [ ] Recommendation to Reject Bids
- [ ] Request for Proposals
- [ ] Other

Action Requested:

- [X] Board Authorization to Execute
- [X] Legal Approval
- [ ] Board Authorization to Award
- [X] Execution by the Chairman
- [ ] Board Authorization to Advertise for Bids
- [ ] Execution by the Secretary to the Authority
- [ ] Board Authorization to Solicit Request for Proposals
- [ ] Other

Approvals Needed:

APPROVED AS TO CONTENT:

- [X] Sr. Distribution Engineer — Date: 6/10/2020
- [X] Chief Operating Officer — Date: 6/10/2020
- [X] Executive Engineer — Date: 6/10/2020
- [X] Director of Administration — Date: 6/10/2020
- [X] Risk Manager — Date: 06/10/2020
- [X] Chief Financial Officer — Date: 06/10/2020
- [X] Legal — Date: 06/10/2020

APPROVED FOR BOARD RESOLUTION:

- [X] Secretary to the Authority — Date: 06/10/20

Remarks:

Resolution Date: **Item No:**

ERIE COUNTY WATER AUTHORITY

INTEROFFICE MEMORANDUM

June 10, 2020

To: Terrence D. McCracken, Secretary to the Authority

From: Leonard F. Kowalski, Executive Engineer

Subject: Contract MP-086
Ball Pump Station Phase-1 Rehabilitation
ECWA Project No. 202000177

The following material is attached:

- Blue Authorization Form indicating the requested Board action and approvals needed.
- Professional Service Contract for the above referenced project (2 copies) with Arcadis of New York, Inc. for execution by the Chairman.
- Copy of Interoffice Memorandum from Leonard F. Kowalski, Executive Engineer, dated May 28, 2020, detailing recommendations for the contract assignment after review of Request for Proposals (PN 202000046).

This project will focus on improvements to the Ball Pump Station located in the Town of Amherst. The project will involve the following tasks:

- Task 1- Basis of Design Report;
- Task 2 - Design Documents;
- Task 3 - General Services;
- Task 4 - Resident Inspection;
- Task 5 - Record Drawings;
- Task 6 – Authority Program/Procedure Updates
- Task 7 – Special Services

The total not to exceed fee for this contract is $1,180,000.00. Funds for this project are included in the 2020 Capital Budget under 2520 Engineering and Construction – Control, Item 101512.

Completion of the Basis of Design report is scheduled for December 2020 and Design in September 2021.

LFK:MWW:jmf
cc: K.Prendergast
R.Stoll
M.Wymer
M.Quinn
L.Lester
CONT-MP-086-2020-X-01

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ERIE COUNTY WATER AUTHORITY

INTEROFFICE MEMORANDUM

May 28, 2020

To: Terrence D. McCracken, Secretary to the Authority

From: Leonard F. Kowalski, PE, Executive Engineer

Subject: Request for Proposals
Ball Pump Station Phase I Rehabilitation
ECWA Project No. 202000046

The Erie County Water Authority (ECWA) recently issued a Request for Proposal (RFP) for the design of a series of improvements related to the Ball Pump Station. This project will involve seven distinct design tasks that will result in the construction of significant improvements to the facility in three primary areas including:

- Pumping system improvements:
- Yard piping improvements;
- HVAC system and miscellaneous improvements.

The Ball Pump Station was constructed in the 1970s and the station was sized based on significant growth in the northtowns, however, the population has not expanded as expected. As such, currently only two pumps, equipped with variable frequency drives handle the majority of the flows while three large constant speed pumps are only used during periods of high demand and may sit idle for several years. The Ball Pump Station is a critical pump station and much of the equipment (piping, valves, and pumps) is original to its construction.

RFPs were issued to five consulting engineers: Arcadis, GHD, Brown and Caldwell, Nussbaumer & Clarke, and Hazen & Sawyer as well as posted the RFP to the Water Authority Website. Four other firms, LaBella, Dubois & King, Foit Albert, and Barton & Loguidice obtained the RFP through our website. In the end, four firms, Arcadis, GHD, Brown and Caldwell and Hazen & Sawyer chose to submit proposals for this project. This is a single project requiring one consulting firm.

The proposals were reviewed and discussed among the engineering staff (Russ Stoll, Len Kowalski, Michael Wymer, and Michael Quinn). Experience, staffing, scope and project approach were considered. It was determined that each firm possessed the basic relevant qualifications to perform the work proposed.

Arcadis provided an experienced project team and demonstrated direct experience with recent work at various Water Authority facilities including the Ball Pump Station. In addition to their relevant experience, the Arcadis team includes Nussbaumer & Clarke who were not only invited to propose on the project but also possess extensive experience at the Ball Pump Station. Their team, approach and level of effort showed an understanding of the necessary project process and workflow for all of the required tasks in this RFP. Their construction phase team includes resident

inspectors who provide multiple years of experience on several previous projects at the Ball Pump Station as well as other Water Authority facilities.

If there are no objections, the Engineering Department plans on moving forward with negotiations with Arcadis to develop a Professional Services Contract for the referenced project.

LFK:MJQ:jmf
cc: K.Prendergast
R.Stoll
M.Quinn
M.Wymer
L.Lester
ECWA-722-2002

Project No. 202000177
Contract MP-086

PROFESSIONAL SERVICES AGREEMENT
FOR ENGINEERING SERVICES

This is an Agreement effective as of June 18, 2020 ("Effective Date") by and between

ERIE COUNTY WATER AUTHORITY
295 Main Street, Room 350
Buffalo, New York 14203

hereinafter referred to as the "Authority," and

ARCADIS OF NEW YORK, INC.
50 Fountain Plaza, Suite 600
Buffalo, New York 14202

hereinafter referred to as the "Engineer."

The Authority project, for which engineering services are to be provided under this Agreement, relates to the Ball Pump Station Phase I Rehabilitation (the "Project").

In consideration of the mutual promises set forth in this Agreement, the Authority and the Engineer agrees as follows:

ARTICLE 1 – THE PROJECT

1.01 The Richard F. Ball Pumping Station and Ground Storage Tanks are located along Sweet Home Road adjacent to the SUNY at Buffalo North Campus in the Town of Amherst, New York and were built in the mid 1970's. The site is between 6 and 7 acres and contains the pump station, two ground storage tanks, associated yard piping and an electrical substation. The Van de Water Treatment Plant in the Town of Tonawanda pumps finished water to the two storage tanks at the pump station. The tanks supply water to five pumps in the pump station which range in size from 700 HP to 1,500 HP.

1.02 The Authority proposes to complete a series of improvements to the pumping station. Pumps 1, 2, and 3 are constant speed pumps that do not provide the Authority with the operational flexibility that is provided by Pumps 4 and 5, which are equipped with variable frequency drives (VFDs). The larger capacity, constant speed pumps, are typically used during periods of high system demand and will often sit idle for several years. Newer, more efficient, properly sized pumps will provide greater operational flexibility to the Authority.

1.03 The project has three main components: Pump System Improvements, Yard Piping Improvements, and HVAC System/Miscellaneous Improvements.

Pump system improvements include, but are not limited to, the following: (1) replacement of all five pumps with new 1,000 – 1,250 HP horizontal split-case pumps (all of similar capacity) equipped with VFDs to expand preferred operating ranges and improve operations and maintenance activities; (2) design pump station to meet a current firm capacity of 71 MGD that is expandable to 82.5 MGD by the addition of a sixth pump (3) new conditioned room to protect VFDs from ambient temperature and humidity fluctuations; (4) replacement of pump suction and discharge piping in between isolation butterfly valves; (5) new cushioned check valves for each pump; (6) surge relief system improvements; (7) installation of all electrical equipment (power, cable, conduit, etc.) associated with the replacement pumps and VFDs; and (8) SCADA integration associated with the replacement pumps and VFDs.

Yard Piping Improvements include, but are not limited to: (1) replacement of the buried 48-inch and 54-inch piping between the two water storage tanks (North and South), west of the pump station building; (2) replacement of sections of the buried 60-inch inlet pipe located south of the pump station building with 48-inch piping and an additional parallel 48-inch pipe to provide redundancy; (3) Addition of a parallel main and other piping improvements to remove a single point of failure of the current 48-inch transmission main east of the pump station building; (4) replacement of the piping associated with the venturi meters, located east of the pump station building; (5) installation of all new piping to a depth to be directly supported on competent rock (approximate depth of 580 – average grade elevation around the Ball Pump Station is 600); and (6) the Engineer shall confirm the location of tie-in points, pipe fittings, pipe alignments, and pipe diameters during basis of design.

HVAC System and Miscellaneous Improvements component includes, but are not limited to: (1) replacement of gas unit heaters, exhaust fan components, and other outdated HVAC components; (2) installation of new 2-inch water supply line within the pump station building; (3) replacement of sump pumps within the three Venturi pits; (4) installation of new instrumentation conduit between the pump station and the three Venturi pits; (5) replacement of the existing sanitary sewer service lateral; (6) installation of a new access man-door on the east side of the building near Pump 1; and (7) installation of new electrical, PLC, and associated controls (SCADA) for the pumps and HVAC.

ARTICLE 2 – COMPLIANCE STANDARDS

2.01 ***Standard of Performance***

A. ***Standard of Care:*** The standard of care for all professional engineering and related services performed or furnished by the Engineer under this Agreement will be the care and skill ordinarily used by members of the subject profession practicing under similar circumstances at the time and in the same locality.

B. ***Technical Accuracy:*** The Authority shall not be responsible for discovering deficiencies in the technical accuracy of the Engineer's services. The Engineer shall correct deficiencies in technical accuracy without additional compensation, unless such

corrective action is directly attributable to deficiencies in Authority-furnished information.

2.02 ***Compliance with Laws and Regulations, and Policies and Procedures***

A. The Authority and the Engineer shall comply with all applicable federal, state or local laws and regulations and all applicable Authority policies and procedures.

B. The Engineer shall comply with the provisions set forth in Public Authorities Law §§ 2875, 2876, and 2878 of the laws of the State of New York. In response to the Authority's Request for Proposals, the Engineer submitted and signed Forms A, B, and C, a copy of which is attached to, and incorporated in, this Agreement as Appendix D.

C. By executing this Agreement, the Engineer affirms under the penalties of perjury that there was no collusion in the proposal submitted to the Authority, upon which forms the basis of this Agreement.

D. The Engineer shall comply with the provisions of State Finance Law § 138-L of the laws of the State of New York. In response to the Authority's Request for Proposals, the Engineer submitted and signed the Sexual Harassment Bidding Certification, a copy of which is attached to, and incorporated in, this Agreement, as Appendix D.

E. The Engineer shall comply with the provisions of the Shield Act, codified at General Business Law § 899-aa of the laws of the State of New York.

F. The Authority shall provide the Engineer in writing any and all Authority policies and procedures applicable to the Engineer's performance of services under this Agreement. The Engineer agrees to comply with such policies and procedures to the extent compliance is not inconsistent with professional practice requirements.

G. While on Authority property, the Engineer's employees, representatives and engineers shall comply with the specific applicable security and access rules established by the Authority's Security Officer.

2.03 ***Unknown Conditions***. The Engineer shall not be required to sign any documents, no matter by whom requested, that would result in the Engineer having to certify, guarantee, or warrant the existence of conditions whose existence the Engineer cannot ascertain. The Authority agrees not to make resolution of any dispute with the Engineer for payment on any amount due to the Engineer in any way contingent upon the Engineer signing any such documents.

ARTICLE 3 – SCOPE OF SERVICE

3.01 ***Kick-off Meeting.*** Prior to rendering any professional services, the Engineer will conduct a kickoff meeting with Authority personnel to take place at the same time as the site walkthroughs referenced in § 3.02 of this Agreement. Provide meeting minutes to the Authority within 5 business days of the meeting date.

3.02 ***Preliminary Investigation and Due Diligence*****.** The Engineer shall provide all engineering services necessary to design and install the Project improvements including, but not limited to, the following:

A. ***Basis of Design ("BOD"):***

1. In contemplation of the basis of design, the Engineer shall:

a. Review reports, drawings, specifications, and other records furnished by the Authority.

b. Verify site conditions at each location.

i. Complete a site walkthrough and conduct meetings with operating staff to discuss current operational strategies and challenges.

ii. Review applicable operating records.

iii. Determine the condition of critical assets and document the need for rehabilitation, remaining life, and required replacement.

iv. Specifically note the condition of equipment to remain in relation to the improvements described in § 1.03 of this Agreement.

c. Identify locations of suspected hazardous materials (e.g., lead paint, asbestos, etc.) or concerning environmental conditions, based on known/assumed age and type of construction.

i. If material sampling and testing becomes necessary, such sampling and testing would be considered a Special Service, subject to the provisions of paragraph B of this section.

d. Prepare preliminary design documents for the new pump station. Preliminary design documents should:

i. Include final design criteria including but not limited to equipment selection, pump capacity, pipe class, and hydraulics analysis. The desktop hydraulic analysis will be performed based on information and data provided by the Authority for present and future demand conditions.

ii. Preliminary design drawings including:

(a) Process Flow Diagram.

(b) Process and Instrumentation Drawing.

(c) Plan view of proposed pump station

(d) Elevations, Sections, and Details required to relay the design intent.

iii. Include an equipment/motor list for all electrical equipment and identify code compliance requirements for electrical components.

iv. Evaluate and recommend an approach to surge relief to minimize water hammer on the pumping system discharge piping and transmission mains.

v. Evaluate and recommend ancillary pump and piping components including mechanical seals, bearing RTDs, vibration sensors, seal water flow switches, automatic lubrication, impeller/wear ring materials, and check valve limit switches.

vi. Include a corrosion protection study for yard piping including a desktop review of record drawings, soil analysis, and stray current assessment.

vii. Process control narrative for operation and monitoring of the system.

viii. List the required technical specifications for final design.

ix. Describe the construction sequencing in conjunction with the maintenance of pumping operations.

x. State an opinion of probable project costs.

xi. Set forth a Project schedule identifying the duration of final design, bid, and construction phases.

2. The Engineer shall prepare a draft BOD Report, setting the factors considered by the Engineer including, but not limited to, those specifically identified in paragraph A, subparagraph 1 of this section. The Engineer shall supply the Authority with ten (10) copies of the draft BOD Report with supporting documentation, along with a digital .pdf file of the draft BOD Report with supporting documentation.

3. The Engineer shall meet with the Authority to review the draft BOD Report and will incorporate all comments into a final version. The Engineer shall supply the Authority with ten (10) copies of the final BOD Report with

supporting documentation, along with a digital .pdf file of the final BOD Report with supporting documentation.

4. The Engineer will prepare a Project schedule identifying the duration of final design, bid, and construction phases.

5. The Engineer will conduct at least two (2) review meetings with the Authority.

B. ***Special Services:***

1. The Engineer may employ one or more of the following special services in carrying out the Project, subject to the Authority's approval:

    a. Soils investigations including test borings, pavement cores, and the related analysis;

    b. Detailed mill, shop and/or laboratory inspection of materials and equipment;

    c. Land surveys, maps, plates, descriptions and title investigations which may be required to acquire lands, easements, and rights-of-way for the proposed facilities;

    d. Air, water, and/or soil sampling, testing, and/or analysis;

    e. Hazardous material testing and assessment;

    f. Wetlands investigations, delineation, and mitigation;

    g. Technical assistance with operation and maintenance manuals;

    h. Start-up services relating to equipment to be installed by the contractor;

    i. Technical assistance with preparing any necessary documents if required by the New York State Environmental Quality Review Act (SEQRA) for Type I or Unlisted actions

    j. Technical assistance with preparing with Storm Water Pollution Prevention Plans (SWPPP), if required;

    k. Assistance with permit and other applications with the New York State Department of Environmental Conservation (DEC);

l. Assistance with grant research, completion of grant applications, and reporting/documentation after award;

m. Laboratory testing, jar testing, and pilot testing;

n. Extra travel and subsistence for the Engineer and its staff beyond that normally required under ordinary circumstances, when authorized by the Authority;

o. Legal services, as deemed necessary and approved by the Authority's General Counsel, for acquiring lands, easements and rights-of-ways or other Project-related services; or

p. Other services, as deemed necessary by the Authority's Chief Operating Officer and Chief Financial Officers.

2. **Reliance on Others.** Subject to the standard of care set forth in § 2.01, paragraph A, the Engineer and its special services consultants may use or rely upon design elements and information ordinarily or customarily furnished by others including, but not limited to, specialty contractors, manufacturers, suppliers and the publishers of technical standards.

3. **Expert Witness Assistance.** The Engineer agrees to assist the Authority as an expert witness in litigation arising from the project development and construction, even if such assistance is requested by the Authority after the expiration or termination of this Agreement.

3.03 ***Design:*** The Engineer will complete design documents for the pump station improvements. The work shall include:

A. ***Detailed Design Drawings, Specifications and Contract Documents:*** Upon authorization from the Authority, the Engineer shall complete the following design services:

1. Obtain field topographic survey data for the preparation of construction plans required for final design of the project. Survey data is to be according to NAD83 and NGVD29 standards.

2. Prepare detailed design drawings and specifications at 60%, 90%, and 100% design stages including, but not limited to:

a. Preparing engineering calculations to support the design of the improvements, including related civil, mechanical, electrical/ instrumentation, structural, and architectural features of the project;

b. Preparing draft and final plans, profiles, and job specific detail drawings that include editing of the Authority's standard detail

drawings where appropriate. In addition, provide revisions to the Process Flow Diagram, Process and Instrumentation Diagram and control descriptions provided as part of the Basis of Design;

c. Using the quantity take-off method, provide detailed measurements of a Project's components, materials, and construction labor to determine a scope of work required and a cost estimate of the construction project;

d. Submitting plans to various utility companies and regulatory agencies to incorporate all existing utilities within the project limits;

e. Preparing engineering data, where necessary, for regulatory permit applications as required to obtain local, state, federal and public utility approval for the initiation and construction of the work;

f. Submitting the BOD Report with contract specifications, drawings, application forms and fees to the New York State Department of Health (NYSDOH) and Erie County Department of Health (ECDOH) for approval;

g. Preparing any necessary and applicable documentation for compliance with New York State, including Type II SEQR declaration and determination of requirements for SWPPP (as applicable);

h. Preparing and updating, as needed, a schedule for the Project utilizing the Authority's standard format; and

i. Preparing base drawings in AutoCAD version 2018 from the available records furnished by the Authority and other agencies.

3. Prepare contract documents including, but not limited to:

a. Preparing contract specifications with edited Authority's standard "front end" specifications and standard technical specifications where appropriate;

b. Preparing additional technical specifications as required including Maintenance of Pumping Operations specification;

c. Obtaining New York State Prevailing Wage Rates and inserting such rates into the specifications;

d. Assisting the Authority with assembling known reports and drawings of existing conditions, and identifying the technical data contained in such reports and drawings upon which bidders may rely; and

e. Using the "Standard General Conditions of the Construction Contract" as prepared by the Engineers Joint Contract Documents Committee (EJCDC C-700, 1996 Edition) or other general conditions mutually agreed to by the Authority and the Engineer and setting forth the exceptions to these general conditions, specific to this Project.

B. ***Design Phase Meetings and Reports.*** The Engineer shall:

1. Conference with the Authority and other related Project stakeholders, as necessary and as required;

2. Report to the Authority bi-weekly on the progress of the design work via email, with the following information:

    a. Design work performed during the previous two weeks;

    b. Design work scheduled for the next two weeks;

    c. Schedule status/deliverable status, attaching an updated project schedule in Microsoft Project format, identifying all project milestones and current project status;

    d. Budget status/percent completed;

    e. Input needed from the Authority or others;

    f. Requests for scope changes; and

    g. Other issues or concerns;

3. Furnishing the Authority with five (5) hardcopy sets of review copies of the drawings, specifications and other contract documents, to the Authority during 60%, 90%, and 100% design and providing digital .pdf file version of each set of documents;

4. Conduct at least three meetings with the Authority engineers and operators to discuss and/or review detailed design drawings, specifications and contract documents. Provide meeting minutes to the Authority within 5 business days of the meeting date; and

5. Attend a final design meeting with the Authority.

3.04 ***Construction Phase***

A. ***Construction Bids.*** Upon authorization from the Authority, the Engineer shall:

1. Assist Authority personnel in preparing bid invitation and contract documents;

2. Refrain from discussing the Project or the bid process with anyone outside of the Authority prior to the advertisement of bids and during the restricted period for the submission and award of bids;

3. Furnish twenty (20) sets and digital .pdf file of contract drawings, final specifications, and other documents required for bidding and construction purposes for each contract;

4. Conduct, at the appropriate time, a pre-bid meeting:

    a. Prepare and distribute addenda for pre-bid meeting;

    b. Record, publish, and distribute minutes from the pre-bid meeting; and

    c. Prepare, if necessary, publish, and distribute any addendum to the bid invitation and contract documents; and

5. Evaluate and determine whether substituted materials and equipment proposed in a bid submission of a prospective contractor is acceptable and at least equal to the materials and equipment set forth in bid and contract documents; and

6. Assist the Authority in securing bids, bid results, analyzing bid results, and making recommendations on the award of each construction contract;

B. ***Pre-Construction***. Prior to construction, the Engineer shall:

1. Provide pre-construction meeting notice to all municipalities, utility companies, fire districts, and all other interested stakeholders;

2. Conduct a pre-construction meeting:

    a. Prepare and distribute agenda for pre-bid meeting; and

    b. Record, publish, and distribute minutes from the pre-bid meeting.

C. ***Construction.***

1. The Engineer is not responsible for the construction means, methods, techniques, sequences or procedures, time of performance, programs or for any safety precautions in connection with the construction work (the "Work"). The Engineer shall not be held liable to the Authority for the failure of the construction contractor (the "Contractor") to execute the Work in accordance with the contract documents (the "Contract Documents").

2. The Engineer shall notify the Authority of all permanent Work which does not conform to the result required in the Contract Documents, prepare a written report describing any apparent non-conforming permanent Work and make recommendations to the Authority for its correction and when requested by the Authority, have recommendations implemented by the Contractor.

3. The Engineer shall have responsibility over the following:

    a. Defective Work:

        i. Based on the Engineer's observations, if the Engineer believes that the Work is defective under the terms and standards set forth in the Contract Documents, the Engineer shall reject the Work and provide the Authority with its recommendations regarding whether the Contractor should correct such Work or remove and replace such Work, or whether the Authority should consider accepting such Work as provided in the Contract Documents.

    b. Compatibility with Design Concept:

        i. If the Engineer has actual knowledge a specific part of the Work, although not defective under the terms and standards set forth in the Contract Documents, but nonetheless is not compatible with the design concept of the completed Project as a functioning whole, the Engineer will inform the Authority of such incompatibility, and provide recommendations for addressing such Work.

    c. Clarifications and Interpretations:

        i. When the Contractor and the Authority submits to the Engineer any question concerning the requirements of the Contract Documents, including any requests for information (RFIs), or relating to the acceptability of the Work under the Contract Documents, the Engineer shall, with reasonable promptness, render a written clarification, interpretation, or decision on the issue submitted, or initiate an amendment or supplement to the Contract Documents.

    d. Differing Site Conditions:

        i. When the Contractor notifies the Engineer of differing site conditions, including conditions relating to underground

facilities such as utilities, and hazardous environmental conditions, the Engineer shall promptly review the condition and prepare findings, conclusions, and recommendations to the Authority as to how to address the condition.

e. Substitutes and "Or-equal":

   i. The Engineer shall evaluate and determine the acceptability of substitute or "or-equal" materials and equipment proposed by Contractor.

f. Change Orders:

   i. The Engineer shall notify the Authority when a change in the Work is proposed, which will cause an adjustment in the contract cost.

   ii. The Engineer will evaluate whether the proposed change is justified and reasonable, and if necessary, prepare change orders, field directives, and make recommendations for approval by the Authority's Board of Commissioners.

   iii. The Engineer shall discuss changes in the plans or procedures recommended by the Engineer with the Authority prior to implementation.

   iv. The Engineer must obtain approval for all change orders from the Board of Commissioners prior to implementation.

g. Change Proposals and Claims:

   i. Review and respond to Change Proposals.

      (a) The Engineer shall review each submitted Change Proposal from Contractor and either deny the Change Proposal in whole, approve it in whole, or deny it in part and approve it in part.

      (b) Such actions shall be in writing, with a copy provided to the Authority and Contractor.

      (c) If the Change Proposal does not involve the design (as set forth in the Drawings, Specifications, or otherwise), the acceptability of the Work, or other

engineering or technical matters, the Engineer will notify the parties that the Engineer will not resolve the Change Proposal.

ii. Reporting of Claims

(a) When the Engineer becomes aware of a situation from which a legal dispute or claim ("Claim") could be filed by a contractor, subcontractor, property owner or other third party against the Authority, the Engineer will promptly report the situation to the Authority.

(b) Upon request, the Engineer will assist the Authority's Legal Department in its investigation and examination of any Claim. The Engineer will provide the names and, if available, addresses and phone numbers of individuals involved or having knowledge of the Claim.

(c) The Engineer will also gather information or data to the Authority regarding engineering or technical matters pertaining to the Claim.

4. The Engineer shall consult, report and advise appropriate Authority personnel as to all relevant and pertinent matters relating or affecting the progress of construction.

5. The Engineer shall review and determine the acceptability of any and all schedules that the Contractor is required to submit to the Engineer, including a Progress Schedule, Schedule of Submittals, and Schedule of Values.

6. The Engineer shall supply the Authority with a construction schedule, which has been submitted by the Contractor and approved by the Engineer.

7. The Engineer will prepare elementary sketches and supplementary sketches, when necessary or required, to resolve issues with actual field conditions encountered.

8. The Engineer shall interpret Contract Documents and resolve problems as to amount, quality, acceptability, and fitness.

9. The Engineer will review the Contractor's submittals of material and/or equipment for compliance with the design concept and take appropriate

action such as but not limited to: “approved”, “approved as corrected”, “revise and resubmit”; or “not approved”.

10. The Engineer will provide the Contractor and the Authority with detailed stakeout information, including benchmarks, reference and axis lines along the routes of the construction or wherever necessary.

11. The Engineer shall check installation for preparation of record drawings.

D. ***Construction Meetings and Reports***.

1. The Engineer will schedule and attend progress meetings with the pertinent Authority personnel, the Contractor, subcontractors and other interested stakeholders at a minimum every two (2) weeks.

2. The Engineer will report to the Authority monthly on the progress of the Work with a written monthly summary including daily inspector reports.

3. The Engineer will report, via email, to the Authority bi-weekly on the progress of the Work with the following information:

    a. Summary of the Work performed in the previous two-week period;

    b. Updated project schedule, attached and in Microsoft Project format, identifying all project milestones and current project status;

    c. Forecast of all upcoming work and project costs expected for the project, including the identification of any contract items which may exceed bid quantities; and

    d. Copies of final inspection reports attached in .pdf format for reports in the previous two-week period.

4. As previously stated in paragraph C, subparagraphs 3f and 3g of this section, the Engineer shall notify the Authority when a change in the work is proposed which will cause an adjustment in the contract cost and will:

    a. Evaluate whether the proposed change is justified and reasonable, and if necessary, prepare change orders, field directives, and make recommendations for approval.

    b. Discuss changes in the plans or procedures authorized by the Engineer with the Authority prior to implementation.

    c. Obtain approval for all change orders from the Authority’s Board of Commissioners prior to implementation.

5. The Engineer will make a final inspection, furnish a report on project completion, and make recommendations for final payments to contractors and for the release of retained amounts, if any.

3.05 ***Resident Inspections:***

A. Upon authorization from the Authority, the Engineer shall furnish a full-time Resident Project Inspector (RPI) who will conduct technical inspection of the Work relating to the Project;

1. *Inspector's duties and responsibilities:* The Engineer, through the RPI's observations, shall protect the Authority against defects and deficiencies in the Work.

2. *RPI's duties and responsibilities:*

a. The RPI shall not:

i. Authorize any deviation from the Contract Documents or substitution of materials or equipment (including "or-equal" items), without written approval by the Authority and the Engineer;

ii. Exceed limitations of the Engineer's authority as set forth in this Agreement;

iii. Undertake any of the responsibilities of the Contractors, subcontractors, or suppliers;

iv. Advise on, issue directions relative to, or assume control over any aspect of the means, methods, techniques, sequences or procedures of the Contractor's work;

v. Advise on, issue relating, or assume control over security or safety practices, precautions, and programs in connection with the activities of the Authority or its Contractors;

vi. Participate in specialized field or laboratory tests or inspections conducted off-site by others; or

vii. Accept shop drawings or sample submittals form anyone other than the Contractor.

2. The RPI shall:

i. Review the progress schedule, schedule of Shop Drawing and Sample submittals, schedule of values prepared by the

Contractor and consult with the Engineer concerning acceptability;

ii. Attend meetings with Contractor and subcontractors, such as preconstruction conferences, progress meetings, job conferences, and other Project-related meetings;

iii. Provide email updates to the Engineer and the Authority regarding meetings with Contractor and subcontractors;

iv. Conduct daily on-site inspections of all Work in progress;

v. Prepare daily inspection reports to determine if the Work is progressing in accordance with Contract Documents;

vi. Report to the Authority and the Engineer whenever the RPI believes any portion of the Work will not produce a completed Project, conforming with the Contract Documents, or will imperil the integrity of the Project design as a functioning whole as indicated in the Contract Documents, or has been damaged, or does not meet the requirements of any inspection, test or approval required to be made;

vii. Advise the Authority and the Engineer whether any part of the Work in progress should be corrected or rejected or should be uncovered for observations, or requires special testing, inspection, or approval;

viii. Verify that tests, equipment, and systems start-ups and operating and maintenance training are conducted in the presence of appropriate Authority personnel, and that the Contractor maintains adequate records relating to the same;

ix. Observe, record, and report to the Engineer appropriate details relative to the test procedures and systems start-ups;

x. Report to the Engineer and the Authority when clarifications and interpretations of the contract documents are needed and transmit to the Contractor clarifications and interpretations as issued by the Engineer;

xi. Advise the Engineer and the Contractor of the commencement of any portion of the Work requiring a Shop Drawing or Sample submittal for which RPI believes that the submittal has not been approved by the Engineer; and

xii. Submit, via email, bi-weekly updates to the Authority summarizing the resident inspection costs and projecting further resident inspection costs for the duration of the Work.

3.06 ***General Services:***

A. ***Contractor's Request for Payment:***

1. As a general service to the Authority, the Engineer will review applications for payment with the Contractor for compliance with the established procedure for their submission and forward recommendation to the Authority, noting particularly the relationship of the payment requested to the schedule of values, work completed, and materials and equipment delivered to the Project site but not incorporated in the work.

2. Based on the Engineer's observations and on review of Applications for Payment and accompanying supporting documentation, the Engineer shall:

    a. Determine the amounts that the Engineer recommends Contractor be paid;

    b. Recommend reductions in payment based on the provisions stated in the Construction Documents;

    c. Such recommendations of payment will be in writing and will constitute the Engineer's representation to the Authority, based on such observations and review, that, to the best of the Engineer's knowledge, information and belief, the Contractor's Work has progressed to the point indicated, the Work is generally in accordance with the Contract Documents:

        i. Subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, to the results of any subsequent tests called for in the Contract Documents, and to any other qualifications stated in the recommendation, and

        ii. Subject to the conditions precedent that permits a Contractor to receive payment based on the Work performed, which has been reviewed and accepted by the Engineer;

    d. In the case of unit price Work, the Engineer's recommendations of payment will include final determinations of quantities and classifications of the Work subject to any subsequent adjustments allowed by the Contract Documents.

B. ***Standards for Certain Construction-Phase Decisions:***

1. The Engineer will render decisions regarding the requirements of the Contract Documents, and judge the acceptability of the Work, pursuant to the specific procedures set forth in the Contract for initial interpretations, Change Proposals, and acceptance of the Work.

2. In rendering such decisions and judgments, the Engineer will not show partiality to the Authority or the Contractor, and will not be liable to the Authority, Contractor, or others in connection with any proceedings, interpretations, decisions, or judgments conducted or rendered in good faith.

C. ***Certificates, Operation and Maintenance Materials:***

1. During the course of construction, as a general service, the Engineer will verify whether materials and equipment certificates, operation and maintenance manuals and other data required by the Contract Documents to be assembled and furnished by the Contractor are applicable to the items actually installed and in accordance with the Contract Documents.

2. After receipt from the Contractor, the Engineer will review and transmit to the Authority:

    a. Any maintenance and operating instructions,

    b. Schedules,

    c. Guarantees, bonds, certificates or other evidence of insurance required by the Contract Documents,

    d. Certificates of inspection, tests and approvals, and

    e. Shop Drawings, Samples, and other data as required.

3. Upon receipt from the Contractor, the Engineer will review and transmit to the Authority the annotated record documents which are to be assembled by Contractor in accordance with the Contract Documents to obtain final payment.

4. The Engineer must deliver to the Authority those documents described in subparagraph 2 of this paragraph, prior to the payment for such work.

D. ***Completion:***

1. Upon authorization from the Authority, as general services, the Engineer shall:

    a. Participate in visits to the Project to determine substantial completion, assist in the determination of substantial completion and the preparation of lists to be completed or corrected;

    b. Participate in a final visit to the Project with Authority personnel; and prepare a final list of items to be completed and deficiencies to be remedied; and

    c. Observe whether all items on the final list have been completed or corrected and make recommendations to the Authority concerning acceptance of the Project and final payment.

2. *Substantial Completion*:

    a. After a notice has been given by the Contractor as to the substantial competition or completion of Work, the Engineer will promptly visit the Project site to review the Work and determine the status of completion.

        b. The Engineer will follow the procedures in the Contract Document regarding the following:

        i. the preliminary certificate of Substantial Completion,

        ii. punch list of items to be completed,

        iii. objections made by the Authority,

        iv. notice to Contractor, and issuance of a final certificate of Substantial Completion.

    e. The Engineer will assist Authority regarding any remaining engineering or technical matters affecting Authority's use or occupancy of the Work following Substantial Completion.

3. *Final Notice of Acceptability of the Work*:

    a. After conducting a final visit to the Project, the Engineer will determine if the Work is complete and acceptable so that the Engineer may recommend, in writing, final payment to the Contractor.

b. Accompanying the recommendation for final payment, the Engineer shall also provide a notice to the Authority and the Contractor that the Work is acceptable to the best of the Engineer's knowledge, information, and belief, and based on the extent of the services provided by the Engineer under this Agreement.

3.07 ***Record Drawings:***

A. Upon authorization from the Authority, the Engineer shall:

1. Provide record drawings, including the base mapping of all completed Work according to the latest Authority As-Built Standards, using the AutoCAD Version 2018 platform.

2. Furnish all AutoCAD files on CD to the Authority.

3. Submit two stamped/signed full size sets, AutoCAD files, .pdf version of the drawings and Project Manual (with addenda) and GPS coordinates no later than one month after final payment of the Work is recommended for approval and in accordance with Authority Standards.

3.08 ***Authority Program/Procedure Updates.*** This task of the project will be to complete Authority program and procedure updates for the project, including:

A. Develop Standard Operating Procedures (SOPs) for the pump station. SOPS shall be developed in accordance with the Authority's existing format.

B. Develop an Arc Flash program for the pump station. Program shall be developed in accordance with the Authority's existing format.

C. Develop comprehensive Lock-out Tag-out (LOTO) program documentation for the pump station. LOTO program shall be developed in accordance with the Authority's existing format.

3.09 ***Service Timeframe.*** Unless otherwise extended by mutual agreement of the parties, the Engineer will render professional services relating to this Project within the following timeframe:

A. All Basis of Design Services shall be completed within 180 days of the issuance of the Authority's notice to proceed;

B. All Design Services shall be completed within 270 days following Authority approval the final Basis of Design documents; and

C. All other services should be completed by the end of construction with an estimated completion date of October 1, 2023.

ARTICLE 4 – PAYMENT OF PROFESSIONAL SERVICES

4.01 ***Lump Sum Payments:*** The Engineer agrees to accept a lump sum payment for the following services:

A. ***Basis of Design:*** For services described under § 3.02, paragraph A of this Agreement, the Authority shall pay Engineer a lump sum which will include all expense, labor and cost associated with this service. Payment will be made monthly based on the percentage of completion up to 100% of the total lump sum amount.

B. ***Design:*** For services described under §3.03 of this Agreement, the Authority shall pay the Engineer a lump sum which will include all expense, labor, and cost associated with this service. Payment will be made monthly based on the percentage of completion up to 70% of the total lump sum amount. After submission by the Engineer to the Authority of a draft set of Contract Documents, payment will be made monthly based on the percentage of completion up to 90% of the total lump sum amount. The balance will be paid when the final Contract Documents are submitted to the Authority.

C. ***Construction and General Services:*** For services described under §§ 3.04 and 3.06 of this Agreement, the Authority shall pay the Engineer a lump sum which will include all expense, labor and cost associated with this service. Payment will be made monthly based on the percentage of completion up to 100% of the total lump sum amount.

D. ***Record Drawings:*** For services described under § 3.07 of this Agreement, the Authority shall pay the Engineer a lump sum which will include all expense, labor and cost associated with this service. Payment will be made monthly based on the percentage of completion up to 70% of the total lump sum amount. After submission by the Engineer to the Authority of draft record drawings, payment will be made monthly based on the percentage of completion up to 90% of the total lump sum amount. The balance will be paid when the final record drawings are submitted to the Authority.

E. ***Authority Program/Procedure Updates:*** For services described under § 3.08 of this Agreement, the Authority shall pay the Engineer a lump sum which will include all expense, labor and cost associated with this service. Payment will be made monthly based on the percentage of completion up to 70% of the total lump sum amount. After submission by the Engineer to the Authority of the program and procedure updates, payment will be made monthly based on the percentage of completion up to 90% of the total lump sum amount. The balance will be paid when the final record drawings and program and procedure updates are submitted to the Authority.

4.02 ***Resident Inspection***: For services described under § 3.05 of this Agreement, the Authority shall pay the Engineer the payable hourly rates listed under § 4.04, paragraph B and direct non-salary expenses. Overtime premium will be paid at 50% of the Resident Inspectors' direct hourly

rate in addition to the payable hourly rate listed under § 4.04, paragraph B. Payment for Resident Inspection and expenses will be made monthly.

4.03 ***Special Services***: For services described under § 3.02, paragraph B of this Agreement, the Authority shall pay the Engineer for special services pre-approved by the Authority's Chief Operating Officer in an amount approved by the Authority's Chief Financial Officer.

A. When the Engineer is performing the special services described in § 3.02, paragraph B of this Agreement, such services will be billed at the fixed rates included in Appendix A of this Agreement.

B. When the Engineer obtains special services from a third party, the Engineer will be reimbursed based on the actual invoice cost paid by the Engineer, plus 5%.

4.04 ***Engineering Cost Schedule***:

A. ***Engineering Costs:***

1.	Lump Sum Basis of Design Cost	$ 195,000
2.	Lump Sum Design Cost	$ 470,000
3.	Lump Sum General Service Cost	$ 160,000
4.	Lump Sum Record Drawings Cost	$ 10,000
5.	Lump Sum Authority Program/Procedure Updates Cost	$ 20,000
	TOTAL LUMP SUM COST:	$855,000

B. ***Resident Inspection Costs:***

	Payable Hourly Rate	Employee Direct Hourly Rate
Resident Project Inspector	$118.00	$42.14
Construction Engineer	$170.00	$60.71

The Dollar amount for Estimated Resident Inspection is based fixed hour estimate of 160 hours of Resident Engineer and 1,800 hours of Resident Inspector during the duration of the project. Payment will be made for actual hours worked during the duration of construction. Actual hours will vary based on production rates of the Contractor during construction, unforeseen circumstances that develop during construction, and weather conditions.

1.	Estimated Resident Inspection	$239,600
2.	TOTAL NOT TO EXCEED RESIDENT INSPECTION:	$275,000

C. Special Services (not to exceed) $ 50,000

D. ***Other Costs:***

1. Estimated Mileage (IRS rate) $0.575/mile

2.	Estimated Copy Costs (per copy)	$0.10/sheet
3.	Prints (per print)	$1.00/print
4.	Subcontractor Expenses, invoiced as special services	Cost plus 5% maximum
5.	Other Direct Non-Salary Costs	At cost

4.05 ***Audit***: The Authority reserves the right to audit the Engineer's records to verify bills submitted and representations made. For this purpose, the Engineer agrees to make company records available for inspection upon written notice by the Authority. The Authority shall have two years from the date of the Engineer's final bill to complete its audit. If the audit establishes an overcharge, the Engineer agrees to refund the excess.

ARTICLE 5 – GENERAL PROVISIONS

5.01 ***Subcontract and Assignments*:** The Engineer may not subcontract or delegate any of the work, services, and/or other obligations of the Engineer without the express written consent of the Authority. The Authority and the Engineer bind themselves and their successors, administrators and assigns to the terms of this Agreement. The Engineer shall not assign, sublet or transfer its interest in the Agreement without the written consent of the Authority.

5.02 ***Amendments:*** No modification or variation from the terms of this Agreement shall be effective unless it is in writing and authorized by a resolution of the Board of Commissioners of the Authority and signed by all parties.

5.03 ***Right to Terminate*:** The Authority reserves the right to terminate the Engineer's services at any time, without cause, based on seven (7) days' written notice. The Engineer shall not be entitled to lost profit and shall perform only such services, after notification of termination, as the Authority directs.

5.04 ***Indemnification*:**

A. To the fullest extent permitted by law, the Engineer agrees to indemnify and hold the Authority harmless from all third party claims, liabilities, damages and costs (including all reasonable attorney's fees, and cost of defense) to which the Authority, its officers, directors and employees may be subject to, arising out of the death or bodily injury to any person or the destruction or damage to any property to the extent caused by the negligent acts, errors or omissions, or willful misconduct of the Engineer's performance of professional services provided under this Agreement and those of its subcontractors or anyone for whom the Engineer is legally liable.

B. To the fullest extent permitted by law, the Authority agrees to indemnify and hold the Engineer harmless from all third party claims, liabilities, damages and costs (including all reasonable attorney's fees and cost of defense) to the extent caused by the negligent acts, errors or omissions of the Authority, its contractors, engineers, or anyone for whom the Authority is legally liable.

5.05 ***Confidential Information*:**

A. In order to assist the Engineer in the performance of this Agreement, the Authority may provide the Engineer with confidential information including, but not limited to information relative to the services to be performed. All information received by the Engineer in any fashion and under any conditions resulting from the rendering of the services in consideration of this agreement, are considered confidential. The Engineer shall hold in confidence and not disclose to any person or any entity, any information regarding information learned during the performance of services including but not limited to information relative to the services to be performed.

B. The Engineer shall use at least the same degree of care to protect and prevent unauthorized disclosure of any confidential information as it would use to protect and prevent unauthorized disclosure of its own proprietary information. The Engineer shall use confidential information only in the performance of this Agreement. No other use of the confidential information whether for the Engineer's benefit or for the benefit of others shall be permitted.

C. In no event is the Engineer authorized to disclose confidential information without the prior written approval of the Authority. The Engineer may provide such information to its subcontractors for the purpose of performing the services; or disclose such information, with notice to the Authority, if such information is required to be disclosed by law or court order.

D. The terms of this section shall be binding during and subsequent to the expiration or termination of this Agreement.

5.06 ***Insurance***: The Engineer shall secure and maintain such insurance as will protect itself from claims under the Workers' Compensation Act; claims for damages because of bodily injury, including personal injury, sickness or disease, or death of any of its employees or of any person other than its employees; and from claims for damages because of injury to or destruction of property including loss of use resulting therefrom in the amounts indicated on Appendix B. The Engineer shall provide and maintain insurance that will provide coverage for claims arising out of the negligent performance of its services. The Engineer shall provide Certificates of Insurance certifying the coverage required by this provision.

5.07 ***Copyrights, Trademarks and Licensing*:**

A. All materials produced under this Agreement, whether produced by the Engineer alone or with others, and regardless of whether produced during regular working hours, shall be considered work made for hire and the property of the Authority. The Engineer shall, during and subsequent to the terms of this Agreement, assign to the Authority, without further consideration, all right, title and interest in all material produced under this Agreement. All material produced under this Agreement shall be and remain the property of the Authority whether registered or not.

B. In performing work under this Agreement, the Engineer may be granted access to the Authority's GIS data, documents, and other information. The Engineer understands

and agrees that the use of such data, documentation and information shall be treated as confidential information and the Engineer shall abide by the terms and conditions of the Confidentiality and Copyright Licensing Agreement, attached and incorporated in this Agreement as Appendix C.

5.08 ***New York Law and Jurisdiction*:** Notwithstanding any other provision of this Agreement, any dispute concerning any question of fact or law arising under this Agreement which is not disposed of by agreement between the Engineer and the Authority shall be governed, interpreted and decided by a court of competent jurisdiction of the State of New York in accordance with the laws of the State of New York.

5.09 ***Conflicts of Interest*:** The Engineer represents that it has advised the Authority in writing prior to the date of signing this Agreement of any relationships with third parties, including competitors of the Authority, which would present a conflict of interest with the rendering of the services, or which would prevent the Engineer from carrying out the terms of this Agreement or which would present a significant opportunity for the disclosure of confidential information. The Engineer will advise the Authority of any such relationships that arise during the term of this Agreement. The Authority shall then have the option to terminate the Agreement without being subject to further obligations under its terms, except for the payment of services already rendered by the Engineer. So long as the Engineer reports such a conflict as required by this section, the Engineer will have no further obligations for completing the scope of services under the terms of this Agreement.

5.10 ***Additional Conditions*:** The Engineer and the Authority acknowledge that there may be additional conditions, terms and provisions which shall apply specifically to the services to be performed. The parties agree to negotiate in good faith to agree upon such additional terms.

5.11 ***Entire Agreement*:** This Agreement constitutes the entire understanding of the parties and no representations or agreements, oral or written, made prior to its execution shall vary or modify the terms herein. This Agreement supersedes all prior contemporaneous communications, representations, or agreements, whether oral or written with respect to the subject matter hereof and has been induced by no representations, statements or agreements other than those herein expressed. No subsequent agreement made between the parties shall be binding on either party unless reduced to writing and signed by an authorized officer of the party sought to be bound by such agreement.

5.12 ***Independent Status***:

A. Nothing contained in the Agreement shall be construed to render either the Authority or the Engineer, an owner, member, officer, partner, employee or agent of the other, nor shall either party have authority to bind the other in any manner, other than as set forth in this Agreement, it being intended that the Engineer shall remain an independent contractor responsible for its own actions. The Engineer is retained by the Authority only for the purpose and to the extent set forth in this Agreement.

B. The Engineer is free to choose the aggregate number of hours worked and the scheduling of such hours as it shall see fit at its discretion within the limitations set forth in Article 4.

C. Neither the Engineer nor its employees shall be considered under the provisions of this Agreement or otherwise as having an employee, servant or agency status or as being entitled to participate in any plans, arrangements or distributions of the Authority.

D. In providing the services under this Agreement, the Engineer represents and warrants that it has complied with all applicable federal, state and local laws particularly with respect to licenses, withholdings, reporting and payment of taxes. The Engineer agrees to furnish copies of documentation to the Authority evidencing its compliance with such laws. The Engineer further represents and warrants that any income accruing to the Engineer and its employees from the Agreement shall be reported as such to the appropriate taxation authorities.

5.13 ***Doing Business Status***: The Engineer represents it is qualified to do business in the State of New York and has registered with the New York Secretary of State.

5.14 ***Force Majeure***: Engineer shall not be liable to the Authority for any failure to perform the Services if any such failure is caused by forces beyond Engineer's reasonable control, including without limitation, actions or inactions of any governmental agencies, changes in law, strikes, lockouts, or other industrial disturbances, acts or omissions of third-parties, civil disturbances, fires, floods, earthquakes, acts of God, acts of a public enemy or terrorism, epidemics or pandemics, including issues arising out of the COVID-19 pandemic, which may include without limitation, workforce shortages, lack of necessary supplies or Personal Protective Equipment, travel restrictions, and other restrictions resulting from public guidance and emergency orders.

5.15 ***Gratuities*:** The Engineer shall prohibit its agents, employees and consultants from using their positions for personal financial gain, or from accepting any personal advantage from anyone under circumstances which might reasonably be interpreted as an attempt to influence the recipients in the conduct of their official duties. The Engineer or its employees shall not, under circumstances which might be reasonably interpreted as an attempt to influence the recipients in the conduct of their duties, extend any gratuity or special favor to employees of the Authority.

5.16 ***Notice:*** Any notices required by this Agreement or otherwise shall be delivered by United States Postal mail or personal delivery upon the addresses hereinbefore stated. Any change in such addresses shall be required to be in writing to the other party and acknowledged as such.

ARTICLE 6 – SEVERABILITY

6.01 Any provision or part of the Agreement held to be void or unenforceable by a court of competent jurisdiction shall be deemed stricken, and all remaining provisions shall continue to be valid and binding upon the parties, which agrees that the Agreement shall be reformed to replace such stricken provisions or part thereof with a valid enforceable provision that comes as close as possible to expressing the intent of the stricken provision. The validity and enforceability of all other provisions of this Agreement shall not otherwise be affected.

ARTICLE 7 – TERMINATION

7.01 The Authority reserves the right to terminate this Agreement in the event it is found that the Certification filed by the Engineer in accordance with New York State Finance Law §139-k was intentionally false or intentionally incomplete. Upon such finding, the Authority may exercise its termination right by providing written notification to the Engineer in accordance with the written notification terms of this Agreement.

ERIE COUNTY WATER AUTHORITY

By_____
Jerome D. Schad, Chair

ARCADIS OF NEW YORK, INC.

By_____
Mark R. Lenz, PE, Vice President

STATE OF NEW YORK)
COUNTY OF ERIE) ss:

On the _____ day of _____, in the year 2020, before me personally came Jerome D. Schad, to me known, who, being by me duly sworn, did depose and say that he resides in Amherst, New York, that he is the Chair of the Board of Commissioners for the Erie County Water Authority described in the above instrument; and that he signed his name thereto by order of the Board of Commissioners.

_____
Notary Public

STATE OF NEW YORK)
COUNTY OF ERIE) ss:

On the _____ day of _____, in the year 2020, before me personally came Mark R. Lenz, PE, Vice President, to me known, who, being by me duly sworn, did depose and say that he resides in _____, New York, that he is the Vice President of the Corporation described in the above instrument; and that he signed his name thereto by order of the Board of Directors of said Corporation.

_____
Notary Public

APPENDIX A

ARCADIS OF NEW YORK FIXED RATES FOR SPECIAL SERVICES

Classification	Billing Rate/hour
Project/Administrative Assistant I	$65.00
Design Tech II/Field Technician II	$80.00
Drafter I/Field Technician III and IV	$90.00
Drafter II/Field Technician V	$115.00
CADD Designer	$125.00
Field Supervisor	$150.00
Engineer/Scientist	$120.00
Staff Engineer/Scientist/Architect	$130.00
Project Engineer/Scientist/Architect	$145.00
Senior Engineer/Scientist/Architect I	$165.00
Senior Engineer/Scientist/Architect II	$180.00
Principal Engineer/Scientist/Architect I	$200.00
Principal Engineer/Scientist/Architect II	$220.00
Engineer/Scientist Director	$240.00

APPENDIX B

BALL PUMP STATION PHASE I REHABILITATION

ECWA Project No. 202000177 (RFP No. 202000046)

Insurance Specs:

The following minimum insurance requirements shall apply to vendors providing services to the Erie County Water Authority (ECWA). If a service or project, in the opinion of ECWA, represents an unusual or exceptional risk, ECWA may establish additional insurance requirements for that service or project. All insurance required herein shall be obtained at the sole cost and expense of the contractor, including deductibles and self-insured retentions, and shall be in full force and effect on the contract commencement date and for the duration of the contract. These requirements include but are not limited to the minimum insurance requirements.

Insurance Requirements:

a. Workers Compensation:

Part 1: Workers Compensation: Statutory
Part 2: Employers Liability: $1,000,000.
Note: If New York State domiciled employees are used, coverage to be New York Statutory for both Parts 1 and 2

b. New York Disability Benefits Liability: Statutory coverage if New York State domiciled employees are used.

c. Commercial General Liability:

- $2,000,000. General Aggregate
- $2,000,000. Products/Completed Operations Aggregate
- $1,000,000. Each Occurrence
- $1,000,000. Personal Injury/Advertising Liability
- Erie County Water Authority to be scheduled as an Additional Insured for both on-going and completed operations (attach Additional Insured endorsement to Certificate of Insurance)
- Insurance to be primary and non-contributory

d. Automobile Liability:

- $1,000,000. Each Accident
- Erie County Water Authority to be scheduled as an Additional Insured.

e. Umbrella Liability:

- $1,000,000. Each Occurrence
- $1,000,000. Aggregate

- Erie County Water Authority to be scheduled as an Additional Insured

e. Professional Liability:

- $1,000,000 Per Claim
- $1,000,000 Aggregate

Certificates of Insurance to be provided to **ECWA** prior to start of work as follows:

ACORD 25 (Item a-e) including copy of Additional Insured Endorsement Note: If coverage provided for NYS domiciled employees require Forms C 105.2 and DB 120.1 for Workers Compensation and NYS DBL.

Certificates of Insurance, on forms approved by the New York State Department of Insurance, must be submitted to ECWA prior to the award of contract. Renewals of Certificates of Insurance, on forms approved by the New York State Department of Insurance, must be received by ECWA 30 days prior to the expiration of the insurance policy period.

Certificates of Insurance and renewals, on forms approved by the New York State Department of Insurance, must be submitted to ECWA prior to the award of contract. Each insurance carrier issuing a Certificate of Insurance shall be rated by A. M. Best no lower than "A-" with a Financial Strength Code (FSC) of at least VII. The professional service provider shall name ECWA, its officers, agents and employees as additional insured on a Primary and Non-Contributory Basis, including a Waiver of Subrogation endorsement (form CG 20 26 11 85 or equivalent), on all applicable liability policies. Any liability coverage on a "claims made" basis should be designated as such on the Certificate of Insurance. Such insurance shall continue through the term of this Agreement and vendor shall purchase at his sole expense either 1) an Extended Reporting Endorsement (also, known as Tail Coverage); or 2) Prior Acts Coverage from new insurer with a retroactive date back to the date of, or prior to, the inception of this Agreement; or 3) demonstrate through Certificates of Insurance that vendor has Maintained continuous coverage with the same or original insurer. Coverage provided under items; 1), 2), or 3) will continue as long as the law allows.

To avoid confusion with similar insurance company names and to properly identify the insurance company, please make sure that the insurer's National Association of Insurance Commissioners (N.A.I.C.) identifying number or A. M. Best identifying number appears on the Certificate of Insurance. Also, at the top of the Certificate of Insurance, please list the project number.

Acceptance of a Certificate of Insurance and/or approval by ECWA shall not be construed to relieve the outside vendor of any obligations, responsibilities or liabilities.

Certificates of Insurance should be e-mailed to mmusarra@ecwa.org or mailed to Ms. Molly Jo Musarra, ECWA Claim Representative/Risk Manager Erie County Water Authority, 295 Main Street – Room 350, Buffalo, New York 14203-2494, or If you have any questions you can contact Ms. Musarra by e-mail or phone (716) 849-8465.

APPENDIX C

ERIE COUNTY WATER AUTHORITY
CONFIDENTIALITY AND COPYRIGHT LICENSING AGREEMENT

LICENSE:

Upon execution of this Agreement, the Engineer acquires from the Authority a license to use the proprietary and intellectual property of the Authority for the purpose of completing the work under this Agreement.

The Authority reserves the right to incorporate any Engineer-created data into the Authority's database.

OWNERSHIP:

This License Agreement does not constitute a transfer of title or interest in the data. Any portion of the data that is modified or merged into another computer file or program by the Engineer or is integrated with other programs or data to form derivative products, shall continue to be subject to the provisions of this License Agreement. The Authority retains ownership of the data and all such portions.

CONFIDENTIALITY CLAUSE:

The Engineer agrees that all digital data and hard copy from the ECWA GIS Basemap Features provided to the Engineer are copyrighted by the Authority, are protected by the copyright laws of the United States and are furnished to the Engineer with all rights reserved. Therefore, the Engineer is hereby permitted to use the digital data and hard copies thereof only for the purposes allowed under this Agreement. The Engineer agrees not to otherwise copy, reproduce or use the digital data, hard copy, or the information contained therein for any other purpose whatsoever.

COPYRIGHT NOTICE:

The copyright notice included in each of the files is not only to be retained in those files but is also to be included in any copies made of those files. No part of the files may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photographing and recording, or by any information storage or retrieval system, except as expressly permitted in writing by the Erie County Water Authority.

Upon notification by the Authority of any changes in copyright requirements, the Engineer will make said changes to all subsequent maps or reports, as required.

LIMITATION OF LIABILITY:

ECWA GIS Basemap Features are compiled to National Map Accuracy Standards for 1"=100' scale mapping by Woolpert, Dayton, Ohio, using Stereo photogrammetric methods from aerial photography dated April, May, and/or November, 1990. The control grid is based on New York State Plane Coordinates and North American Datum 1983. The parcels are from Erie County Tax Maps which were available in the County Finance office in June of 1993.

The Authority makes no claims as to the accuracy of the ECWA GIS Basemap Features and assumes no responsibility for their positional or content accuracy. The Authority makes no claims as to the ability of the ECWA GIS Basemap Features to fulfill Engineer application requirements. In providing data, the Authority assumes no obligation to assist the Engineer in the use of the data, or in the development, use, or maintenance of any applications applied to the data.

Engineer recognizes and agrees that the Authority makes NO REPRESENTATIONS OF ANY KIND INCLUDING, BUT NOT LIMITED TO, THE WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR USE, NOR ARE ANY SUCH WARRANTIES TO BE IMPLIED, WITH RESPECT TO THE DATA OR INFORMATION FURNISHED.

TERMINATION:

The License to use data terminates upon completion of the work under this Agreement.

LIQUIDATION OF DAMAGES FOR BREACH OF AGREEMENT:

The parties agree that if Engineer breaches the Agreement and uses or discloses any of the copyrighted information in any way other than that allowed, during or subsequent to the terms of this Agreement for any purpose whatsoever, the damages of the Authority shall be deemed liquidated at three times the amount of the total value of the data as determined by the Erie County Water Authority.

In addition to treble damages for breach of Agreement, Engineer will additionally forfeit the license acquired to use copyrighted property of the Authority.

SPECIFIC TERMS OF ACCEPTANCE:

This Agreement constitutes the entire agreement between the parties.

APPENDIX D

ARCADIS OF NEW YORK, INC. RESPONSE TO RFP

INSURANCE REQUIREMENTS FOR PROFESSIONAL SERVICES CONTRACT FOR CONSULTING ENGINEERING SERVICES

BALL PUMP STATION PHASE 1 REHABILITATION

ECWA PROJECT No. 202000177 (RFP No. 202000046)

Insurance Specs:

The following minimum insurance requirements shall apply to vendors providing services to the Erie County Water Authority (ECWA). If a service or project, in the opinion of ECWA, represents an unusual or exceptional risk, ECWA may establish additional insurance requirements for that service or project. All insurance required herein shall be obtained at the sole cost and expense of the contractor, including deductibles and self-insured retentions, and shall be in full force and effect on the contract commencement date and for the duration of the contract. These requirements include but are not limited to the minimum insurance requirements.

Insurance Requirements:

a. Workers Compensation:
Part 1: Workers Compensation: Statutory
Part 2: Employers Liability: $1,000,000.
Note: If New York State domiciled employees are used, coverage to be New York Statutory for both Parts 1 and 2

b. **New York Disability Benefits Liability:** Statutory coverage if New York State domiciled employees are used.

c. Commercial General Liability:
- $2,000,000. General Aggregate
- $2,000,000. Products/Completed Operations Aggregate
- $1,000,000. Each Occurrence
- $1,000,000. Personal Injury/Advertising Liability
- Erie County Water Authority to be scheduled as an Additional Insured for both on-going and completed operations (attach Additional Insured endorsement to Certificate of Insurance)
- Insurance to be primary and non-contributory

d. Automobile Liability:
- $1,000,000. Each Accident
- Erie County Water Authority to be scheduled as an Additional Insured.

e. Umbrella Liability:
- $1,000,000. Each Occurrence
- $1,000,000. Aggregate

- Erie County Water Authority to be scheduled as an Additional Insured

f. Professional Liability

- $2,000,000 Per Claim
- $2,000,000 Aggregate

Certificates of Insurance to be provided to **ECWA** prior to start of work as follows:

ACORD 25 including copy of Additional Insured Endorsement Note: If coverage provided for NYS domiciled employees require Forms C 105.2 and DB 120.1 for Workers Compensation and NYS DBL.

Certificates of Insurance, on forms approved by the New York State Department of Insurance, must be submitted to ECWA prior to the award of contract. Renewals of Certificates of Insurance, on forms approved by the New York State Department of Insurance, must be received by ECWA 30 days prior to the expiration of the insurance policy period.

Certificates of Insurance and renewals, on forms approved by the New York State Department of Insurance, must be submitted to ECWA prior to the award of contract. Each insurance carrier issuing a Certificate of Insurance shall be rated by A. M. Best no lower than "A-" with a Financial Strength Code (FSC) of at least VII. The professional service provider shall name ECWA, its officers, agents and employees as additional insured on a Primary and Non-Contributory Basis, including a Waiver of Subrogation endorsement (form CG 20 26 11 85 or equivalent), on all applicable liability policies. Any liability coverage on a "claims made" basis should be designated as such on the Certificate of Insurance. Such insurance shall continue through the term of this Agreement and vendor shall purchase at his sole expense either 1) an Extended Reporting Endorsement (also, known as Tail Coverage); or 2) Prior Acts Coverage from new insurer with a retroactive date back to the date of, or prior to, the inception of this Agreement; or 3) demonstrate through Certificates of Insurance that vendor has Maintained continuous coverage with the same or original insurer. Coverage provided under items; 1), 2), or 3) will continue as long as the law allows.

To avoid confusion with similar insurance company names and to properly identify the insurance company, please make sure that the insurer's National Association of Insurance Commissioners (N.A.I.C.) identifying number or A. M. Best identifying number appears on the Certificate of Insurance. Also, at the top of the Certificate of Insurance, please list the project number.

Acceptance of a Certificate of Insurance and/or approval by ECWA shall not be construed to relieve the outside vendor of any obligations, responsibilities or liabilities.

Certificates of Insurance should be e-mailed to mmusarra@ecwa.org or mailed to Ms. Molly Jo Musarra, ECWA Claim Representative/Risk Manager Erie County Water Authority, 295 Main Street – Room 350, Buffalo, New York 14203-2494, or If you have any questions you can contact Ms. Musarra by e-mail or phone (716) 849-8465.

CERTIFICATE OF LIABILITY INSURANCE

DATE(MM/DD/YYYY)
06/09/2020

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must have ADDITIONAL INSURED provisions or be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

PRODUCER
Aon Risk Services South, Inc.
Franklin TN Office
501 Corporate Centre Drive
Suite 300
Franklin TN 37067 USA

CONTACT NAME:
PHONE (A/C. No. Ext): (866) 283-7122 **FAX (A/C. No.):** 800-363-0105
E-MAIL ADDRESS:

INSURER(S) AFFORDING COVERAGE		NAIC #
INSURER A:	Greenwich Insurance Company	22322
INSURER B:	XL Specialty Insurance Co	37885
INSURER C:		
INSURER D:		
INSURER E:		
INSURER F:		

INSURED
Arcadis of New York, Inc.
One Lincoln Center
110 West Fayette St., Suite 300
Syracuse NY 13202 USA

COVERAGES **CERTIFICATE NUMBER:** 570082187765 **REVISION NUMBER:**

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

Limits shown are as requested

INSR LTR	TYPE OF INSURANCE	ADDL INSD	SUBR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS	
A	X **COMMERCIAL GENERAL LIABILITY** CLAIMS-MADE X OCCUR GEN'L AGGREGATE LIMIT APPLIES PER: POLICY X PRO-JECT X LOC OTHER:			GEC001076118 SIR applies per policy terms & conditions	10/01/2019	10/01/2020	EACH OCCURRENCE DAMAGE TO RENTED PREMISES (Ea occurrence) MED EXP (Any one person) PERSONAL & ADV INJURY GENERAL AGGREGATE PRODUCTS - COMP/OP AGG	$1,000,000 $1,000,000 $10,000 $1,000,000 $2,000,000 $2,000,000
B	**AUTOMOBILE LIABILITY** X ANY AUTO OWNED AUTOS ONLY HIRED AUTOS ONLY SCHEDULED AUTOS NON-OWNED AUTOS ONLY			AEC001075818	10/01/2019	10/01/2020	COMBINED SINGLE LIMIT (Ea accident) BODILY INJURY (Per person) BODILY INJURY (Per accident) PROPERTY DAMAGE (Per accident)	$1,000,000
B	X **UMBRELLA LIAB** X OCCUR **EXCESS LIAB** CLAIMS-MADE DED X RETENTION			UEC001075918 SIR applies per policy terms & conditions	10/01/2019	10/01/2020	EACH OCCURRENCE AGGREGATE	$1,000,000 $1,000,000
	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY Y / N ANY PROPRIETOR / PARTNER / EXECUTIVE OFFICER/MEMBER EXCLUDED? N / A **(Mandatory in NH)** If yes, describe under DESCRIPTION OF OPERATIONS below						PER STATUTE OTH-ER E.L. EACH ACCIDENT E.L. DISEASE-EA EMPLOYEE E.L. DISEASE-POLICY LIMIT	

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (ACORD 101, Additional Remarks Schedule, may be attached if more space is required)

RE: ECWA Project No. 202000177 (RFP No. 202000046) - Ball Pump Station Phase I Rehabilitation. Erie County Water Authority (ECWA), its officers, agents and employees are included as Additional Insured in accordance with the policy provisions of the General Liability, Automobile Liability and Umbrella Liability policies. General Liability policy evidenced herein is Primary and Non-Contributory to other insurance available to Additional Insured, but only in accordance with the policy's provisions. A Waiver of Subrogation is granted in favor of Certificate Holder in accordance with the policy provisions of the General Liability, Automobile Liability, Umbrella Liability and Workers' Compensation policies.

APPROVED /MJM

CERTIFICATE HOLDER

Erie County Water Authority
Attn: Molly Jo Musarra
295 Main Street, Suite 350
Buffalo NY 14203 USA

CANCELLATION

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS.

AUTHORIZED REPRESENTATIVE

Aon Risk Services South, Inc.

Holder Identifier :

Certificate No : 570082187765

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CERTIFICATE OF LIABILITY INSURANCE

DATE(MM/DD/YYYY)
06/09/2020

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must have ADDITIONAL INSURED provisions or be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

PRODUCER
Aon Risk Services South, Inc.
Franklin TN Office
501 Corporate Centre Drive
Suite 300
Franklin TN 37067 USA

CONTACT NAME:
PHONE (A/C. No. Ext): (866) 283-7122 **FAX (A/C. No.):** (800) 363-0105
E-MAIL ADDRESS:

INSURER(S) AFFORDING COVERAGE		NAIC #
INSURER A:	Lexington Insurance Company	19437
INSURER B:	Indian Harbor Insurance Company	36940
INSURER C:		
INSURER D:		
INSURER E:		
INSURER F:		

INSURED
Arcadis of New York, Inc.
One Lincoln Center
110 West Fayette St., Suite 300
Syracuse NY 13202 USA

COVERAGES **CERTIFICATE NUMBER:** 570082187755 **REVISION NUMBER:**

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

Limits shown are as requested

INSR LTR	TYPE OF INSURANCE	ADDL INSD	SUBR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS	
	COMMERCIAL GENERAL LIABILITY						EACH OCCURRENCE	
	☐ CLAIMS-MADE ☐ OCCUR						DAMAGE TO RENTED PREMISES (Ea occurrence)	
							MED EXP (Any one person)	
							PERSONAL & ADV INJURY	
	GEN'L AGGREGATE LIMIT APPLIES PER:						GENERAL AGGREGATE	
	☐ POLICY ☐ PRO-JECT ☐ LOC						PRODUCTS - COMP/OP AGG	
	☐ OTHER:							
	AUTOMOBILE LIABILITY						COMBINED SINGLE LIMIT (Ea accident)	
	☐ ANY AUTO						BODILY INJURY (Per person)	
	☐ OWNED AUTOS ONLY ☐ SCHEDULED AUTOS						BODILY INJURY (Per accident)	
	☐ HIRED AUTOS ONLY ☐ NON-OWNED AUTOS ONLY						PROPERTY DAMAGE (Per accident)	
	☐ **UMBRELLA LIAB** ☐ OCCUR						EACH OCCURRENCE	
	☐ **EXCESS LIAB** ☐ CLAIMS-MADE						AGGREGATE	
	☐ DED ☐ RETENTION							
	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY Y / N						☐ PER STATUTE ☐ OTH-ER	
	ANY PROPRIETOR / PARTNER / EXECUTIVE OFFICER/MEMBER EXCLUDED? ☐ N / A **(Mandatory in NH)**						E.L. EACH ACCIDENT	
	If yes, describe under DESCRIPTION OF OPERATIONS below						E.L. DISEASE-EA EMPLOYEE	
							E.L. DISEASE-POLICY LIMIT	
B	Env Contr Poll			US00090310EO20A Professional & Pollution SIR applies per policy terms & conditions	06/01/2020	06/01/2021	Each Claim Annual Aggregate	$2,000,000 $2,000,000

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (ACORD 101, Additional Remarks Schedule, may be attached if more space is required)

RE: ECWA Project No. 202000177 (RFP No. 202000046) - Ball Pump Station Phase I Rehabilitation. Professional Liability policy evidenced herein is Primary to other insurance available to Additional Insured, but only in accordance with the policy's provisions. A Waiver of Subrogation is granted in favor of Certificate Holder in accordance with the policy provisions of the Professional Liability policy. For Professional Liability and Pollution Liability coverage, the Aggregate Limit is the total insurance available for claims presented within the policy period for all operations of the insured. The Limit will be reduced by payments of indemnity and expense.

APPROVED /MJM

CERTIFICATE HOLDER

Erie County Water Authority
Attn: Molly Jo Musarra
295 Main Street, Suite 350
Buffalo NY 14203 USA

CANCELLATION

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS.

AUTHORIZED REPRESENTATIVE

Aon Risk Services South, Inc.

Holder Identifier :

Certificate No : 570082187755

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AGENCY CUSTOMER ID: 570000005571
LOC #:

ADDITIONAL REMARKS SCHEDULE

AGENCY	NAMED INSURED
Aon Risk Services South, Inc.	Arcadis of New York, Inc.
POLICY NUMBER: See Certificate Number: 570082187755	
CARRIER: See Certificate Number: 570082187755 / NAIC CODE	EFFECTIVE DATE:

ADDITIONAL REMARKS

THIS ADDITIONAL REMARKS FORM IS A SCHEDULE TO ACORD FORM,
FORM NUMBER: ACORD 25 **FORM TITLE:** Certificate of Liability Insurance

INSURER(S) AFFORDING COVERAGE	NAIC #
INSURER	
INSURER	
INSURER	
INSURER	

ADDITIONAL POLICIES If a policy below does not include limit information, refer to the corresponding policy on the ACORD certificate form for policy limits.

INSR LTR	TYPE OF INSURANCE	ADDL INSD	SUBR WVD	POLICY NUMBER	POLICY EFFECTIVE DATE (MM/DD/YYYY)	POLICY EXPIRATION DATE (MM/DD/YYYY)	LIMITS	
	OTHER							
	[X] Claims-Made							
	[X] Professional Liabil							
	[X] and Contractors							
	[X] Pollution Liability							

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NEW YORK STATE | Workers' Compensation Board

CERTIFICATE OF NYS WORKERS' COMPENSATION INSURANCE COVERAGE

1a. Legal Name & Address of Insured (use street address only) Arcadis of New York, Inc. 110 W. Fayette Street, Suite 300 Syracuse, NY 13202 Work Location of Insured *(Only required if coverage is specifically limited to certain locations in New York State, i.e., a Wrap-Up Policy)*	1b Business Telephone Number of Insured 720-344-3803 1c NYS Unemployment Insurance Employer Registration Number of Insured 37-21861 1d Federal Employer Identification Number of Insured or Social Security Number 16-1448024
2. Name and Address of Entity Requesting Proof of Coverage (Entity Being Listed as the Certificate Holder) Erie County Water Authority Attn: Anthony Alessi 295 Main Street, Room 350 Buffalo, NY 14203 APPROVED	3a Name of Insurance Carrier XL Insurance America, Inc. 3b Policy Number of Entity Listed in Box "1a" RWD9435163-14 3c Policy effective period 10-1-2019 to 10-1-2020 3d The Proprietor, Partners or Executive Officers are [X] included. (Only check box if all partners/officers included) [ ] all excluded or certain partners/officers excluded.

This certifies that the insurance carrier indicated above in box "3" insures the business referenced above in box "1a" for workers' compensation under the New York State Workers' Compensation Law. **(To use this form, New York (NY) must be listed under Item 3A on the INFORMATION PAGE of the workers' compensation insurance policy).** The Insurance Carrier or its licensed agent will send this Certificate of Insurance to the entity listed above as the certificate holder in box "2".

The insurance carrier must notify the above certificate holder and the Workers' Compensation Board within 10 days IF a policy is canceled due to nonpayment of premiums or within 30 days IF there are reasons other than nonpayment of premiums that cancel the policy or eliminate the insured from the coverage indicated on this Certificate. (These notices may be sent by regular mail.) **Otherwise, this Certificate is valid for one year after this form is approved by the insurance carrier or its licensed agent, or until the policy expiration date listed in box "3c", whichever is earlier.**

This certificate is issued as a matter of information only and confers no rights upon the certificate holder. This certificate does not amend, extend or alter the coverage afforded by the policy listed, nor does it confer any rights or responsibilities beyond those contained in the referenced policy.

This certificate may be used as evidence of a Workers' Compensation contract of insurance only while the underlying policy is in effect.

Please Note: Upon cancellation of the workers' compensation policy indicated on this form, if the business continues to be named on a permit, license or contract issued by a certificate holder, the business must provide that certificate holder with a new Certificate of Workers' Compensation Coverage or other authorized proof that the business is complying with the mandatory coverage requirements of the New York State Workers' Compensation Law.

Under penalty of perjury, I certify that I am an authorized representative or licensed agent of the insurance carrier referenced above and that the named insured has the coverage as depicted on this form.

Approved by: Joseph Tocco
(Print name of authorized representative or licensed agent of insurance carrier)

Approved by: _____ 10-1-19
(Signature) (Date)

Title: Chief Executive Officer

Telephone Number of authorized representative or licensed agent of insurance carrier: 213-239-8191

Please Note: Only insurance carriers and their licensed agents are authorized to issue Form C-105.2. Insurance brokers are NOT authorized to issue it.

NEW YORK STATE | Workers' Compensation Board

CERTIFICATE OF INSURANCE COVERAGE
under the NYS DISABILITY AND PAID FAMILY LEAVE BENEFITS LAW

PART 1. To be completed by Disability and Paid Family Leave Benefits Carrier or Licensed Insurance Agent of that Carrier

1a. Legal Name & Address of Insured (use street address only)
Arcadis of New York
110 W. Fayette St. Suite 300
Syracuse, NY 13202

Work Location of Insured *(Only required if coverage is specifically limited to certain locations in New York State, i.e., Wrap-Up Policy)*

1b. Business Telephone Number of Insured
3154469120

1c. Federal Employer Identification Number of Insured or Social Security Number
161448024

2. Name and Address of Entity Requesting Proof of Coverage (Entity Being Listed as the Certificate Holder)
Erie County Water Authority
Attn: Molly Jo Musarra
295 Main St. Room 350
Buffalo, NY 14203

3a. Name of Insurance Carrier
CIGNA LIFE INSURANCE COMPANY OF NEW YORK

3b. Policy Number of Entity Listed in Box "1a"
NYD067857

3c. Policy effective period
1/1/2020 to 1/1/2021

4. Policy provides the following benefits:
- ☒ A. Both disability and paid family leave benefits.
- ☐ B. Disability benefits only.
- ☐ C. Paid family leave benefits only.

APPROVED

5. Policy covers:
- ☒ A. All of the employer's employees eligible under the NYS Disability and Paid Family Leave Benefits Law.
- ☐ B. Only the following class or classes of employer's employees: _____

Under penalty of perjury, I certify that I am an authorized representative or licensed agent of the insurance carrier referenced above and that the named insured has NYS Disability and/or Paid Family Leave Benefits insurance coverage as described above.

Marcelina E. Reilly

Date Signed December 16, 2019 By _____
(Signature of insurance carrier's authorized representative or NYS Licensed Insurance Agent of that insurance carrier)

Telephone Number 1-866-761-4236 Name and Title Underwriting Director

IMPORTANT: If Boxes 4A and 5A are checked, and this form is signed by the insurance carrier's authorized representative or NYS Licensed Insurance Agent of that carrier, this certificate is COMPLETE. Mail it directly to the certificate holder.

If Box 4B, 4C or 5B is checked, this certificate is NOT COMPLETE for purposes of Section 220, Subd. 8 of the NYS Disability and Paid Family Leave Benefits Law. It must be mailed for completion to the Workers' Compensation Board, Plans Acceptance Unit, PO Box 5200, Binghamton, NY 13902-5200.

PART 2. To be completed by the NYS Workers' Compensation Board (Only if Box 4C or 5B of Part 1 has been checked)

State of New York
Workers' Compensation Board

According to information maintained by the NYS Workers' Compensation Board, the above-named employer has complied with the NYS Disability and Paid Family Leave Benefits Law with respect to all of his/her employees.

Date Signed _____ By _____
(Signature of Authorized NYS Workers' Compensation Board Employee)

Telephone Number _____ Name and Title _____

Please Note: Only insurance carriers licensed to write NYS disability and paid family leave benefits insurance policies and NYS licensed insurance agents of those insurance carriers are authorized to issue Form DB-120.1. ***Insurance brokers are NOT authorized to issue this form.***

DB-120.1 (10-17)

Additional Instructions for Form DB-120.1

By signing this form, the insurance carrier identified in Box 3 on this form is certifying that it is insuring the business referenced in box "1a" for disability and/or paid family leave benefits under the New York State Disability and Paid Family Leave Benefits Law. The Insurance Carrier or its licensed agent will send this Certificate of Insurance to the entity listed as the certificate holder in Box 2.

The insurance carrier must notify the above certificate holder and the Workers' Compensation Board within 10 days IF a policy is cancelled due to nonpayment of premiums or within 30 days IF there are reasons other than nonpayment of premiums that cancel the policy or eliminate the insured from coverage indicated on this Certificate. (These notices may be sent by regular mail.) Otherwise, this Certificate is valid for one year after this form is approved by the insurance carrier or its licensed agent, or until the policy expiration date listed in Box 3c, whichever is earlier.

This certificate is issued as a matter of information only and confers no rights upon the certificate holder. This certificate does not amend, extend or alter the coverage afforded by the policy listed, nor does it confer any rights or responsibilities beyond those contained in the referenced policy.

This certificate may be used as evidence of a Disability and/or Paid Family Leave Benefits contract of insurance only while the underlying policy is in effect.

Please Note: Upon the cancellation of the disability and/or paid family leave benefits policy indicated on this form, if the business continues to be named on a permit, license or contract issued by a certificate holder, the business must provide that certificate holder with a new Certificate of NYS Disability and/or Paid Family Leave Benefits Coverage or other authorized proof that the business is complying with the mandatory coverage requirements of the New York State Disability and Paid Family Leave Benefits Law.

DISABILITY AND PAID FAMILY LEAVE BENEFITS LAW

§220. Subd. 8

(a) The head of a state or municipal department, board, commission or office authorized or required by law to issue any permit for or in connection with any work involving the employment of employees in employment as defined in this article, and not withstanding any general or special statute requiring or authorizing the issue of such permits, shall not issue such permit unless proof duly subscribed by an insurance carrier is produced in a form satisfactory to the chair, that the payment of disability benefits and after January first, two thousand and twenty-one, the payment of family leave benefits for all employees has been secured as provided by this article. Nothing herein, however, shall be construed as creating any liability on the part of such state or municipal department, board, commission or office to pay any disability benefits to any such employee if so employed.

(b) The head of a state or municipal department, board, commission or office authorized or required by law to enter into any contract for or in connection with any work involving the employment of employees in employment as defined in this article and notwithstanding any general or special statute requiring or authorizing any such contract, shall not enter into any such contract unless proof duly subscribed by an insurance carrier is produced in a form satisfactory to the chair, that the payment of disability benefits and after January first, two thousand eighteen, the payment of family leave benefits for all employees has been secured as provided by this article.

ARCADIS Design & Consultancy for natural and built assets

PROPOSAL

ERIE COUNTY WATER AUTHORITY (ECWA)

PROJECT A
BALL PUMP STATION PHASE I
REHABILITATION

ECWA PROJECT NO. 202000046

MAY 2020
10334013

Erie County Water Authority

Erie County Water Authority
Mr. Leonard F. Kowalski, PE
Executive Engineer
3030 Union Road
Cheektowaga, NY 14227

Arcadis U.S., Inc.
50 Fountain Plaza
Suite 600
Buffalo, NY 14202
Tel 716 667 0900
Fax 716 667 0279
www.arcadis.com

WATER

Date:
May 7, 2020

Contact:
Mark Lenz, PE

Phone:
716.316.5886

Email:
Mark.Lenz@arcadis.com

Our ref:
10334013

Subject:
PROPOSAL – BALL PUMP STATION PHASE I REHABILITATION

Dear Mr. Kowalski:

Arcadis is pleased to submit our proposal to meet Erie County Water Authority's (ECWA's) needs on the above-referenced project. Our team includes industry leading technical experts in hydraulic modeling and pumping systems; individuals with in-depth knowledge of ECWA's vertical assets; and certified water operators who understand capital upgrades and plant operations from the owner's perspective. Arcadis, along with our partner Nussbaumer and Clarke, Inc. (N&C), offers value to ECWA that no other team can provide, including:

You can continue to count on us as your trusted advisor to maintain your legacy of dependable water service. Our proven project management team, including Dan Seider and Mike Chirico, is intimately familiar with the critical role of Ball Pump Station. They will carefully lead the execution of this project so that the new infrastructure and tie-ins occur without disruption in water supply and water quality for ECWA's customers.

Our national experts in pump station design, along with our local team, will provide a reliable and high-performing design for the Ball Pump Station in a cost-effective manner. Our proposed team includes process mechanical engineers that work nationally on large-capacity pump stations, including Dan Seider and Brian Duane. Our pump station engineers have successfully provided consulting services for several similar projects. These individuals will work side-by-side with our strong team of experienced subject-matter experts in hydraulic modeling, electrical and instrumentation and controls (I&C), and N&C's local structural, HVAC/plumbing, architectural design, and construction oversight staff to deliver a successful project.

Our team brings in-depth knowledge of your water system, offering you high-level execution from day one to expedite your project schedule. Our team has provided ECWA with guidance on the Ball Pump Station since its original construction and commissioning in 1980. This guidance has continued for the last 40 years through several other projects. This incumbent facility knowledge provides peace-of-mind and assurance to ECWA that the Arcadis team can deliver this project on budget and on schedule while reducing any up-front learning curve on the pump station system.

Virtual tools leveraged to facilitate complex design, project sequencing and improve overall performance in design, construction and operation. Virtual tools will allow our team to focus on constructability issues at project onset like shutdowns, bypasses and proper disinfection of systems prior to being brought back online to facilitate project success.

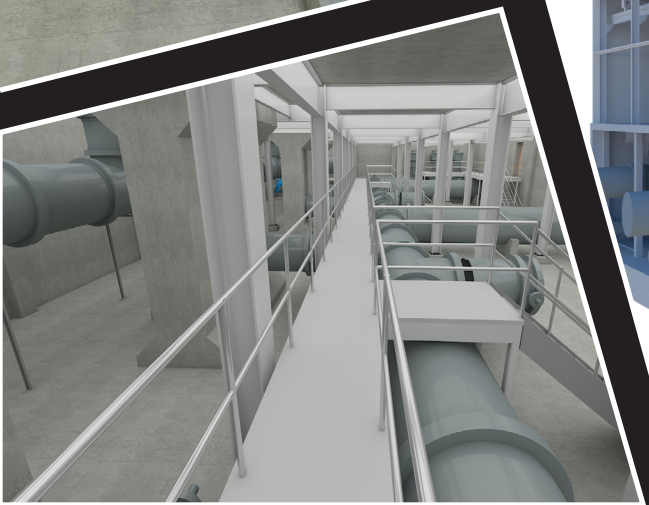
We thank you for the opportunity and look forward to assisting ECWA with this important project. If you have any questions or need any additional information, please feel free to contact Mark at 716.316.5886

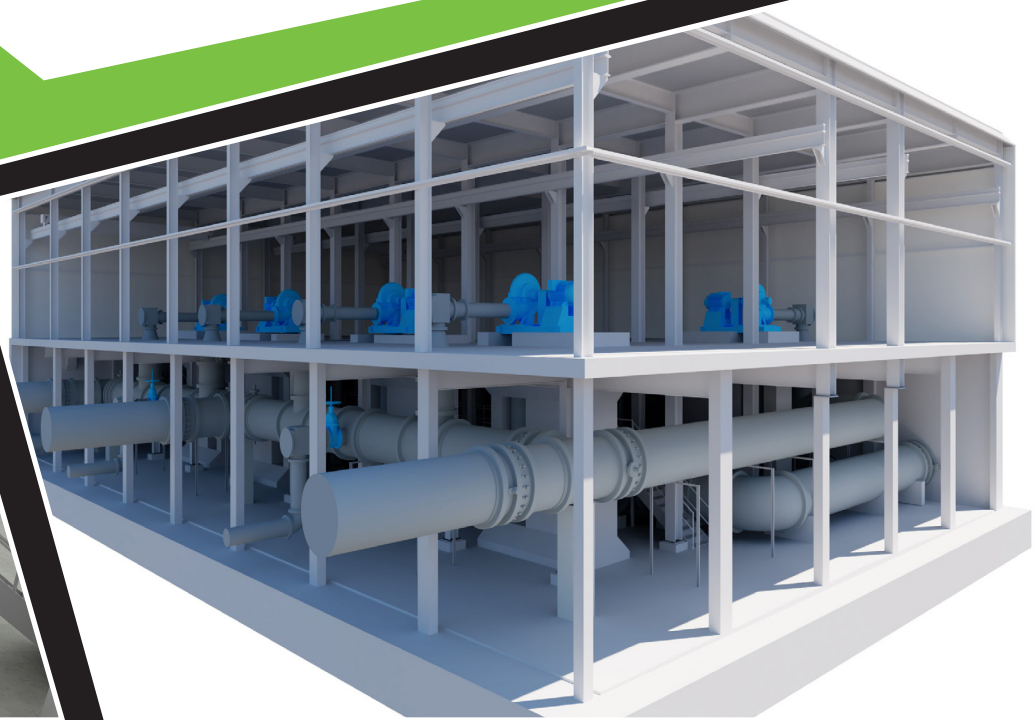
Sincerely,

Arcadis of New York, Inc.

Mark Lenz, PE
Senior Vice President

CONTENTS





ARCADIS

SECTION 1
Qualifications and Related Experience

Erie County Water Authority

Arcadis is internationally recognized for its expertise in water resources engineering and is highly ranked in numerous categories on Engineering News-Record's list of Top Firms in the country.

2019 ENR TOP 500

#3
Water (International)

#3
Top New York State Design Firms

#3
Pure Design

#12
Top 200 Environmental

#13
Top 500

About Arcadis

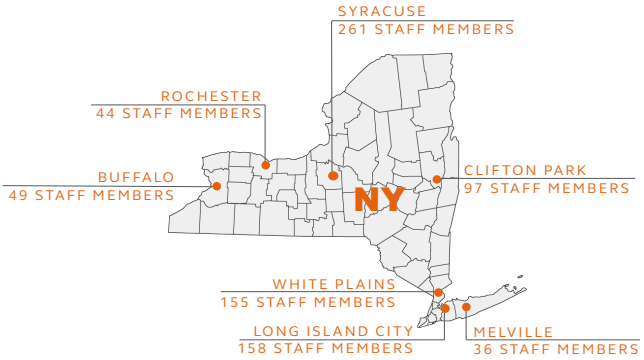
Arcadis is a global company providing consultancy, design, engineering, and management services in water, wastewater, infrastructure, environment, and buildings. We partner with our clients to enhance sustainability and quality of life by creating balance in the built and natural environments. Our most defining characteristics are a staff of talented and passionate people, a unique combination of capabilities covering the whole asset life cycle, deep market sector insights that work to our clients' advantage, and a commitment to integrate health and safety and sustainability into the design and delivery of customized solutions. With 27,000 employees and $3.7 billion in annual revenues worldwide, the company has strong local knowledge and experience supported by an extensive national network. Arcadis has 5,000+ employees working in 120+ offices across the U.S.

WATER	INFRASTRUCTURE	PMCM AND BUILDINGS	ENVIRONMENT
• Water Management • Water supply planning and development • Water treatment, distribution and storage • Wastewater treatment and collection • Stormwater	• Transportation • Land resources • Alternative project delivery • Global positioning systems (GPS) and surveying • Geographical information systems (GIS) • Information management	• Program, project and construction management • Facilities planning and design • Project close-out and occupancy phase • Construction claim services • Value engineering • Sustainability consulting	• Site investigation • Remediation • Planning and permitting • Risk and eco-restoration • Strategic environmental consulting compliance • Energy / climate change • Incident response and recovery
BUSINESS ADVISORY			

New York State Presence

Arcadis has strong roots in New York State due largely to the founding of two predecessor firms — Malcolm Pirnie, Inc. and Blasland, Bouck, and Lee, Inc. Today, our presence remains strong:

- Seven offices and over 750+ personnel in New York State.
- 45+ employees in our Buffalo office.
- More than 300 employees in Western and Central New York region (Buffalo, Rochester and Syracuse).



This project will be staffed primarily from Arcadis' Buffalo, New York office which has over 45 employees.

History with ECWA

Our Arcadis Buffalo office was established to provide engineering services to ECWA — a relationship that began in the mid-1960s with a contract to prepare a water supply master plan. This project included a phased program for rehabilitating several treatment plants and pumping stations. The assignment grew into several design and construction phase projects to expand, and ultimately high rate, the Sturgeon Point Treatment Plant followed by the design of a new Van de Water Treatment Plant (VDWTP) to satisfy growing system demands.

We have since completed 81 projects for ECWA, and we look forward to the opportunity to continue to provide a high quality of service through both local knowledge and national expertise.

Expertise in Pumping Stations

Arcadis' pump station experience ranges in capacity from less than one mgd to over one billion gallons per day and includes upgrading existing pump stations, which requires a special design approach because one must work within existing building/site constraints and maintain continuous water delivery during construction. Our design engineers are experienced in condition assessment; equipment evaluation, selection and specification; life-cycle cost analyses; and process design to efficiently integrate systems and equipment into existing facilities. We recognize that equipment and piping selection, along with layout, will have long-term impacts on the facility's operations and maintenance (O&M) costs. Our designs will balance the initial capital cost with O&M requirements for the project's total life.

With a pump station of this capacity, pump drive selection is important for an efficient and effective pump station. Our experience includes constant and variable speed drive applications in situations that involve variability in suction and discharge conditions. We emphasize energy efficiency and reliability in the selection of motor drives (variable frequency drives (VFDs)).

To complete this work, Arcadis has a full-spectrum of specialty design disciplines in-house enabling us to maximize project coordination and quality control in pump station projects. Our specialty groups include electrical engineering, I&C, building mechanical systems and HVAC, structural engineering, architectural design, and O&M. These in-house resources enable us to optimize project coordination, quality control and scheduling to deliver projects that meet or exceed our clients' expectations.

As summarized in the following table, **our involvement with large pump station facility projects demonstrates the relevant experience we will draw from to successfully complete this project. Our reference projects are included at the end of this section.**

Lake Huron WTP (LHWTP)
Great Lakes Water Authority, Detroit, MI

Arcadis is performing evaluation, design and construction phase services for the "right-sizing" of the LHWTP pumping systems from a firm capacity of 420 mgd to 380 mgd. LHWTP has 8 x 5,500-hp high service pumps which will be rehabilitated or replaced to decrease overall capacity while improving operational flexibility through VFDs or multi-sized constant speed pumps.

Elm Fork WTP Pump Station #1
Dallas Water Utilities (DWU), Dallas, TX

Arcadis completed the detailed design of the new integrated 220-mgd raw water pump station and the 160-mgd high service pump station. The new station includes 4 x 800-hp raw water pumps and 4 x 2,750-hp high service pumps with VFDs. The raw water portion of the pump station is operated by the Elm Fork WTP operations staff while the high service portion is operated by the DWU Pumping Division. The high service system can pump in multiple directions, including to customer cities and to DWU's distribution system.

SCAN ME

Ball Pump Station Condition Assessment
Erie County Water Authority, Buffalo, NY

Arcadis completed a condition assessment, risk assessment and hydraulic evaluation of the 70-mgd pump station to develop a prioritized list of recommendations to improve reliability, energy efficiency and operational flexibility. The recommendations were incorporated into a 15-year Capital Improvement Program.

Table 1.1. Arcadis' Pump Station Experience				
Project | Location	Capacity (mgd)	Condition Assessment / Evaluations	Detailed Design	Construction
GLWA Lake Huron | Detroit, MI	420	■	■	■
Northeast WTP Low Lift and High Lift Pump Stations | Detroit, MI	340	■	■	■
Greater Cincinnati Water Works Richard Miller Treatment Plant Filtered Water Pump Improvements | OH	220 to 240, 32 to 42	■	■	■
Alvarado WTP Intermediate Pump Station | San Diego, CA	200	■	■	■
Winthrop Terminal Facilities Pump Station | Boston, MA	192		■	
Cleveland Kirtland Pump Station | Cleveland, OH	190		■	■
City of Phoenix Squaw Peak Influent Pump Station | AZ	180	■	■	■
Elm Fork WTP - Pump Station #1 Replacement High Service Pumps | Dallas, TX	160	■	■	■
City of Buffalo Colonel Ward Pump Station | Buffalo, NY	150	■	■	■
Lardner's Point Pump Station Replacement - High Service Pumps | Philadelphia, PA	143		■	
PWSA Aspinwall Pump Station | Pittsbrugh, PA	117	■		
Charlotte County / Upgrade of Pump Stations and Chemical Feed | Charlotte, NC	115	■	■	■
Collins Park High Service Pump Station | Toledo, OH	100		■	■
NYCDEP Hudson River Pump Station | Chelsea, NY	100	■	■	
South Central Connecticut Regional Water Authority / Lake Gaillard | CT	100	■	■	■
PWSA Ross Pump Station | Pittsbrugh, PA	100	■		
High Service Pumps | Erie County, NY	90	■	■	■
Auburn Hills Booster Pump Station | Oakland County, MI	90		■	
Grand Blanc Water Booster Pump Station | Grand Blanc, MI	90		■	
Windermere Boulevard Pump Station | Toledo, OH	90	■	■	
Auglaize River Raw Water Pump Station | Lima, OH	90		■	■
ECWA Sturgeon Point WTP Pump Station | Buffalo, NY	90	■	■	■
NYCDEP Pumping System for DEL-185 Transmission Main | NY	80	■	■	
City of Irving Hackberry Pump Station | TX	80	■	■	■
Trinity River Authority of Texas Murphy Drive Pump Station | TX	80	■	■	■

Table 1.1. Arcadis' Pump Station Experience				
Project | Location	Capacity (mgd)	Condition Assessment / Evaluations	Detailed Design	Construction
City of Dayton Water Treatment Plant | OH	79	■	■	■
Alum Creek Pump Station and Reservoir | Columbus, OH	70	■	■	■
City of Dallas Water Utilities Sunset Pump Station | TX	65	■	■	■
Cross River Pump Station | Carmel, NY	60	■	■	
Shades Mountain Filter Plant and Pump Station Upgrades | Birmingham, AL	60/80	■	■	■
City of Scottsdale Central Arizona Project (CAP) Water Supply and Treatment Program | AZ	55	■	■	■
Monroe County Water Authority Webster WTP | Rochester, NY	50	■	■	■
OCWA Raw Water and Clear Water Pump Station | Syracuse, NY	49 / 53	■	■	■
City of Cleveland Baldwin WTP Improvements (Included Backwash Pump Station) | OH	42	■	■	■
City of Irving MacArthur Pump Station | TX	35	■	■	■
City of Victoria Surface Water Treatment Plant | TX	32 / 47	■	■	■
Lehigh County Authority Pump Station Investigation | Allentown, PA	30	■		
Trinity River Authority of Texas / TCWSP WTP | TX	20	■	■	■
Broadway Booster Pump Station | Cleveland, OH	20	■	■	■
City of Findlay Raw Water Pumping Station | OH	20 / 10	■	■	■
ECWA Pine Hill Pump Station | Buffalo, NY	15	■	■	■
City of Columbus Parsons Avenue WTP High-Service Pump Station | OH	15 / 20 / 25	■	■	■
Gwinnett County Yellow River / Sweetwater Creek Pump Station | GA	12	■	■	■
Butler County Liberty Fairfield Water Pump Station Replacement | PA	9	■	■	■
City of Fort Worth West Side IV Pump Station | TX	6	■	■	■
City of Scottsdale Storage Reservoir and Pump Stations | AZ	5	■	■	■
City of Wooster Buckeye Street Pumping Station | OH	4.3	■	■	■
City of North Canton / Tower No. 2 Booster Pump Station Improvements | OH	2.5	■	■	■
City of Hamilton Washington Boulevard Pump Station | Hamilton, OH	2	■	■	■
Buckeye Water District Booster Pump Station and Elevated Tank | Wellsville, OH	0.6	■	■	■
Butler County Rialto-Muhlhauser Pump Stations Interconnection | Butler, OH	Varies	■	■	■

Electrical Experience

Our proposed team also brings local and national electrical and control expertise with large pump motors and starters, including VFDs, eddy current clutch drives and soft starters, medium- and low-voltage switchgears, switchgear controls, and standby power systems. With over 100 years of combined experience between our electrical team — Mike Chirico, Greg Moore, Ryan Kowalski, and Alex Misiaszek — they have a proven track record with projects similar to your Ball Pump Station Rehabilitation project, as illustrated below. With this extensive electrical and control expertise, the result will be a reliable and efficient performing pump station design.

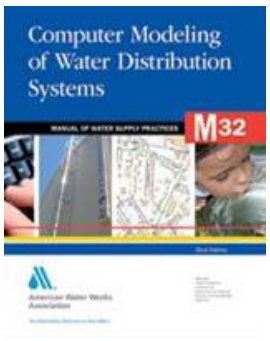
Arcadis' in-house electrical design resources enable us to undertake large, complex electrical projects with challenging deadlines. Our resources enable us to maximize coordination and quality control. **Arcadis' proposed electrical engineering team brings extensive knowledge and hands-on experience in the design and upgrading of electrical systems such as ECWA's Ball Pump Station Substation Replacement, Ball Pump Station VFD's No.4 and 5, and Switchgear Relay Upgrades at Ball Pump Station and VDWTP.**

Table 1.2. Arcadis' Electrical Design Experience

Client and Project	Electrical Assessment of Existing Systems	Switchgear Replacement and/or Addition	Electrical Upgrades and/or Addition	Developed Procedures to Maintain Plant Operations
ECWA - VDWTP and Ball Pump Station Substation Improvements | Buffalo, NY	■	■	■	■
Western Butler County - Harmony Pump Station Improvements | PA	■	■	■	
Williamsport Sanitary Authority - Contract No. 4 Plant Additions (BNR Upgrades and CSO Long-Term Control Plan Implementation) | Williamsport PA	■	■	■	
Ann Arbor, MI - WWTP Facilities Renovations | Ann Arbor, MI	■	■	■	■
Carson Filter Plant Expansion | Birmingham, AL	■	■	■	■
Shades Mountain Filter Plant Improvements | Birmingham, AL	■	■	■	■
Alum Creek Pump Station Improvements | Columbus, OH	■	■	■	■
Dublin Road WTP Disinfection Improvements | Columbus, OH	■	■	■	■
Dublin Road Water Plant Standby Power | Columbus, OH	■	■	■	■
Southerly WWTP Headworks Facility (New) | Columbus, OH	■	■	■	■
Olentangy WTP (New) | Del-Co Water Company, OH		■	■	
Olentangy WTP New Raw Water Pump Station (New) | Del-Co Water Company, OH		■	■	
Up-Ground Reservoir and WTP Project (New) | Delphos, OH		■	■	
Pump Station Improvements | Elkhart, IN	■	■	■	■
Ft Wayne, IN - Raw Water Pumping Station | Ft Wayne, IN	■	■	■	■
Ft Wayne, IN - WTP Expansion and Improvements | Ft Wayne, IN	■	■	■	■
WWTP Effluent Aeration Improvements | Ft Wayne, IN	■	■	■	■
Sugarcreek WRRF & Influent Pump Station | Greene County, OH	■		■	■
Wet Weather Expansion Project | Hartford, CT	■	■	■	■
Upper Hocking Water Pollution Facility (New) | Lancaster, OH		■	■	
Wastewater Treatment Plant (New) | Marysville, OH		■	■	
Crosses Run Pump Station (New) | Marysville, OH		■	■	
WWTP Upgrades | Montgomery County, OH	■	■	■	■
WWTP Upgrade | Mt. Vernon, OH	■	■	■	■
WTP Standby Power Generator | Newark, OH	■	■	■	■
WWTP Standby Generator and Switchgear | Troy, OH	■	■	■	■
Water Treatment Plant Improvements | Westerville, OH	■	■	■	■

Hydraulic Analysis Experience

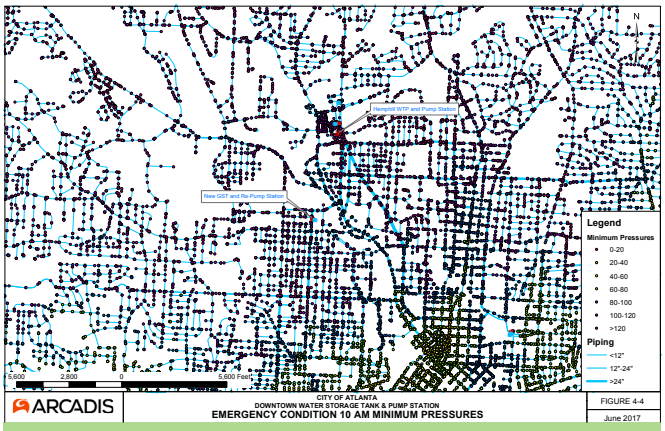
Arcadis is an industry leader in hydraulic, operational and water quality modeling. We take pride in using a holistic approach that considers water supply requirements, hydraulic conditions, regulatory compliance, and utility-specific water quality goals to develop an optimized approach to distribution system modeling and hydraulic analysis. For distribution system projects, our goal is to understand your water system so that we identify operational modifications in the distribution system, and/or capital improvements that will cost-effectively meet the stated water system goals of a project. Our expertise and approach has been applied for the five largest distribution systems in the country (Los Angeles, Chicago, Houston, Dallas, and New York City).



Arcadis wrote the most referenced guidance on water system modeling, *AWWA M32, Computer Modeling of Water Distribution Systems,* and we led a Water Research Foundation project that provided guidance on model development, calibration and usage. For your project, Arcadis' combination of distribution system modeling expertise and knowledge of distribution system best practices allows us to quickly and effectively evaluate the hydraulic impacts of various future scenarios and pump selections.

Virtually all of our water and wastewater projects have a hydraulic evaluation component. Whether for treatment plant hydraulics or distribution system expansions/upgrades, our engineers have performed analysis for the following:

- Hydraulic capacity elevations.
- System-wide storage analyses.
- Storage tank, water age sizing and turnover evaluations.
- Pump station evaluations.
- Hydraulic design.
- Hydraulic profile development.
- Maintenance of plant operations (MOPO) during construction.
- Flow distribution studies.
- Physical model studies.
- Transient analyses.
- Mixing and dilution studies.
- Short-circuiting studies.
- Determination of baffling factors and chlorine breakthrough curves.



Downtown Water Storage and Pumping Facility Design, Atlanta Department of Watershed Management, Atlanta, GA

Since 2006, Arcadis, through its Joint Venture team, has been asked to provide services to the City of Atlanta's Department of Watershed Management (DWM) related to the Hemphill Water Treatment Plant. These services have ranged from geotechnical evaluations, pumping systems evaluation and upgrades, and electrical system evaluation and upgrades.

The Joint Venture is working with the DWM to develop a new ground storage tank and pump station within the periphery of the downtown area to provide emergency service to maintain pressure and fire flow within the downtown area in the event of interruption of finished water pumping at either the Hemphill or Chattahoochee water treatment facilities. As envisioned, a 7-MG ground storage tank with a pump station with a capacity up to 25,000 gpm will be constructed on a heavily landscaped site. The pumping station will include on site generation capability and housed in a building suitable to integrate into the surrounding neighborhood.

Our services also included extensive modeling and performance of environmental assessments for the site. Hydraulic modeling was performed to support design for facility location, sizing of storage and pumping facilities, and included various operational scenarios throughout a typical day and during emergency conditions.

Hydraulic Transient Model Approach and Relevant Experience

A key analysis of any pump station upgrade is the evaluation of potential transient conditions that require mitigation. All appurtenances relevant to flow control and hydraulic transients, such as air relief and vacuum break valves, are included in a hydraulic model, as well as pump performance curves and various operations. The model is then imported into Bentley's HAMMER™ or Innovyze's InfoSurge to analyze the system and determine if the proposed design can accommodate potential hydraulic transients under different operating conditions, including high distribution demand, low distribution demand, power failure, valve closures, and others.

Arcadis recently performed an analysis for the Onondaga County Water Authority to determine the impact of proposed pumps and controls on pressure transients within a 23-mile transmission main. Multiple demand and operational conditions were explored to evaluate the potential worst-case scenarios and develop mitigation strategies. Our efforts identified pressures that fluctuated for nearly 60 minutes and four areas that developed negative pressures after a pump shutdown.

Two areas reached vapor pressure which indicates water column separation and can lead to catastrophic failure of the transmission main. Improvements included a 12-inch surge anticipator valve at the clear water pump station and several air/vacuum valves at strategic locations to eliminate the negative pressures upon pump shutdown and then relieve the air once the pressure transients stabilize.

Other major hydraulic transient evaluations include the following:

- 200-mgd raw water pump station to establish design of new surge control equipment and pump control valve settings.
- 12,500 linear feet, 54-inch diameter raw water pipeline with flows up to 90-mgd.
- Suction and discharge hydraulics for 75-mgd and 125-mgd pump stations drawing from 84-inch and 96-inch diameter tunnels. Hydraulic analysis revealed that valve configurations at the WTP were having significant impact on the suction side head losses. The hydraulic surge analysis for both pump stations also evaluated the impact of transient down surge during successive pump starting.
- 120,000 linear feet of 54-inch diameter finished water pipeline with flows up to 52-mgd.

Table 1.3. Arcadis Pump Station Hydraulic Tools and Analysis Experience

Project | Location	Capacity (MG)	Field Testing	Hydraulic Profiles	CFD Modeling	Physical Model	Hydraulic Design & Transient Analysis	MOPO / Staging Considerations
OCWA Clear Water and Raw Water Pump Station Improvements | Syracuse, NY	49 / 53	■	■	■		■	■
PWSA Ross Pump Station | Pittsburgh, PA	100	■	■				
GLWA Lake Huron Pump Station | Detroit, MI	420	■	■		■	■	■
ECWA Pine Hill Pump Station | Buffalo, NY	15	■	■				■
Wills Raw Water Pump Station | Wilmington, DE	32	■	■			■	■
Huntington Levee Pump Station | Fairfax, VA	155			■	■	■	
Baldwin Water Works Plant | Cleveland, OH	165		■			■	■
Hemphill Raw Water Pump Station | Atlanta, GA	210		■	■		■	
CAP Water Treatment Facility | Scottsdale, AZ	55	■	■			■	
Folsom Water Treatment Plant | Folsom, CA	50		■	■		■	
Loudonville Reservoir UV Treatment Facility | Albany, NY	40	■	■	■		■	
Western Filter Plant | Birmingham, AL	60			■			
Carson Filter Plant | Birmingham, AL	35		■			■	
Chandler Surface Water Plant Expansion | Phoenix, AZ	45	■	■			■	■
Southerly WWTP | Columbus, OH	440	■	■		■	■	■
WWTP Wet Weather Expansion | Hartford, CT	200	■	■		■	■	■
Low Service & High Service Pump Stations | Oregon, OH	24		■	■		■	■
Clintondale Pump Station | Detroit, MI	78			■	■		
USACE West Closure Complex Pump Station | New Orleans, LA	12, 926		■	■	■	■	
Cholla Water Treatment Plant | Glendale, AZ	28		■			■	■

References

We have included detailed project summaries below.

LARDNER'S POINT PUMP STATION UPGRADE

Philadelphia, Pennsylvania

Lardner's Point Pump Station (LPPS) has been in service for over 100 years supporting PWD's mission to provide safe drinking water to the City of Philadelphia. LPPS is the largest finished water pumping station in the city, conveying over 30% of the water consumed by the city on any given day. Given the age of the facility and its criticality, PWD is undergoing a project to construct a new modern pumping station on the site to replace the aging LPPS that is at the end of its life cycle. Arcadis developed the basis of design. Multiple workshops were held with the PWD Core Review Committee stakeholders for the project, including:

- Evaluating alternative design concepts.
- Risk assessment.
- Theory of operations.
- Site assessment.
- Existing building repurpose considerations.
- Preserve historical legacy of 110+ year old building through adaptive repurposing.
- Renew aging infrastructure while maintaining 30% of the City's water supply during construction.
- Achieve water system master planning goals by meeting system demand under various outage scenarios.
- Enhance system resiliency with fully redundant pumping capabilities.
- Reprogram the site holistically to meet PWD organizational needs, City sustainability goals, and integrate it with the surrounding community.

Project elements of the new pumping station facility developed in the basis of design include:

- Pumping equipment and related mechanical support systems:
  - Six main pumps, four large-capacity (33 mgd) pumps and two small-capacity (22 mgd) pumps. The total capacity of the main pumps will be 176 mgd with a firm capacity of 143 mgd.
  - Four standby pumps with nominal capacity of 30 mgd each, and firm capacity of 143 mgd.
- New pumping station facility and building systems, including mechanical space, electrical room, control room, office space, break room, and restrooms.
- New electrical switchgear, motor control centers, and backup generators.
- HVAC, plumbing, and fire protection equipment.
- I&C, including provision for remote monitoring and operation.
- Site process piping, including the connection to Shaft 11, which connects Torresdale Conduit to LPPS.
- New discharge piping loop that receives flow from both main and standby pumps, new suction piping loop for the main pumps, and new valve to provide flow distribution between pressure districts.
- Junction chambers to provide flow control, isolation, and connection to existing structures.
- New flow metering chambers to measure distribution flow.
- Demolition and removal of existing sewer maintenance facilities to accommodate construction and contractor activities.
- Decommissioning of the existing pumping station.

CLIENT
Philadelphia Water Department (PWD)

REFERENCE
Vahe Hovsepian
Manager Design Branch
1101 Market Street
2nd Floor
Philadelphia, PA 19107
215-685-6278
Vahe.Hovsepian@phila.gov

BUDGET
$135 million
(estimated construction)

COMPLETION DATE
2016 - Ongoing

KEY STAFF
Dan Seider (TA), Mark Lenz (TA), Ryan Kowalski (PIC), Brian Duane (TA), Tim Shafer (Construction Sequencing)

RELEVANCE
- ✓ Major pumping system rehabilitation project.
- ✓ New suction and discharge piping ranging in diameter between 48" and 108".
- ✓ Detailed MOPO plans to maintain existing pump station operations while new pump station is brought on-line.

Supporting the operation of the new pumping station outside of the LPPS property includes the following components:

- 60-inch water main in Levick Street — piping work to accommodate operation of new standby pumps.
- Piping jumper connection at Tacony and Comly Streets to accommodate operation of new standby pumps.
- Valves and piping to connect the new pumping station to the existing water distribution system.

Project site integration design includes:

- Stormwater management and site utilities.
- Site circulation elements with active and passive site security elements to accommodate new site programming and configuration.
- Decommissioning and abandonment of unused buried infrastructure, including mains.
- Repurposing of the existing LPPS building, including:
  - New programming for office and assembly spaces and associated building support facilities.
  - Hazardous material abatement, seismic retrofit, and new building systems.
  - New facility entrance with transition section linking the new and old buildings together.
- Construction of new sewer maintenance facilities.

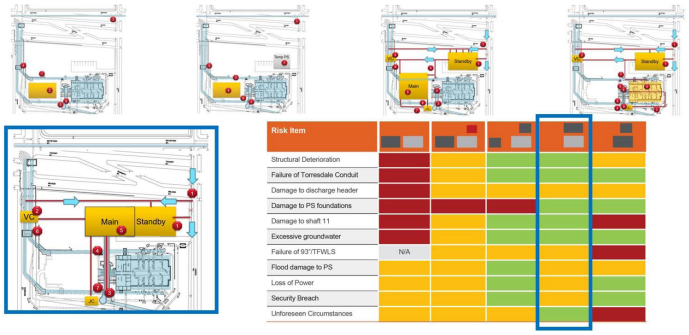
Challenges and Objectives: PWDs primary objectives grew as the project evolved. These included the following:

Providing simple and reliable operations. This required defining an implementation approach that fully appreciated the specific risks that must be overcome to maintain a continuous pumped supply of water throughout construction. This also required an understanding of the overall system hydraulics and piping issues so that acceptable solutions could be crafted to allow the new pump station to serve its primary duty while also providing a full, independent standby pumping system to replace the limited A-stage system.

Creating an optimally integrated and functional campus. This required defining an approach to holistically reprogram the use of the entire site so that it serves the needs of multiple PWD stakeholders while preserving the historical integrity of the existing station's architecture. Close collaboration with PWD architectural and design branch staff resulted in a comprehensive analysis of the potential for reusing the existing pump station building and approaches to reprogram the site.

Minimizing project risks. This required a comprehensive understanding of on and related off-site considerations, including PWDs O&M, pumping and controls philosophy, buried piping and shafts, required piping connections, construction timing and sequencing, geotechnical and groundwater concerns, historical piping and foundation leaks, customer and public considerations, and many others. A risk matrix was used effectively for decision making.

Solutions. Arcadis learned, integrated and balanced the needs and considerations of a wide range of PWD stakeholders. Technical solutions achieved PWD's goals of reliable main and standby pumping capacity and a successful site integration plan was developed that was embraced by PWD stakeholders. Implementation risks were investigated, understood, appreciated and categorized providing an effective roadmap for project implementation.



Client Praise

In April 2019, as part of the monthly Capital Program Review Team presentation, Arcadis, along with PWD, presented the culmination of two years of planning and basis of design work to PWD's entire management and Executive Group. The feedback from PWD management was enthusiastic and a testament to the close coordination between key members of our project team and PWD design staff. Comments were made specifically with regards to:

- Our team's ability to present complex information and distill to the essence to present the project in front of such a diverse group of stakeholders and managers.
- The choreography between our team and PWD architects during the presentation, with "seamless" transitioning between one topic to the next.
- The high engagement and collaboration with PWD Design Branch, specifically the architectural staff, on the project.
- The technical animation of the piping and operation of the new facility.

PINE HILL PUMP STATION IMPROVEMENTS

Cheektowaga, New York

CLIENT
Erie County Water Authority

REFERENCE
Leonard F. Kowalski, PE
Executive Engineer
716-685-8220
lkowalski@ecwa.org

BUDGET
$2.7 million (construction)

COMPLETION DATE
2014 - 2016

KEY STAFF
Mark Lenz (PIC/PM), Dan Seider (Engineering Consultant Manager), Tim Shafer (Design Quality Leader, CA and RPR), Marnie Bell (Deputy PM), Greg Moore (Electrical), Ryan Kowalski (I&C/SCADA), Vinnie Vitale (HVAC), Paul DiCorso (Structural), Matt Welshans (CADD), Craig DeWyer (RPR)

RELEVANCE
- ✓ Major upgrade to a key ECWA pump station, including pumps, motors, VFD's, standby power, and all appurtenant systems.
- ✓ Detailed hydraulic analysis to 'right size' pumps for normal and emergency operating conditions.

The ECWA Pine Hill Pump Station is located in the town of Cheektowaga, New York and was originally constructed in the 1950's and had minor upgrades since its completion. The existing pump station had two 350-hp 12-inch Worthington horizontal split case pumps with a total approximate capacity of 7 mgd. One of the pumps was powered via a VFD for flow control and most of the pumping, piping and electrical equipment had reached the end of its useful life. Additionally, ECWA had recently upgraded and reactivated its connection to the City of Buffalo's distribution system which will affect the pump station's future use and operating conditions. As such, ECWA retained Arcadis to study, evaluate and design pump station upgrades that meet current and future demands and operating conditions as well as provide improved reliability and additional operational flexibility.

ECWA's distribution model was updated calibrated and used to evaluate system-wide transmission main improvements and preliminary pump sizing requirements for the Pine Hill Pump Station. Additionally, pump station capacity requirements under future operating scenarios were evaluated. Based on current and potential future operations, it was recommended that the pump station be designed to meet the following conditions:

- Median operating flow of 4 mgd.
- Firm capacity (N+1 redundancy) of 14 mgd.

Additionally, the total capacity of the pump station (N+0 redundancy) was maximized to the extent possible with the goal of delivering in the range of 18 to 20 mgd.

Horizontal-split case pumps and vertical turbine pumps were considered for upgrades to the Pine Hill Pump Station. Based on efficiencies, initial capital expenditures on structural modifications, operation and maintenance requirements, and budgetary pump costs horizontal-split case pumps were recommended. Pumps were selected to optimize efficiency at the median operating condition of 4 mgd while providing the ability to pump at the firm capacity (14 mgd with two pumps and approximately 7 mgd per pump). This approach guarantees that the pumps will be operating near their best efficiency point (BEP) for the majority of the time, while pump efficiency at the more extreme conditions are of less importance.

The Pine Hill Pump Station Improvements included the following:

- Demolition and replacement of all existing electrical equipment (including cabinets, battery cabinet, lighting and conduits).
- Electrical service upgraded from 5KV primary to 480V secondary.
- Demolition of two 350-hp pumps, piping and appurtenances.
- Installation of three new 350-hp pumps, piping and appurtenances inside the pump station
- Installation of three new VFDs.
- Installation of a new outdoor standby generator.
- Demolition and replacement of the plumbing fixtures within the pump station.
- Installation of new louvers and fans.
- Demolition and replacement of roof, gutters, windows, doors, and railings.
- Improved insulation in the Operating Floor ceiling.
- Installation of a new venturi flow meter, piping, valves, and vault on the exterior of the pump station.
- Installation of new exterior lighting.
- Demolition and replacement of the fence along the entire west property line.
- Removal of trees along the west fence line.

LAKE HURON WTP LOW LIFT, HIGH LIFT, WASH WATER PUMPING IMPROVEMENTS, ELECTRICAL IMPROVEMENTS, AND MISCELLANEOUS CHEMICAL IMPROVEMENTS

Detroit, Michigan

CLIENT
Great Lakes Water Authority

REFERENCE
Eric Kramp
Project Manager
313-999-3875
Eric.kramp@glwater.org

BUDGET
$50 million

COMPLETION DATE
2020 - 2028

KEY STAFF
Dan Seider (PM), Brian Duane (Pumps TA), Mike Chirico (Electrical), Mark Lenz (Safe-By-Design TA), Tim Shafer (Construction MOPO TA), John Salvagno (Engineer)

RELEVANCE
- ✓ Major rehabilitation project, including pumps, motors, VFDs, switchgear, and other appurtenant systems.
- ✓ Detailed hydraulic analyses to develop existing/future pump system curves, and surge relief improvements.
- ✓ Detailed MOPO plans to maintain existing operations while new pumping and electrical systems are brought on-line.

The Lake Huron Water Treatment Plant (LHWTP) was constructed in 1974 to provide water service to high growth areas northwest of the city of Detroit. Arcadis is performing an evaluation, design and construction phase services to “right-size” the pumping systems, upgrade the electrical systems and improve the phosphoric acid chemical feed system.

Pumping Systems

The existing pumps are original to the plant construction and consist of pumps ranging from 40 mgd to 200 mgd, 500 hp to 5,500 hp, supplied by 4.16KV and 13.2KV electrical gear. This project will evaluate the existing pumping systems to determine the optimal size and combinations of pumps required to meet system demands. The major tasks that will drive the final improvements include:

- Addition of new pumps and/or arrangement of rehabilitated pumps to meet firm capacity requirements while coordinating with GLWA’s long-term vision for the WTP operation.
- Condition assessments of the existing pumping units and associated equipment to develop rehabilitation or replacement recommendations.
- Evaluation of VFDs and whether flow demands can be met through other options that provide operational flexibility but are more cost-effective.

Electrical Systems

The primary electrical system has seen little improvement since the plant was constructed in 1974. As electrical systems are critical to plant operations, Arcadis is evaluating alternatives to replace those systems without adversely impacting operations by considering the construction of a new electrical room and switchgear prior to the replacement of the pumping systems. This will eliminate major electrical shutdowns to replace equipment in the same location and minimizes the shutdown length when the pumps are rehabilitated or replaced and connected to the new electrical gear.

Phosphoric Acid Chemical System

The existing phosphoric acid system was installed in 1995 and improvements will be evaluated within the context of GLWA’s current Corrosion Control Study so capital investments are being made in equipment that are not under/over-sized or have limited functionality once the study recommendations are finalized. Improvements may include new or rehabilitated storage tanks, new metering pumps, piping, instrumentation, and SCADA controls.

This eight year project will upgrade the major pumping and electrical systems while maintaining plant capacity throughout construction. All improvements will be evaluated within the context of life-cycle costs to account for capital, operations, and maintenance costs while improving reliability and redundancy.

RAW WATER, CLEAR WATER AND EASTERN PUMP STATION IMPROVEMENTS

Syracuse, New York

CLIENT
Onondaga County Water Authority

REFERENCE
Andrew J. Weiss, PE, BCEE
Executive Engineer
315-455-7061 x3108
ajweiss@ocwa.org

BUDGET
$14 million (construction)

COMPLETION DATE
2012 - 2019

KEY STAFF
Mark Lenz (PIC), Dan Seider (Project Engineer), Marnie Bell (PM), William Barhorst (Surge Analysis), Tim Shafer (Design & CA), John Salvagno (Engineering Support), Paul DiCorso (Structural), Matt Welshans (CADD)

RELEVANCE
- ✓ Major pumping system upgrade to existing raw water and finished water pump stations.
- ✓ Detailed MOPO to incorporate improvements while maintaining service to OCWA system.
- ✓ Transient analysis and surge relief improvements.

The Onondaga County Water Authority's (OCWA's) Lake Ontario Water Treatment Plant (WTP) provides an average of 20 mgd and a peak of approximately 50 mgd to retail customers in Central New York. Transmission begins at an intake off the shore of Oswego, NY where raw water is pumped to the nearby WTP and then the finished water is pumped to the Town of Clay and then pumped east, west, and south where the water is distributed to retail water utilities.

A core philosophy of the project is to catapult the utility from the best practices and engineering design that were available nearly 50 years ago when it was constructed, to the forefront of cutting edge technology available today with an ultimate goal to achieve significant gains in energy and operational efficiency.

The project is being implemented in two phases. Under Phase 1, preliminary technical evaluations were completed on key system components. Under Phase 2, equipment procurement, design and implementation will be completed through an integrated project delivery under Article 9 of the New York State Energy Law. Phase 1 has been completed and Phase 2 is currently underway. In addition, key components of the project included:

Upgrades to Transmission Pump Systems. Improvements to key pump stations were identified to maximize life-cycle cost savings and maximize energy savings. The reduction in life-cycle costs has led to the use of high quality manufacturers of high efficiency equipment. The improvements include the installation of three, 1,250-hp vertical turbine pumps with a firm capacity of 53 mgd at the Raw Water Pump Station and three, 1,250-hp horizontal split case pumps with a firm capacity of 49 mgd at the Clear Water Pump Station. VFDs are being provided for each pump to provide operational flexibility under current and future conditions. These pumping solutions provide OCWA with an estimated 25% energy use and greenhouse gas (GHG) reduction that accounts to annual energy savings of over $400,000. This project removes more than 1,000 metric tons of CO_2 emissions from Onondaga County each year, equivalent to electricity usage of about 525 homes in a single year (off the grid). Other improvements include new hydraulic power units, pump control valves, isolation butterfly valves, and a surge relief system to protect the 23-mile finished water transmission main during unexpected shutdowns of the Clear Water Pumps.

Communications/Telemetry and SCADA. A state-of-the-art communications network and SCADA system is being implemented to provide a robust, reliable, secure, and sustainable communications and telemetry network for OCWA's treatment and pumping facilities, and 48 remote sites.

CROSS RIVER AND CROTON FALLS PUMPING STATIONS

Carmel and Bedford, New York

CLIENT
New York City Department of Environmental Protection

REFERENCE
Michael Svoboda
Accountable Manager
Croton Falls Pumping Station Construction Trailer
Samantha Lane
Carmel, NY 10512
914-490-8026
SvobodaM@dep.nyc.gov

BUDGET
$86.7 million (construction)
$15.5 million (design)

COMPLETION DATE
2003 - 2017

KEY STAFF
Mark Lenz (TA), Vinnie Vitale (HVAC)

RELEVANCE
- ✓ Hydraulic and transient model development.
- ✓ For the Cross River Pump Station, our innovative approach of maximizing existing infrastructure saved DEP millions of dollars in capital costs.

The Cross River and Croton Falls Pump Stations are located on the upper reaches of the historically significant New York City Department of Environmental Protection's (DEP's) East-of-Hudson system within the Croton watershed. Located in proximity to the bases of the Cross River and Croton Falls Dams, respectively, these pump stations are key components of the New York City water supply system. As part of a Joint Venture, Arcadis led the effort to design and reconstruct the pump stations so that they can serve the city's current and future needs.

During the planning phase of this project, Arcadis successfully obtained all permits from state and federal regulating agencies such as NYSDEC and the Army Corps and the local Townships of Carmel, Somers and Bedford. Also, due to the historical significance of the sites, Arcadis conducted archaeological investigations as required by the State Historic Preservation Office (SHPO). At the Cross River site, Phase I was conducted, whereas at Croton Falls, Phase I, IB and II were completed.

The Cross River Pump Station had an initial capacity of 27 mgd which was upgraded to 60 mgd under this project. The Croton Falls Pump Station had a capacity of 65 mgd. A new 180-mgd Croton Falls Pump Station was designed, bid and constructed to replace the original station.

Quality: A quality plan was developed and implemented throughout design and construction.

Schedule: The project was completed on time. Internal DEP stakeholder support was obtained at the onset to prevent delays in processing permit applications.

Safety: Arcadis was selected by the DEP EH&S to receive the "Excellence in Prevention Through Design" award for the design of the Croton Falls Pump Station.

Cross River Pump Station, Town of Bedford, Westchester County

The original Cross River Pump Station was constructed in the late 1940s at the base of the Cross River Dam. This station was demolished and new pumps were installed inside the existing Delaware Aqueduct Shaft 13 building, approximately 1,500 LF away. Our innovative approach did not require an increase in the building footprint, thereby saving DEP millions of dollars in capital costs.

Under this contract, three 20-mgd electric pumps were installed on the ground-floor level of the Shaft 13 building to replace the original hydraulically driven pump. Use of electric pumps will allow the pump station to operate over a wider range of capacities and conditions and eliminate the waste to stream water experienced with the use of hydraulic turbines.

Croton Falls Pump Station, Town of Carmel, Putnam County

The existing pump station was demolished and a new pump station building was constructed to house six 30-mgd pumps. The building is approximately 16,960 square feet in area and 45 feet tall. The structure was constructed of a steel frame with exterior precast concrete panels and contains an electrical room, control room, storage room, office and bathroom.

Hydraulic Model and Transient Model Development

NYC was concerned about transient surges in their water distribution system because they have the potential to damage pipeline systems and equipment, reduce system efficiency, induce adverse water quality conditions, and threaten the integrity and quality of supply as well as public safety. Arcadis developed hydraulic models that represent the DEP water distribution system under different operating conditions. Those models were used on this project to evaluate scenarios ranging from transient events to hydraulic deficiencies. Such modeling has supported the development of recommendations for improvement and simplified decision making on facility sizing, redundancy, infrastructure rehabilitation, and flexibility in operations. Of particular importance was the use of the model for transient analysis and hydraulic optimization, which was extremely helpful in the start-up of the Cross River Pump Station and detailed design of the Croton Falls Pump Station.

Challenges	Arcadis Solutions
Addressing Hazardous Material Remediation During Design & Construction • Extent of Previous Remediation Unknown • Potential for Contractor claimed delay for unknown Hazardous Materials remediation due to contract language • Potential for delays due to poor quality of Contractor's HASP & Work Plan submittals	• Verified extent of remediation work prior to bidding • Developed payment mechanism to a "Split" Measurement & Payment into a known Lump Sum and Unknown Allowance • Proactively engaged contractor to coordinate HASP/Work Plan preparation and approval • Provided Hazardous Materials specialist early in the project to assist contractor • Confirmed that CPM schedule reflects unknown Hazardous Materials and Collaborated with CM to mitigate schedule impacts
Utility Power Supply Availability • Utility preferred to have a contract directly with DEP • Delays experienced in executing utility contract	• Coordinated utility contract work to be performed through General Contractor as an allowance item • Acted as liaison to progress work • Minimized potential for delay claims due to utility coordination to advance DEP's goals and objectives
Failure of Pump Materials of Construction • Pump manufacturer could not meet own specification requirements • Bronze wear rings were submitted and failed during fabrication • Pump Manufacturer did not submit testing results in a reasonable time frame (5 months) • DEP Quality Control Group works independently from design engineer	• Collaborated with manufacturer to provide suitable bronze at no additional cost • Worked hand-in-hand with DEP Quality Control Group and manufacturers to identify and specify an appropriate material for Croton Falls PS • Engaged DEP QC Group early in project to establish expectations and foster communication for the Croton Falls Project • Recommended DEP SOP for QC Group
Contractor's Submittals and Coordination Drawings Lacking Information • Contractor refused to prepare coordination drawings • Poor quality shop drawing submittals • Excessive Review Cycles (R&R)	• Enforced the Contractor to submit coordination drawings to avoid conflicts • Reviewed submittal turnaround with CM, BWS, BEDC, and contractor • Scheduled partnering meetings per contract • Verified reviewers are providing quality reviews
Coordination and Collaboration • Responsibilities between CM and Designer need to be clearly defined to avoid "That's your responsibility" • Designer responding to non-critical construction RFI/RFCs	• Met and reviewed staffing plans, assignments and responsibilities • Established expectations • Conducted "Partnering Meetings" • Orchestrated on-site coordination at the start of construction

Erie County Water Authority (NC-35)
Ball Pump Station – Electrical Substation

The Erie County Water Authority has a project in progress to replace the high voltage electrical substation for the Ball Pump Station. Ball Pump Station is a major facility serving the northern portion of the Water Authority system. Nussbaumer was retained to provide full engineering services including study, design, construction administration, and construction inspection.

The primary to secondary voltage for the substation is 115 kV to 4,160 V. The proposed electrical substation includes two 7,500 kVA transformers, isolation switches, tie switches, dead tank circuit breakers, structural receiving structures for overhead 115 kV transmission lines, ground grid, underground duct banks, lightning protection, surge arrestors, protective relaying modifications, access roads, fencing, and security lighting.

In addition, a section of an existing 48-inch transmission main conflicted with the location proposed for the new electrical substation, so the project includes the construction of new 48-inch ductile iron main to facilitate the abandonment of the existing portion. The repair of sections of existing 48-inch and 60-inch storage tank inlet piping at the site using internal joint seals is also included.

PROJECT DETAILS

CLIENT / CONTACT

Erie County Water Authority
3030 Union Road
Cheektowaga, NY 14227
(716) 684-1510
Leonard F. Kowalski, P.E.
Director of Engineering

COST / COMPLETION

Cost: $5,750,000
Date: 2019

SCOPE OF SERVICES

Design Report, Design Services, including Civil, Electrical, Structural, and Mechanical Engineering, General Services During Construction, and Resident Engineering

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Erie County Water Authority (NC-34)
Sturgeon Point Raw Water Pump Station Improvement Project

The Erie County Water Authority has a project in progress to upgrade the Raw Water Pump Station at the Sturgeon Point Treatment Plant. Nussbaumer was retained to provide full engineering services including planning, design, construction administration, and construction inspection.

The project includes replacement of the existing travelling screens, sluice gates, Raw Water Pump discharge valves and piping, Raw Water Pump drives with 480 volt VFDs, and bridge crane. A building addition; and architectural, lighting, and ventilation improvements to the existing building are also included.

A detailed CFD model of the Raw Water Pump wet well was developed to determine the inlet flow conditions for the Raw Water Pumps and to identify means to make improvements. Nussbaumer recommended the construction of concrete baffle walls in front of each of the five vertical pumps to reduce some of the high flow velocities around the pump inlets.

In addition, a portion of the 42-inch Delivered Water Transmission Main at the site will be replaced to correct a previously repaired leak. Lastly, the project included a ROV inspection of the intake tunnel for condition assessment.

PROJECT DETAILS

CLIENT / CONTACT

Erie County Water Authority
3030 Union Road
Cheektowaga, NY 14227
(716) 684-1510
Leonard F. Kowalski, P.E.
Director of Engineering

COST / COMPLETION

Cost: $3,512,506.00
Date: 2018

SCOPE OF SERVICES

Design Report, Design Services, including Civil, Electrical, Structural, and Mechanical Engineering, General Services During Construction, and Resident Engineering

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City of Buffalo
Rehabilitation of Equipment in Low Lift Pump Station
Colonel Francis G. Ward Filtration Plant

Nussbaumer was retained by the City of Buffalo to evaluate the condition of the low lift/raw water (6) and wash water (2) pumps installed circa 1920, and to issue a report including recommendations for improvements to the equipment and facility.

Nussbaumer was subsequently retained to provide engineering services for the design and construction of the recommended equipment rehabilitation and various other improvements at the facility. The work included the complete replacement of the medium voltage electric switchgear, rehabilitating seven of the eight existing pumps and motors, replacing Low Lift No. 6 with a new/smaller variable speed drive pump and motor, installation of a SCADA system and integration with the existing monitoring and control system, and painting of the piping and equipment. Construction of the $3.98M project spanned a five year period and was done in multiple phases to allow the treatment plant to remain in operation while the work proceeded.

The electrical work also included 5kV incoming utility metering, relaying, and disconnects; 5kV automatic transfer switches, 5kV fused motor starters, 5kV fused distribution switches, 4160V - 480Y/277V step down transformers, 480V motor control centers and 5kV, 480V power factor correction capacitors, and short circuit, coordination and arc flash studies. Main-tie-main arrangements were installed on the 5kV switchgear and 480V motor control centers enabling the facility to be fed from either of two separate utility services or plant generators to maintain pumping operations.

These improvements have significantly improved the efficiency, reliability and operation of the pumping equipment and extended the useful life of this important water treatment facility for the customers of the BWB.

PROJECT DETAILS

CLIENT / CONTACT
City of Buffalo
DPW, Division of Water
City Hall – Room 602
Buffalo, NY 14202
(716) 851-9626
Peter J. Merlo, P.E.
Principal Engineer

COST / COMPLETION
Cost: $3,977,225.00
Date: 2016

SCOPE OF SERVICES
Design, Bidding, Construction Administration, Construction Inspection and Record Phases

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City of Buffalo
Manhattan Pump Station Improvements

Nussbaumer was retained by the City of Buffalo to evaluate the condition of the pumps, electrical equipment and building envelope for the Manhattan Pump Station, which was constructed circa 1965.

Nussbaumer was subsequently retained to provide engineering services for the design and construction of improvements to 3 existing 5 mgd canned, vertical turbine pumps, and related 100 Hp vertical electric induction motors. The water booster pumps and motors are being rebuilt to improve operation/performance, monitoring and control. Each rebuild includes conversion to mechanical split seals, new RTDs to monitor operating temperatures, vibration sensors, new pump control valves with electro-hydraulic actuators to replace existing discharge check valves, prime and finish painting. The project also includes complete replacement of electrical switchgear and MCC line-up, and instrumentation and control equipment upgrades to facilitate remote operation via the SCADA/ Telemetry system; safety and aesthetic upgrades, improvements to mechanical systems, and building envelope and roofing system improvements.

These improvements will significantly enhance the efficiency, reliability and operation of the booster pumping equipment and extend the useful life of this important water facility.

PROJECT DETAILS

CLIENT / CONTACT
City of Buffalo
DPW, Division of Water
City Hall – Room 602
Buffalo, NY 14202
(716) 851-9626
Peter J. Merlo, P.E.
Principal Engineer

COST / COMPLETION
Cost: $1,427,500.00
Date: 2019

SCOPE OF SERVICES
Planning/Study, Design, Bidding, Construction Administration, Inspection and Records

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City of Buffalo
Massachusetts Pump Station Improvements

The City of Buffalo retained Nussbaumer to provide engineering services is connection with the rehabilitation, modifications, and upgrades at the Massachusetts Avenue Pump Station (Mass Station). Phase 1 consisted of electrical system upgrades including the high voltage electrical substation, switchgear, vacuum circuit breakers, transformers, motor control centers, VFD's, panelboards, motors, feeders, and related electrical systems, and controls. Nussbaumer performed an Engineering Study which included the recommended electrical upgrades, associated cost, and implementation schedule.

Based on findings and recommendations of the Study, Nussbaumer is currently working with the City to provide Design and Bidding Services in connection with the following:

1. Rehabilitate the existing 23kV electrical substation in the existing location.
   a. Structural and architectural improvements to the substation building.
   b. New 23kV switchgear, vacuum circuit breakers, protective relaying, DC battery system, and medium voltage transformers with load tap changers.
   c. Modifications to the three National Grid 23kV primary feeders and metering.
2. New substation secondary feeders routed underneath the existing railroad to the pump station via existing pathways (i.e., tunnels and conduits).
3. Addition of permanent standby backup power via a single diesel generator and automatic 5kV transfer switch.
4. New 5kV electrical switchgear, protective relaying, and motor control centers.
5. New low voltage transformers, motor control centers, and panelboards designed for 208V/120V.
6. New electric distribution feeders, both medium and low voltage.
7. Rehabilitate Pump #1.
8. Rehabilitate Motor #1 and convert to brushless DC excitation.
9. Replace Motors #2 and #4 with larger 1750hp induction units.
10. Provide variable frequency drives (VFDs) for Motors #2 and #4.
11. Construct an addition to the Pump Station above the former Chlorine Room for the VFDs, including a HVAC system.
12. Remove the existing hydraulic actuator system for the discharge header valves and tunnel valves and replace hydraulic actuators with electric motor actuators.
13. SCADA control integration to facilitate both local and remote operation of the equipment.
14. Ground fault circuit interrupters and branch circuits to equipment (i.e., dewatering pumps) will be upgraded.

PROJECT DETAILS

CLIENT / CONTACT
City of Buffalo
DPW, Division of Water
City Hall – Room 602
Buffalo, NY 14202
(716) 851-9626
Peter J. Merlo, P.E.
Principal Engineer

FEE / COMPLETION
Cost: $16,800,000
Date: On-going

SCOPE OF SERVICES
Planning/Study, Design and Bidding

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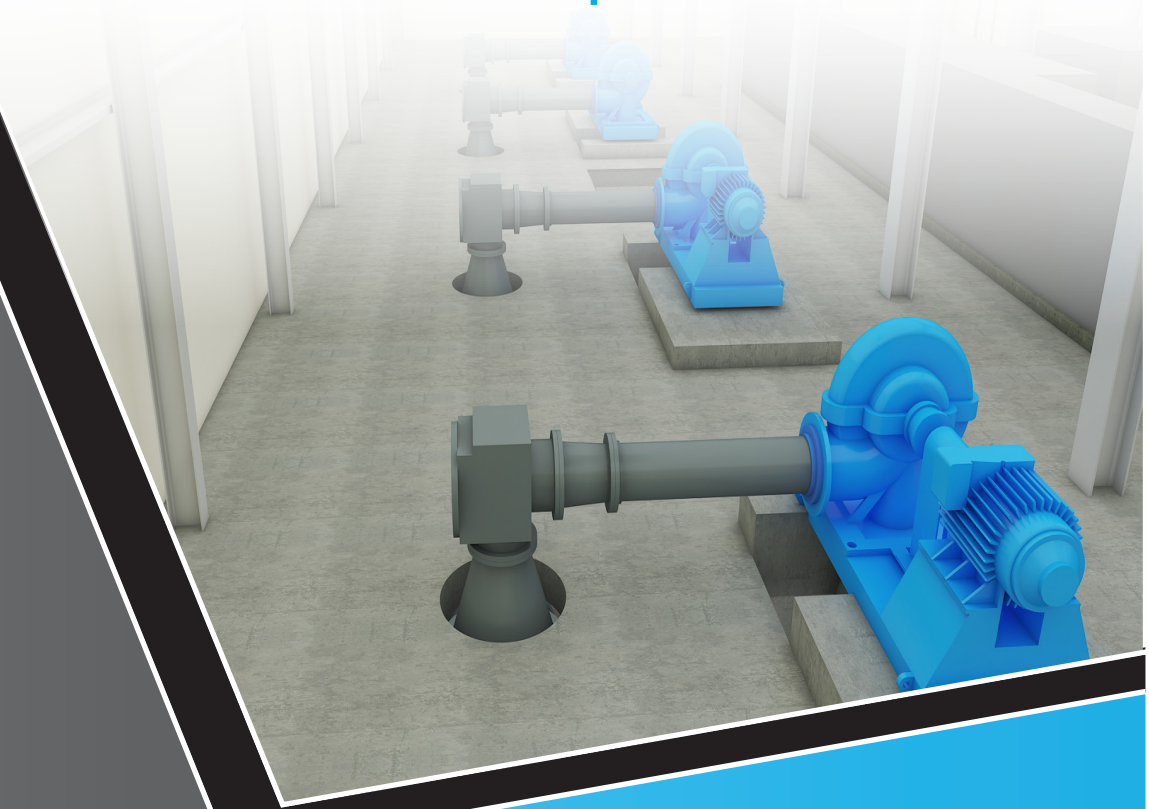
ARCADIS

SECTION 2

Project Understanding, Technical Approach and Detailed Scope of Services



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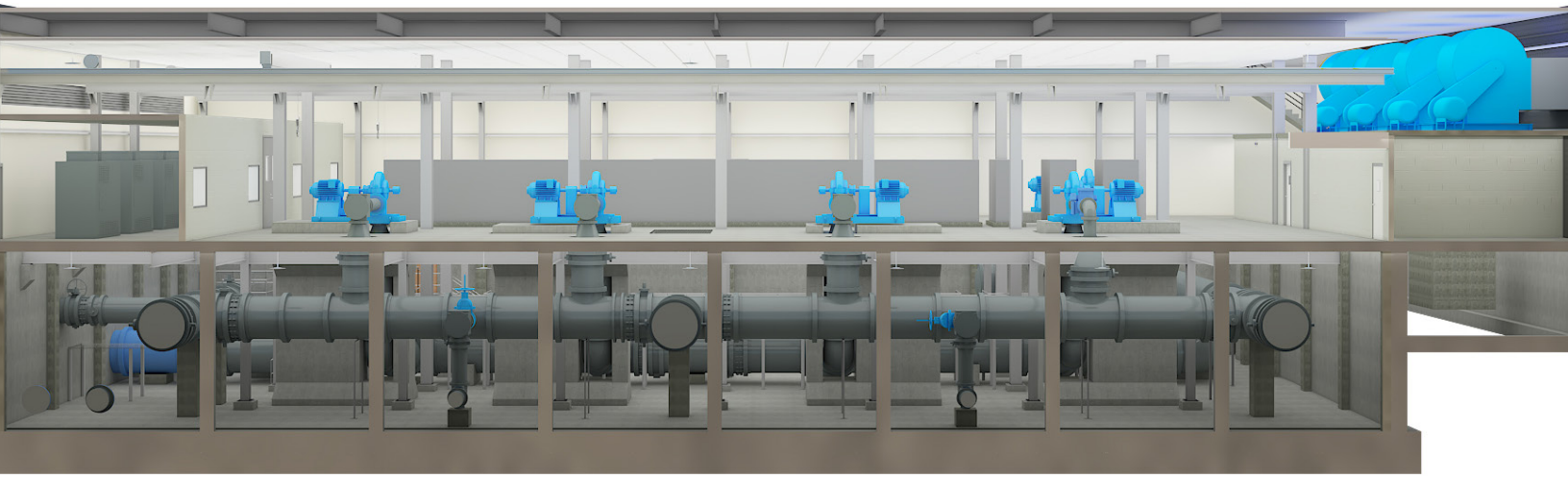
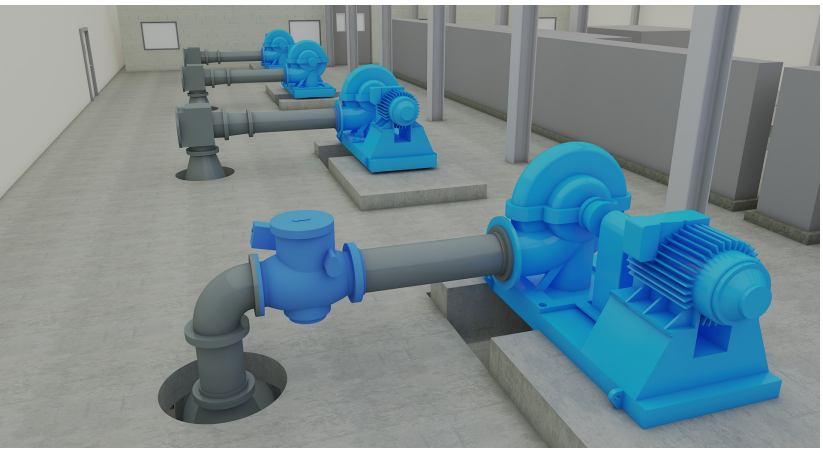
Erie County Water Authority

Project Understanding, Technical Approach and Scope of Services





To ensure ECWA achieves successful results on the Ball Pump Station Phase I Rehabilitation Project, Arcadis has assembled a project team that knows your facility, and has worked with your staff at this facility. We have a thorough understanding of your project objectives. With this clear understanding and commitment to providing ECWA an industry-leading improvements project, we developed an approach specifically tailored for this project and backed by a team that is committed to delivering results that will meet or exceed ECWA's expectations. Arcadis shares your vision and understanding for these improvements and offers the following benefits to ECWA.

THE ARCADIS TEAM BRINGS **VALUE** TO ECWA

CONTINUITY DRIVES YOUR VISION FORWARD

BENEFITS TO YOU

Excellent working relationship between ECWA and Arcadis.

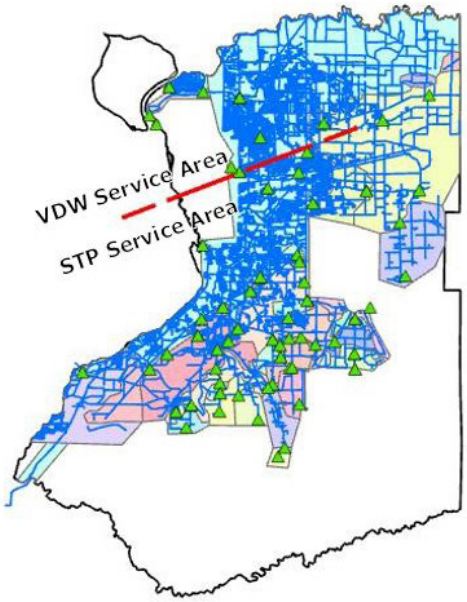
Quick ramp up time as the same project team that prepared the recent Ball Pump Station CIP will be leading this project.

Decisions made with your best interest in mind.

You can continue to count on us as your trusted advisor to maintain your legacy of dependable water service.

Our proven project management team, including Dan Seider and Mike Chirico, are intimately familiar with the critical role of Ball Pump Station in providing water to the northern portion of ECWA's service area and the interconnectivity of this pump station with the other main pressure zone facilities, including ECWA's treatment plants and Windom, Pine Hill, and Guenther Pump Stations. Essentially acting as the high service pump station for VDWTP, the loss of operation of Ball Pump Station can result in numerous issues and concerns up to and including boil water advisories.

Arcadis understands the critical nature of the Ball Pump Station. Rehabilitation will require careful planning during design and construction so that the new infrastructure and tie-ins occur without disruption in water supply and water quality for ECWA's customers.



ENDURING RELIABILITY AND PERFORMANCE

BENEFITS TO YOU

Design to meet the long-term goals of ECWA and the ratepayers.

Minimal service interruptions to maintain water delivery to the system and the customers.

Equipment approved by Engineering and Operations staff that will provide reduced maintenance for years to come.

A cost-effective design that will perform above expectations.

Our national experts in pump station design, along with our local team, will provide a reliable and high-performing design for the Ball Pump Station in a cost-effective manner.

Our proposed team includes process mechanical engineers that work nationally on large-capacity pump stations, including Dan Seider and Brian Duane. Our pump station engineers have successfully provided consulting services for the reference projects highlighted below (further detailed in Section 1). These individuals work side-by-side with our strong team of experienced subject-matter experts in hydraulic modeling, electrical, instrumentation and controls (I&C), structural, HVAC/plumbing and architectural design, and will deliver a successful project.

Lardner's Point Pump Station Upgrade
Philadelphia Water Department, PA

Pine Hill Pump Station Improvements
ECWA, *Cheektowaga, NY*

Lake Huron WTP Pumping Improvements
Great Lakes Water Authority, Detroit, MI

Our proposed team also offers ECWA expertise in electrical and control engineering with large pump motors and starters, including VFDs, eddy current clutch drives and soft starters, medium- and low-voltage switchgear, switchgear controls, and standby power systems. With nearly 100 years of combined experience between Mike Chirico, Greg Moore, Ryan Kowalski, and Alex Misiaszek, they have a proven track record with projects similar to the Ball Pump Station. Our previous experience working on similar projects will be carried forward and applied to the Ball Pump Station Rehabilitation. With this extensive electrical and control expertise, ECWA will get a reliable and efficiently performing pump station design.

STEADFAST DELIVERY

BENEFITS TO YOU

Project efficiencies for faster implementation / availability and use of facilities.

An award-winning project delivered by an experienced management and technical team.

Our team brings in-depth knowledge of your water system, offering you high-level execution from day one to expedite your project schedule.

ECWA's water distribution system is complex and aging. We understand the existing operational strategy, the hydraulic relationships of your interconnected facilities, and the level of improvements needed to bring the facility up to meet those needs and standards. Arcadis offers a team with the needed experience and availability to assist from start to finish — our knowledge ensures that project objectives are not overlooked and are given emphasis throughout the entire project so the project is completed on schedule and on budget.

Our team has provided ECWA with guidance on the Ball Pump Station since its original construction and commissioning in 1980. This guidance has continued for the last 40 years through several other projects, including new pump rotating assemblies, motors, and VFDs; permanent standby power; switchgear relay upgrades; new substation; Capital Improvement Program. This incumbent knowledge of this facility provides peace-of-mind and assurance to ECWA that the Arcadis team can deliver this project on budget and on schedule while reducing any up front learning curve on the pump station system.

INNOVATIVE SOLUTIONS

BENEFITS TO YOU

360-degree view of improvements.

Visualize preliminary design and sequence of work.

Minimize infrastructure conflicts.

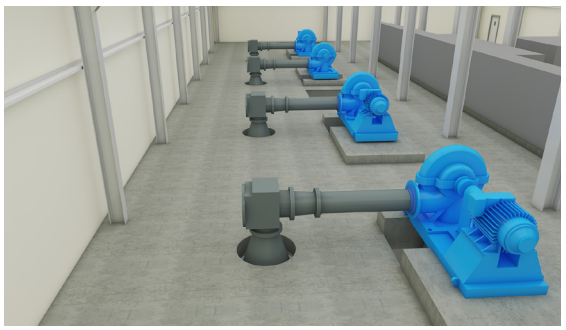
Operations and maintenance virtual walkthrough.

Team meetings without a physical presence on-site.

3D modeling to avoid interferences and improve design efficiency.

Virtual tools leveraged to facilitate complex design, project sequencing and improve overall performance in design, construction and operation.

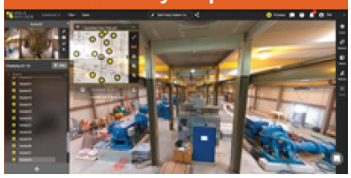
Arcadis is well aware of the many constraints at the project site that can impact design and construction activities. 3D modeling provides a virtual site view of the proposed improvements allowing for better visualizations and project understanding. 3D models are also used for virtual walkthroughs for operations or health and safety reviews, to identify any potential infrastructure conflicts, and to understand project sequencing and staging. Virtual tools will allow our team to focus on constructability issues at project onset like shutdowns, bypasses and proper disinfection of systems prior to being brought back online to facilitate project success.



Our 3D rendering capabilities allow us to virtualize the existing conditions as well imagine future constructs.

Arcadis employed a technology known as Holobuilder as part of the recent CIP Project. HoloBuilder allows 360-degree photos to be spatially linked onto the facility's site plan. Arcadis can use HoloBuilder to augment the 360-degree tour of each facility with additional information (photos, documents) generated in the project. This can be used on the project to help with remote quality control and validation efforts in the office, as well as turned over to ECWA at project conclusion providing your staff with 360-degree views of your facilities for future maintenance, engineering, operations, and training purposes. HoloBuilder can also be linked with Revit or other 3D design platforms to show future improvements along with existing conditions.

HoloBuilder for 360-degree Reality Capture



Our experience with and ability to use these (and other) virtual tools on this project will help ECWA and the project team collaborate and evaluate design and construction activities to implement the most effective project.

2.A PROJECT UNDERSTANDING

The Richard F. Ball Pumping Station and Ground Storage Tanks are located along Sweet Home Road adjacent to the SUNY at Buffalo North Campus in the Town of Amherst, New York. The facility was constructed in the 1970's and put into service upon the completion of the VDWTP and the 48" transmission mains that supply water from VDWTP to the Ball Storage Tanks. The pump station sizing was based on significant growth in the north towns. However, the population did not expand as expected and the larger constant speed capacity pumps are only used during periods of high demand and may even sit idle for several years. Pumps 1, 2 and 3 are constant speed pumps and do not provide ECWA with the operational flexibility that they receive from pumps 4 and 5, which have VFDs. Pumps 4 and 5 are used to maintain stable pressures within the north towns by adjusting pump speed based on the diurnal daily water demand. The capacity of Pump 3 is so large that it has only been operated for only a few hours over the last 20 years.

The facility has undergone several capital improvements since the 1970's, including:

- New 1,000-hp pump rotating assemblies, motors and VFDs for #4 and #5 (NC-26A).
- Installation of Permanent Standby Power (NC-32A).
- South Tank Replacement (W-22A).
- Electrical Improvements – Switchgear Relay Upgrades (MP-77A).
- New Substation (NC-35).
- North Tank Replacement (W-31) – Currently in construction.

Ball Pump Station currently has a firm capacity of 71 mgd with the largest pump out of service. However, ECWA desires to have capability to pump 82.5 mgd with the addition of a future sixth pump. Furthermore, it is desired that all pumping systems be similar, thereby improving operations and future maintenance activities. To accomplish this objective, ECWA desires to procure engineering services for the design and construction improvements at the Ball Pump Station as described in the Request for Proposals (RFP), ECWA Project No. 202000046.

To accomplish this objective, piping and ancillary system improvements are needed. These are categorized into three components defined as Pump System Improvements, Yard Piping Improvements, and HVAC System/Miscellaneous Improvements. These components are detailed in the RFP and the Arcadis Capital Improvement Plan but are also summarized below for completeness of our project understanding.

Pump Improvements

We understand that ECWA normally operates using the two 1,000-hp pumps with VFDs 4 and 5. Since both pumps are used on a regular basis there is little redundancy and marginal operational room for growth. Size and lack of adjustability in the existing constant speed pumps 1, 2 and 3 mean they rarely get used. ECWA desires to have additional pumping flexibility via a number of similar "right sized" pumps with VFDs for adjustable control while also planning for potential future system improvements and system demands. Therefore, we acknowledge the improvement items requested in the RFP and recapped herein along with our unique perspective and additional ideas that can be further discussed during Task 1 – Basis of Design. A summary of the existing pumps and their estimated capacities are listed in Table 2.1.

Table 2.1. Summary of Existing Pumps

Pump Number	Pump Type and Size	Rated Capacity (mgd)	Rated Total Dynamic Head (ft)	Rated Motor Horsepower (hp)	Rated Motor Speed (RPM)
Pump 1	P16/14 D	12.5	255	700	1,185
Pump 2	T20/18 AD	23.0	255	1,250	890
Pump 3	T20/18 AD	28.8	255	1,500	890
Pump 4	P18/16 D	17.7	255	1,000	1,185
Pump 5	P18/16 D	17.7	255	1,000	1,185

ECWA desires replacement of the existing pumps with identical, “right sized” units of approximately 1,000 hp to 1,250 hp, each with their own VFD. Pumps will be horizontal split case design with a bottom suction, similar to the existing design. The pumps must be capable of meeting potential future flow requirements being developed as part of the VDWTP Capacity Expansion Project. It is expected that future demands within Erie and Genesee Counties could require the expansion of VDWTP from 49.5 mgd to 82.5 mgd which will require Ball Pump Station to meet this same capacity.

To accompany the pumps, new pump suction and discharge piping will be installed between the existing butterfly isolation valves and new cushioned check valves on each pumps’ discharge pipe.

The existing surge relief system is original to the pump station, has not undergone any major capital improvements over the past 40 years, and is reaching the end of its useful life. It also may not provide the best protection against pressure transients. ECWA desires that the surge relief system be evaluated to determine the best approach for improvements to minimize water hammer on the pumping system discharge piping and transmission mains.

Electrical Improvements

New VFDs will be provided in a conditioned room to provide a range of flexibility and control over the pumps and their corresponding discharge. The VFDs will be powered via the existing 4160V Westinghouse/Eaton Ampguard Motor Starters (aka switchgear). Pumps 4 and 5 already have retrofit Eaton fused disconnects; however, new retrofits will be needed for Pumps 1, 2 and 3, and future Pump 6. Our team has worked with ECWA to perform these retrofits in the past and are confident in our abilities to accomplish this for the new VFD feeders.

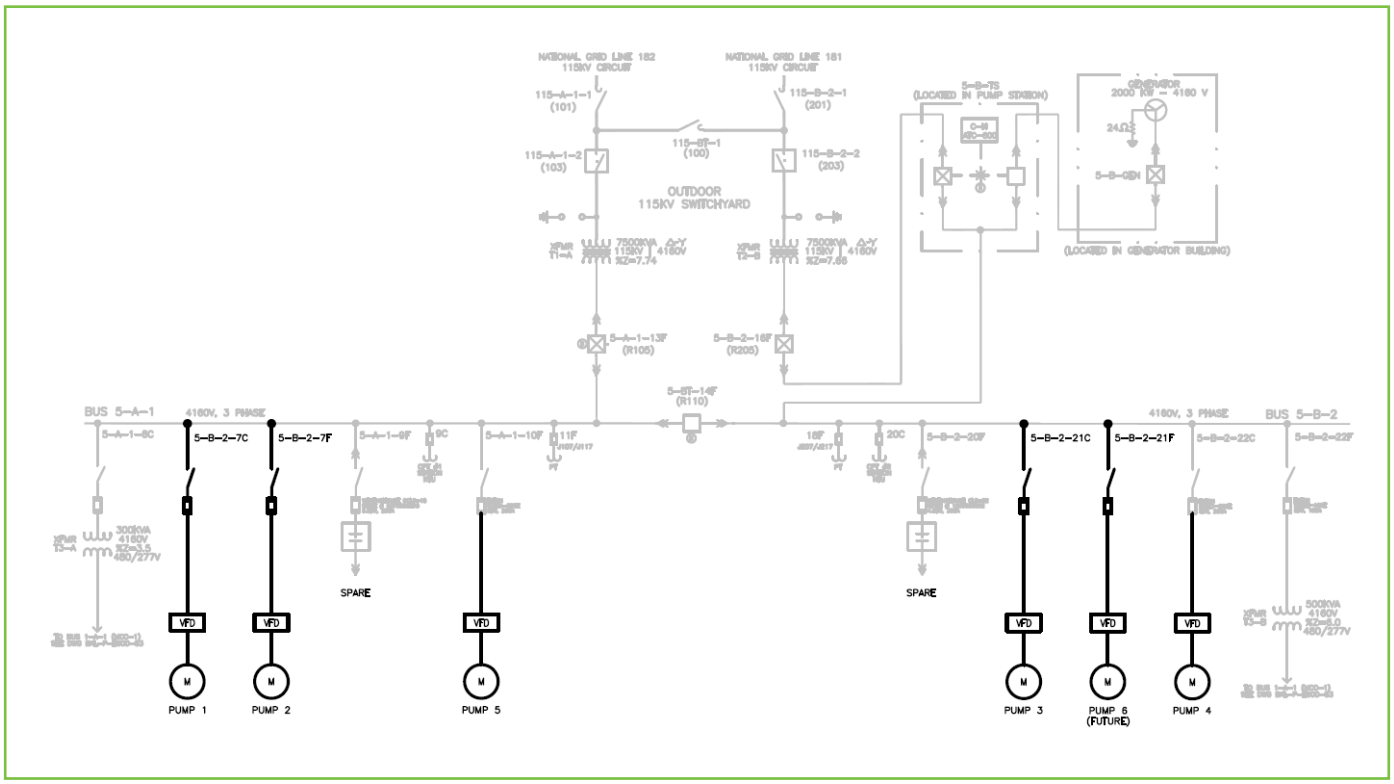


Figure 2.1. 5kV one line modifications (concept only).

Understanding Recap: *Pump and Electrical System Improvements*

- “Right sized” pumps, approximately 1,000 hp to 1,250 hp.
- Provisions for future No. 6 pump providing a minimum firm capacity as identified by the VDWTP Capacity Expansion Project which is expected to be 82.5 mgd.
- New pump suction and discharge piping between each pump’s isolation valves.
- New cushioned check valves.
- New dedicated pump VFDs inside an air-conditioned room.
- Surge relief system improvements.
- All related electrical infrastructure.
- SCADA integration.

Yard Piping Improvements

Arcadis knows that the resiliency of the new pumping system can only be as good as the transmission of water to and from the pump station; therefore, we recognize ECWA's desire to make improvements to the outdoor piping network to ensure a robust overall system of high performance. Improvement items requested in the RFP and listed below, along with our unique perspective and additional ideas, will be further detailed under Task 1 – Basis of Design.

We understand that ECWA has experienced significant settling at the Ball Pump Station which is likely attributed to the piping not being built on competent rock. For this reason, Arcadis understands that ECWA is requiring all new construction be built on competent rock (approximate elevation of 580 feet).

The North and South 4.2-MG Water Storage Tanks (tanks) are located Northwest and Southwest of the pump station. There are various pipes that run underground between the tanks and interconnect to the supply system and the pump station, namely a 48" overflow, 48" inlet, and 54" outlet. Portions of these piping systems have been replaced as part of the tank replacement projects but a significant portion remains, mostly beneath the former substation area. However, we understand that even some of the new piping at the South Tank may be settling as well.

Furthermore, we acknowledge the existing single point of failure where the two existing 48" transmission mains tee and form a single 60" pump station inlet. To improve resiliency, individual 48" inlet connections will be made between the pump station/tanks and the transmission network. One connection being to the tank inlet piping in the yard and second being to the pump suction piping in the basement of the pump station (which also will interconnect to the tank inlets via a separate connection point). Under the current operating mode, water flows into the basement of the pump station before it is redirected back outside and to the tank inlets. The new scheme will maintain a similar operating approach for redundancy and resiliency but also have a direct connection at the outdoor yard piping (as shown on Arcadis Figure 1 from the RFP).

With the new dual 48" inlet connections, new check valve chambers are also desired to ensure there is no inadvertent backflow to the VDWTP. These will be located to the West of the pump station in their own underground chambers.

The existing altitude valves have been blocked open by ECWA for decades. These valves do not serve a purpose in ECWA's operations and could be removed as part of the new yard piping improvements. The North and South Tanks float on the discharge pressure from VDWTP with ECWA operations staff adjusting pump speeds to maintain the tanks within their normal operating ranges.

The new piping to the West of the Ball Pump Station will also cross beneath the existing 5kV substation electrical duct banks. To the south of the pump station, the new piping will be near the existing electrical ductbank from the generator building. While these duct banks are significantly reinforced and supported on micro pile piers, care must be made during construction to not compromise the duct bank integrity as the new piping is installed. The new piping will also cross the existing natural gas supply line; however, this is less critical as it supplies energy for the boilers and gas unit heaters, therefore can be replaced as needed and work can be scheduled during the fall before the heating season.

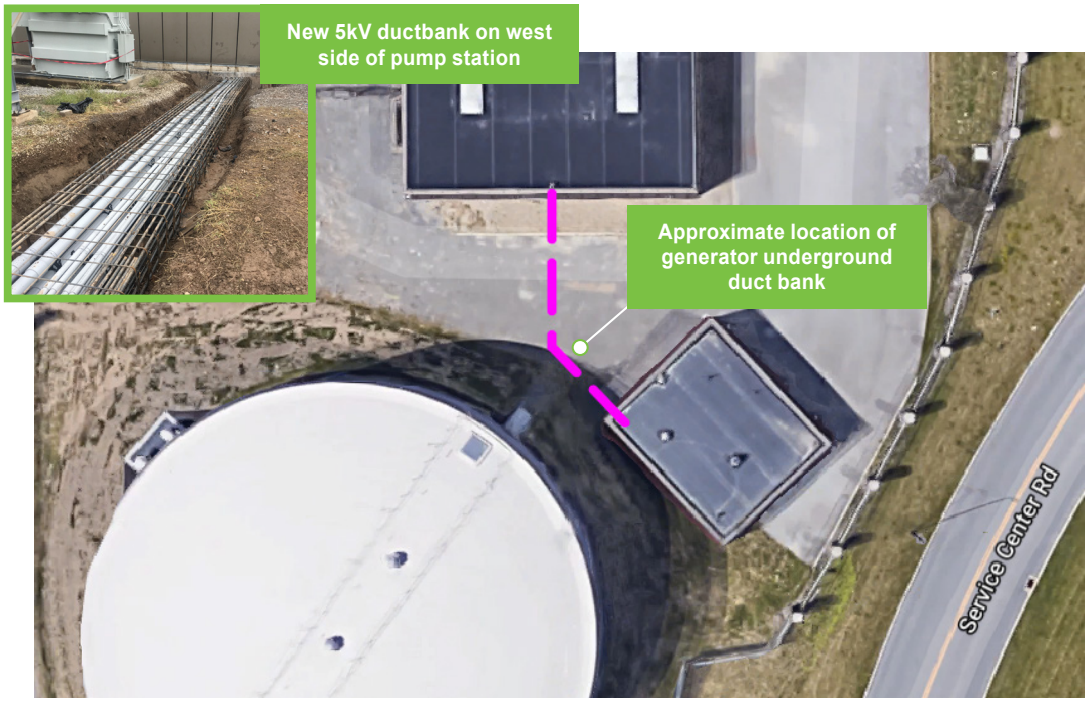


Figure 2.2. Existing generator underground duct bank.

Pump station discharge piping will also be improved with a new 42” discharge line from the pump station to Venturi Chamber No. 2 and new discharge piping on the outlet side of the three venturi chambers. Additionally, all three venturi meter chambers will be replaced, including the venturi meters, piping/fittings, electrical conduit/wire, lighting, electrical outlets, pipe supports, and sump pumps. Care must be used during this work to ensure adequate supply to the system during this work; therefore, a thorough review of sequence and system operation modes will be reviewed with the ECWA during the Basis of Design.

HVAC System/Miscellaneous Improvements:

Finally, we understand that the facility operations and maintenance are also dependent on ancillary systems and are very important even if they do not directly contribute to the distribution of drinking water. For this reason, ECWA desires to make the following improvements.

- Update outdated HVAC components such as unit heaters, exhaust fans and ancillary components. This work must be coordinated with the new VFD room improvements as potential relocation of intake louvers on the south wall will need to be considered. Each existing exhaust fan is rated for 44,000 CFM so relocation of the louvers is key to ensuring proper ventilation if the proposed VFD room obstructs them.
- Install a new 2” water supply line within the pump station with a new connection to the discharge header to feed larger hose bibs and refeed the bathroom, hot water tank, and boiler system (if applicable).
- New 6” sanitary sewer lateral with two connections to the existing pump station.
  - Connection No.1 on East side of building for basement sump pumps, roof drains, old substation electric manhole, etc.
  - Connection No.2 on North side of building at house trap for the bathroom, and floor drains in the boiler room, bathroom, server room (former chlorinator room), and storage room (former chlorine storage room).
  - This will also involve coordination with SUNY as the discharge from the sanitary line appears to connect to an existing SUNY manhole located at the southeast corner of the property.
  - It is understood that the primary objective here is to prevent the backups in the bathroom that have been occurring. A review of the history, existing conditions, and site investigation will be conducted to ensure this work alleviates the current problems.
- New instrumentation conduit from the pump station to the three venturi pits for the sensing lines.
- New access man-door on East side of the pump station, near Pump 1.
- New electrical, RTU/PLC, and SCADA interconnections for the new pumps, VFDs, and HVAC systems. It is understood that the existing GE iFIX and RTU/PLC systems have sufficient I/O and system capacity for the improvements.
- Additionally, the existing MCC-3 (BUS 1-A-3) located in the boiler room, will be replaced.

Understanding Recap:
Yard Piping, HVAC, and Miscellaneous Improvements

- New 48” and 54” tank inlet and outlet piping.
- New 48” overflow piping.
- New 48” and 54” pump station supply with new 48” interconnection to the tank inlet piping to improve redundancy.
- Two new 48” check valves.
- Remove four existing altitude valves (AV-1 through AV-4).
- New 30”, 42” and 48” discharge piping.
- New venturi chambers and associated equipment.
- New sanitary sewer lateral.
- New HVAC equipment.
- New 480V MCC in the boiler room.
- New 2” water supply line.

2.B TECHNICAL APPROACH

Based on the project understanding above, our team proposes the following project approach.

As we have on previous major capital improvements, Arcadis and ECWA staff will work to define the required improvements and then develop detailed design documents and provide expert construction oversight that will result in:

- A rehabilitated facility that is more reliable, resilient, energy efficient, offers operational flexibility, and is easier and safer to maintain.
- A project that is completed on budget and on schedule so that the benefits can be realized for ECWA's staff and rate payers as quickly as possible.

The Arcadis team will approach this project with the understanding that the Ball Pump Station is a critical asset and that design-based decisions will be made in the interest of maintaining operations during construction and life-cycle operation/maintenance. For this reason, our team will focus the design into four key criteria.

1. Does this accomplish ECWA's desired objective?
2. Can this be built while maintaining operations?
3. Will this provide operational and maintenance value to ECWA?
4. Is this a long-term lasting solution for the life of the asset?

2.B.1. Task 1 – Basis of Design Development/Engineering Report

The Basis of Design Development/Engineering Report for the Ball Pump Station Rehabilitation will be very important and incorporate the following four key tasks:

1. Condition Assessment of Existing Equipment.
2. Desktop Hydraulic Analysis.
3. Preliminary Design.
4. Construction Sequencing.

Condition Assessment of Existing Equipment

We will assemble key members of our design team, including process mechanical, pumping, electrical, instrumentation and controls, and structural for an initial site assessment and kick-off meeting. We have successfully used this approach previously with ECWA for the VDWTP and Sturgeon Point Treatment Plants and the Pine Hill Pump Station project. We feel that this first step is critical in getting the entire project team (The Arcadis team and ECWA) 'on the same page' relative to current concerns, issues and possible alternatives which are to be evaluated. Thanks to the efforts already performed by Arcadis for the Condition Assessment and Evaluation as part of the CIP, this effort should be streamlined and focused on confirmation of existing information and bringing our teaming partner N&C up to speed with the recommendations from the CIP.

This will be a one-day site visit/workshop with the morning being spent at the Ball Pump Station reviewing the limits of the proposed work, documenting issues and concerns of ECWA Operations and Engineering staff which are relayed to our project team while on-site, and also capturing measurements and photographs to support the development of electronic as-built drawings/ base files for the design development.

Arcadis and ECWA have used this one-day kick-off approach successfully on past major capital projects to quickly get the entire project team thinking and talking about concerns, opportunities and positive experiences from other projects.

During the afternoon, we will convene at the ECWA Service Center to meet with ECWA staff and relay what 'we saw and heard' during the morning, as well as discuss possible alternatives which should be evaluated and next steps which need to be taken further to develop the Engineering Report.

Hydraulic Analysis

Arcadis is uniquely qualified to lead the hydraulic analysis and alternatives evaluation as we have previously worked with ECWA on the Ball Pump Station CIP hydraulic analysis that provided recommendations for new pump sizes. Our team's thorough understanding of current operations of the ECWA distribution system is critical to the project being a success as there are several areas within ECWA's distribution system that can benefit from improvements to the Ball Pump Station.

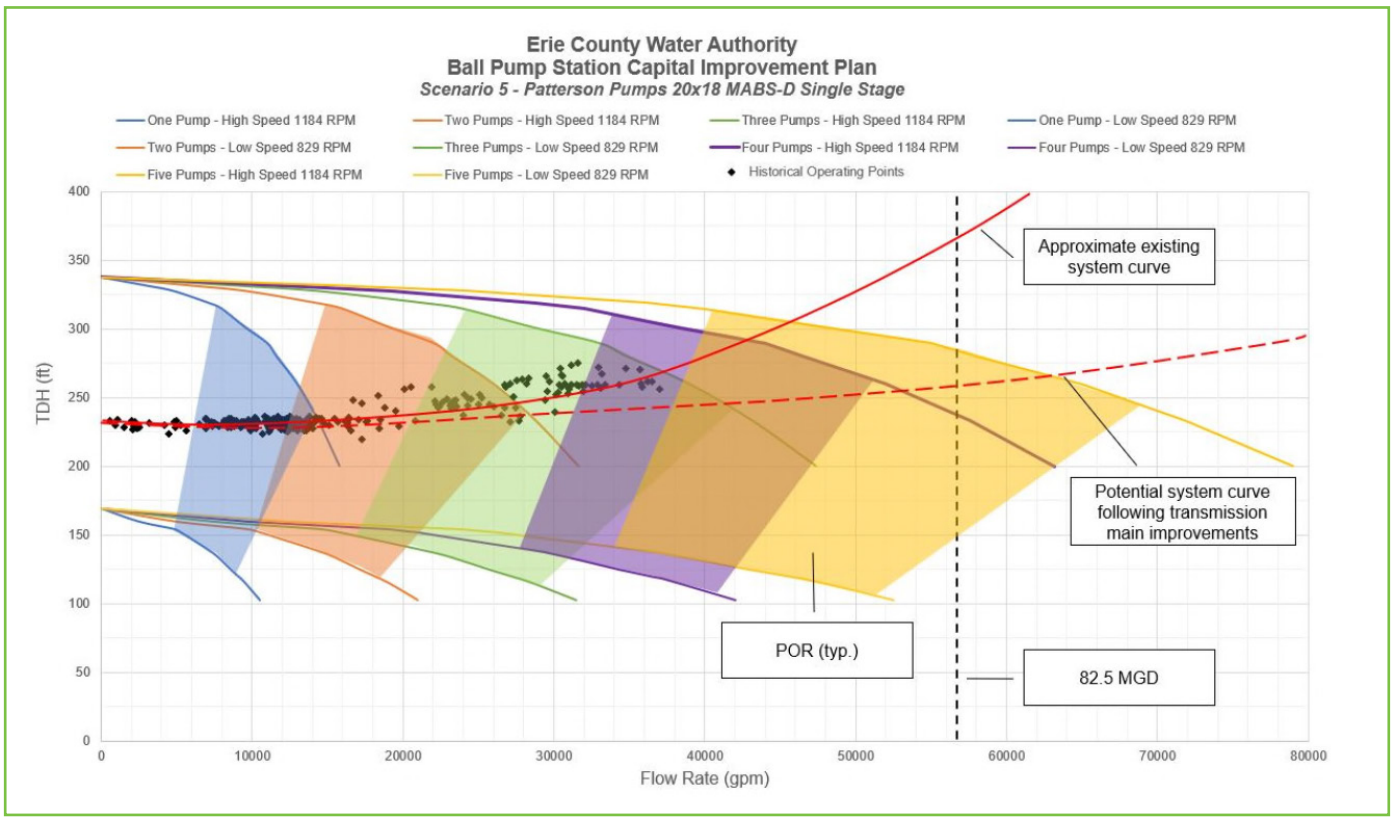


Figure 2.3. Future Growth - Patterson Pumps 20x18 MABS-D Single Stage.

As recommended by the Arcadis CIP, "a more detailed hydraulic analysis should be performed during design to refine the final pump selection." As shown in Figure 2.3, to reach a current firm capacity of 71 mgd (50,000 gpm) and a final firm capacity of 82.5 mgd, transmission main improvements will be required to maintain system pressures within their current ranges. Arcadis will perform a desktop analysis based on information and data provided by ECWA for present and future demand conditions. We will use the demand projections being developed under the VDWTP Capacity Expansion Project to understand the water demands for the City of Tonawanda and whether the final firm capacity of Ball Pump Station could be reduced accordingly.

We have assumed that ECWA will also provide information as to the potential transmission main improvements necessary to improve the hydraulics downstream of the pump station. Arcadis is proposing to use ECWA's hydraulic model to analyze the transmission main and pump station improvements to develop an existing and future system curve. This will assure ECWA that the final selected pumping systems can operate within their preferred operating range under current conditions and future conditions that include an expanded VDWTP capacity.

Surge Analysis

Pressure transients are the result of sudden changes in the velocity in a pipeline. Following a power failure or during a normal pump shutdown, a low pressure wave will travel out from a pump station through the transmission main. Once it reaches a termination point, such as a storage tank or a pressure zone boundary, the wave is reflected off the end point and travels back to the pumps. However, at the point of reflection, the wave changes algebraic sign and the low pressure wave now becomes a high-pressure wave. The pressure wave is then reflected at the pump station and this cycle is repeated until the waves are dampened out, or dissipated, by the pipe friction and the effect of any surge control devices.

There are two considerations for Ball Pump Station:

1. Transmission System from VDWTP to Ball Pump Station.
2. Ball Pump Station discharge transmission and distribution system.

VDWTP to Ball Pump Station

Surge Relief Valves No. 1 and No. 2 (SR-1 and SR-2) are connected to the transmission system between

VDWTP and Ball Pump Station. We believe these valves were necessary to provide surge relief if Altitude Valves No. 1 through No. 4 closed (AV-1 to AV-4). Since these altitude valves have been blocked open for decades and the proposed improvements eliminate these valves, we believe that SR-1 and SR-2 can also be eliminated. It is still important to consider a transient analysis for the VDWTP to Ball Pump Station transmission mains, especially in consideration of the potential increase in the capacity of VDWTP. This increase will create higher velocities and pressures within the transmission mains to Ball Pump Station which may exacerbate any transients that already occur. The most likely location for surge relief would be at VDWTP where pressures are higher and the impact of surge would be more pronounced. At Ball Pump Station, the storage tanks act as surge relief making SR-1 and SR-2 redundant and they could most likely be removed. Arcadis has not included a fee in our proposal for a surge relief system on the VDWTP to Ball Pump Station transmission mains but offer to provide it as a Special Service if desired by ECWA.

Ball Pump Station Discharge

Surge Relief Valves No. 3, No. 4 and No. 5 (SR-3, SR-4, and SR-5) are connected to Ball Pump Station discharge and were designed to protect the transmission/distribution system downstream of the pump station. Since Wehrle and Pleasantview Tanks are the only storage tanks within Ball Pump Station's service area that float on the system, there are limited open water surfaces that can aid in surge protection. In addition, the potential increased treatment capacity from VDWTP will result in increased flow from Ball Pump Station, creating higher velocities in the transmission system which will exacerbate any transients that already occur.

As such, Arcadis recommends and has included costs in our proposal to perform a detailed transient analysis and to design any necessary improvements. This requires a calibrated hydraulic model to understand existing conditions and evaluate different scenarios that generate transients, such as normal pump shutdowns, emergency pump shutdowns, opening/closing a valve too rapidly, sudden release of entrapped air from a pipeline, and power outages. The surge modeling will verify whether the existing surge relief system provides adequate protection, or if required, recommend surge mitigation devices to control transients. We will also investigate pump control valve styles to determine whether swing checks are appropriate or if a different valve type with slower opening/closing times can assist in controlling transients. Pending the results of the analysis, we will prepare design documents for the replacement of the current surge relief system.

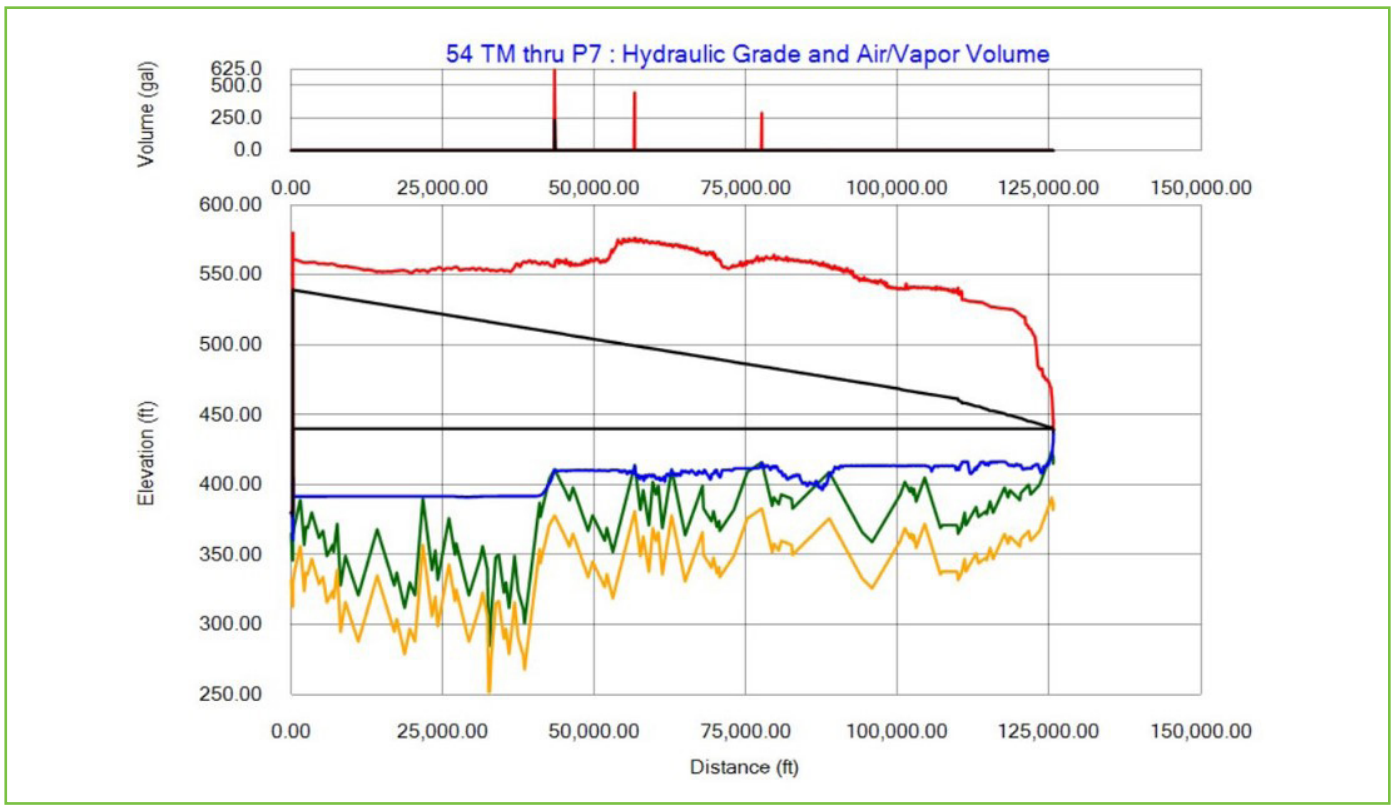


Figure 2.4.Surge elevation profile from transient analysis for upgrades to OCWA Clear Water Pump Station.

Figure 2.5. VFD rendering.

Pump Improvements

As part of the BODR and preliminary design for the new pumps, optional features will be evaluated and discussed with ECWA. An example of such features include:

- Mechanical seals.
- Bearing RTDs.
- Vibration sensors.
- Seal water flow switches.
- Automatic lubrication.
- Special materials for impeller and/or wear ring.
- Check valve limit switches.

New ductile iron pipe (DIP) class determination will be made to ensure pressure ratings and strength for current and future use.

The VFDs will be designed for 3-wire in / 3-wire out design that have their own internal control power transformers, meaning that no additional external power will be required at the VFD for control, blowers, etc. (e.g. they will be similar to the existing VFDs). This greatly increases simplicity of LOTO procedures and reduces the electric shock and arc flash hazard risks via eliminating the additional energy source (i.e., prevention through design). Each VFD will be equipped with integral motor protection features such as overload, temperature, locked rotor, loss of load, etc. and have redundant internal components (e.g. blowers and power modules) to ensure resilient operations even during minor faults. The VFDs can also be equipped with SEL motor protection relays that can integrate into the existing RTAC, RTU/PLC, and SCADA system, if desired by ECWA. Communication to/from the VFDs (and/or SEL relays) is anticipated to be ethernet based, possible Modbus TCP or DNP3; however, the exact protocols will be determined with ECWA to ensure compatibility and operational support.

The conditioned room for the five new VFDs, with provisional space for a future sixth will consist of both interior and exterior access doors for operations and maintenance as well as redundant air-handling units (AHU) to ensure proper circulation and cooling of clean filtered air to the VFDs. Multiple AHUs will be planned to allow for redundancy and growth while ensuring efficient operation and energy use. Maintaining proper cooling of the room is essential to ensuring longevity of the VFDs. Information about the room temperature and equipment can also be interconnected to SCADA, as well as remote control functionality, if so desired.

Location of the AHUs will be determined during the Basis of Design; however, they could be roof-mounted with access via the existing mezzanine stairs or located within the pump station directly above the VFD room. Additional convenience power and maintenance accesses is anticipated regardless of final location(s). The AHUs will also require a 480V power source.

We could provide the 480V power from the existing MCC-1 (BUS 1-A-1) or we could install a new 480V, 800A MCC in the VFD room. This optional MCC could be connected to the secondary of the 500kVA transformer T3-B and interconnected to MCC-1 allowing for a kirk-keyed secondary selective system (aka main-tie-main). This could allow for reorganization of feeders to keep essential 480V loads (i.e. VFD room A/C) on the generator 'B' side whereas non-critical load could be shed during an emergency. This could also provide maintenance flexibility for the future by possibly, including a 480-208/120V transformer for redundant low voltage power too.

Yard Piping

The yard piping and associated improvements may require the use of micro piles, support piers, deep foundations, or additional bedding (e.g. 3-4' of pipe bedding). Our team includes McMahon and Mann Consulting and Geology, PC to provide expert structural analysis and evaluation of the existing site conditions and proposed improvements to ensure the new construction will not suffer a similar circumstance from settling. Furthermore, we recognize that ECWA would like to have a corrosion protection study/design included in the project. For this work our team includes Corrosion Probe, Inc. to provide analysis, assessment, design, and oversight through construction on this matter. This work includes a desktop review of record and proposed drawings, soil analysis, stray current assessment, and cathodic protection design (if warranted). For the soil analysis, assistance from ECWA may be required to collect the necessary sample(s).

The new check valve chambers will be equipped with access hatches and have a gravity drain to the 48" tank overflow line. The associated new butterfly valves will be located outside of the chambers with curb boxes for operations.

Further investigation will be necessary to determine what, if any, work is needed for the existing newer piping at the South Tank (above and beyond the limits shown in the RFP Attachment 2). With the significant potential impact on operations, sequencing of this work will be critical to maintaining reasonable system operations, please see our construction sequence section for ideas.

The proposed yard piping will cross beneath the existing 5kV and generator electric feeders and may compromise the existing duct banks. Further analysis will need to be performed during the Basis of Design for the generator duct bank as it may need to be supported, relocated or replaced as part of this work. During these activities, a mobile 2MW generator can be provided for backup power in the event of an emergency.

Additionally, there is an existing 8" drain line from the new substation manhole and transformer oil containment area that dead ends in the vicinity of the existing 48" overflow line. It is our recommendation that this line be connected to the new 48" overflow for eventual discharge into Bizer Creek. Please note that the drain line from the transformer oil containment area will only include storm water runoff as the containment system has an integral oil/water separation membrane to contain any spilled oil.

Permitting

The proposed project will require the approval of the Erie County Health Department. Based on our calculations, a Stormwater Pollution Prevention Plan (SWPPP) will likely be required due to the length and width of the disturbed area. Arcadis has not included costs for a SWPPP in this proposal as ECWA has indicated that this will be addressed through Special Services if it is determined that one is necessary.

It is Arcadis' opinion that this project will fall under a SEQR Type II action. According to Section 617.5 (c) (2) of NY-CCR, a project can be considered a Type II action if it includes the *"replacement, rehabilitation, or reconstruction of a structure or facility, in-kind, on the same site."* Arcadis will provide documentation to ECWA describing our opinion and recommend that ECWA issue a negative declaration for the project.

Preliminary Design Meetings and Workshops

Given the current COVID-19 situation, we are proposing to conduct regular virtual meetings (including but not limited to those stated in the RFP) as web conferences to focus on the various portions of the preliminary design. Besides the initial kick-off and task review meetings, intermediate monthly meetings will be scheduled to focus on certain portions of the preliminary design (i.e. HVAC, Pumps, or Yard Piping). Our Holobuilder system gives us the ability to conduct virtual walk-throughs during these meetings thereby boosting meeting productivity and efficiency while allowing everyone to "virtually" meet from wherever they are at the time. Arcadis is a leader in digital innovation and having incorporated Holobuilder into the CIP project, ECWA and Arcadis are now in an excellent position to keep the design on schedule while reducing infection risk to ECWA staff that maintain such a vital service to our community. At some point during design, we believe the risk to ECWA and Arcadis staff will be reduced such that we can return to our preferred approach of face-to-face meetings and workshops.

Construction Sequencing

We understand that sequencing the construction will be crucial to ensuring ECWA operations are maintained, thereby providing uninterrupted water supply to your customers. During our Basis of Design, we will prepare a proposed phased approach to the construction. Each phase will identify which assets are in/out of service but will be coordinated to ensure a level of operational redundancy is maintained, including the addition of temporary provisions, if necessary. This sequence, once approved by ECWA, will lay the foundation for the construction phasing plan that will be incorporated into the Contract Documents, including a table of key shutdowns and tie-ins necessary to complete the work.

A high-level construction sequence is provided below showing a phased approach that maintains ECWA operations and system redundancies throughout construction.

Deliverables for Task 1 – Basis of Design will include, but not be limited to, our efforts described above, the work explained in the RFP, and the following:

- Topographic survey of the property.
- 3D Laser scans and BIM of existing conditions.
- Preliminary arc flash hazard calculations for the new electrical equipment using SKM.
- Preliminary 3D rendering of proposed pump, VFD, and major building improvements.

Figure 2.6. Conceptual construction sequence.

PHASE	Pump 1	Pump 2	Pump 3	Pump 4	Pump 5	N. Tank	S. Tank	Generator	Temp. Generator
1 - Discharge piping modifications	IN	IN		IN	IN	IN	IN	IN	
2 - South Tank 48" piping and valves	IN	IN		IN	IN	IN	OUT	IN	
3 - North Tank 48" piping and valves	IN	IN		IN	IN	OUT	IN	IN	
4 - 48" & 54" yard piping and to pump station	IN	IN		IN	IN	IN	IN	OUT	IN
5 - New VFD, room, HVAC	IN	IN		IN	IN	IN	IN	IN	IN
6 - Bus 5-B-2 retrofit	IN	IN	OUT	OUT	IN	IN	IN	OUT	IN
7 - Install New Pumps 3 and 4	IN	IN	OUT	OUT	IN	IN	IN	IN	
8 - Bus 5-A-1 retrofit	OUT	OUT	IN	IN	OUT	IN	IN	IN	
9 - Install New Pumps 1, 2 and 5	OUT	OUT	IN	IN	OUT	IN	IN	IN	
10 - Miscellaneous Improvements	IN	IN	IN	IN	IN	IN	IN	IN	

* Greyed out Pump 3 indicates the existing pump is locked out but may be used if necessary.

2.B.2. Task 2 – Detailed Design Development

After the Basis of Design is developed and the preferred alternative(s) and options are selected, the detailed design will be advanced. Our project team's overarching approach to the proposed upgrades relies on the following principles:

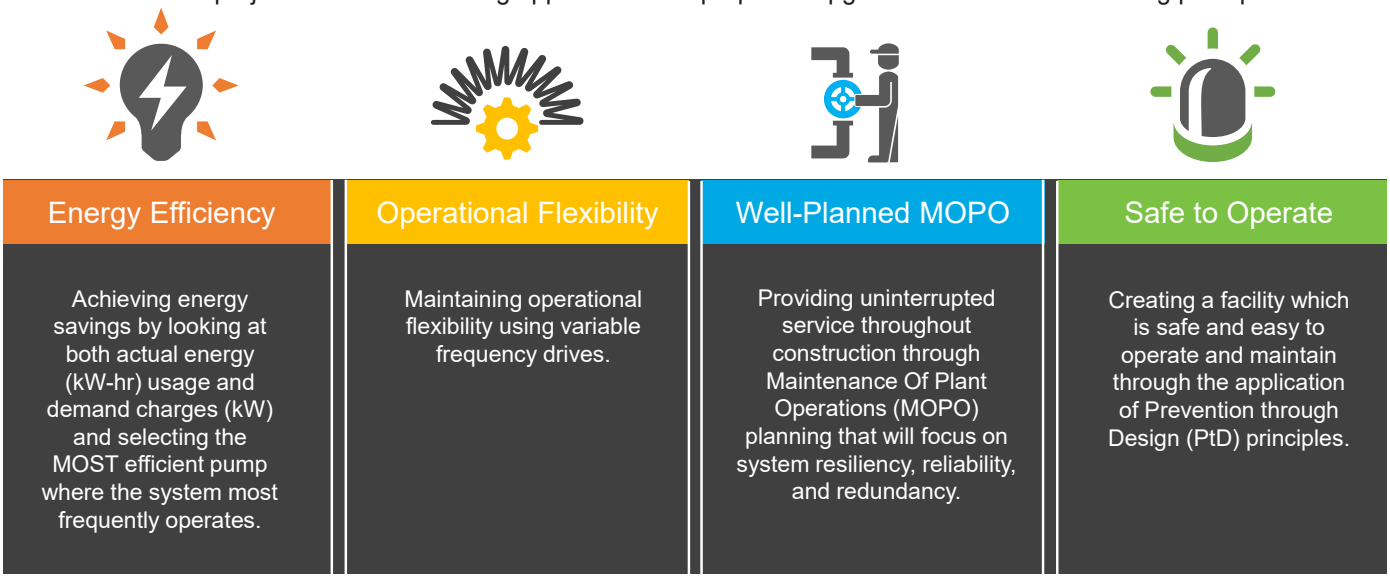


Figure 2.7. Arcadis will focus on these four pillars during the design development process to ensure that the rehabilitated Ball Pump Station is energy efficient, provides operational flexibility, can be constructed with minimal interruptions to service during construction, and provides a final facility that is safe and easy for staff to operate and maintain.

Energy Efficiency & Operational Flexibility

Rising utility costs and increased emphasis on operational efficiency has brought renewed focus to pumping efficiency and our team has responded by developing a unique approach which is consistent with ECWA's desires to continually improve efficiency of operation, including:

- Achieving energy savings through selection of the optimum pumping equipment.
- Improving operational flexibility by selecting appropriate motors and drives, including VFDs and high efficiency motors.
- Reducing the carbon footprint and greenhouse gas emissions.
- Incorporating sustainable principles and LEED design features into building envelope improvements.
- Using technology improvements such as SCADA to optimize O&M efforts for a utility's work force and Smart Energy Purchases/Operating Times.

Our team, as a matter of practice, focuses on pump efficiency over the entire operational range which maintains, and can improve, operational flexibility. The goal is to achieve a pump installation where the pump is operating at its BEP on a routine basis. This is an important differentiator from older approaches which focused on selecting the BEP based on maximum day conditions. The older/conventional approach often leads to higher energy consumption and increased maintenance costs because the bearings and seals are more prone to wear when the pump is not operating at the BEP.

Alternative Funding and Procurement Strategies

Arcadis believes there may be several opportunities with this project to pursue additional funding and/or evaluate alternative procurement strategies, including:

NYSERDA FlexTech Funding. Arcadis is a New York State Energy Research and Development Authority (NYSERDA) FlexTech Consultant. Therefore, we can work with ECWA and NYSERDA to get up to 50% of the initial study phase work that can be related to energy efficiency paid for by NYSERDA.

NYSERDA Rebates. In addition to FlexTech funding, ECWA could also be eligible for reimbursement during the construction phase for premium efficiency motors and drives installed as part of the project. As with previous projects performed for ECWA, Arcadis would collect all of the required data and complete the required paperwork so that ECWA could receive these rebates.

National Grid. Somewhat similar to NYSERDA, National Grid also offers incentives and rebates such as the Energy Retro-Commissioning program. ECWA could be eligible for reimbursement during the construction phase for premium efficiency motors and drives installed as part of the project. Arcadis would coordinate with National Grid, collect all of the required data and complete the required paperwork so that ECWA could receive these rebates.

For the purposes of this proposal, Arcadis has not included any costs to pursue alternative funding and procurement strategies but would welcome the opportunity to discuss further and potentially include as a Special Service if desired by ECWA.

Continued MOPO Planning

Arcadis knows that while achieving a rehabilitated facility which meets your needs is the ultimate goal, careful planning can make the construction and interim period much easier. For the Ball Pump Station Rehabilitation, the biggest challenge is maintaining an appropriate water supply to the Ball Storage Tanks and providing continuous delivery into the system during construction by staging the rehabilitation and/or providing temporary measures. Our team will continue to work with ECWA to understand the key shutdowns and tie-ins identified in the preliminary design and then further developed during Task 2 – Design Documents so that ECWA and Contractor all understand who needs to do what and when during construction.

Prevention through Design Experience

Another key focus area for our Arcadis design team is to ensure that the rehabilitated Ball Pump Station is as safe and easy to operate and maintain as possible. Our team is well-versed in the principles of Prevention through Design (PtD) and we will use our 3D design tools, simulated walk throughs, SKM arc flash software, and workshops with ECWA staff so that we achieve that goal.

PtD Workshops Delivering Safer and Easier to Operate and Maintain Facilities

Health and Safety (H&S) is a core value at Arcadis and as such we bring an acute H&S focus to all of our work whether planning, design or construction. During the design phase we will hold specific PtD Workshops at the 30%, 60% and 90% design phase to ensure that the design documents create a facility that is as safe to construct, safe to operate, and easy to maintain as possible.

Please see Schematic 2.1 on the following page for the benefits which our teams (Arcadis and ECWA) were able to incorporate into the Pine Hill Pump Station Project.

Design Development: 60%, 90% and 100% Submittals

During the Task 2 – Design Document Development, we will provide ECWA with submittals at 60%, 90% and 100%. These submittals will allow for communication between all ECWA's stakeholders and an accelerated project schedule.

As stated earlier, our approach during the design development process will be to continue to collaboratively work with ECWA to develop and manage the project on budget and on schedule.

Therefore, in addition to the formal submittals noted above, we will also continue to hold monthly progress meetings and at times develop technical memoranda during the design development stage to identify and resolve design issues and alternatives. Minutes for all meetings will be distributed with five business days after the meeting.

Please note that the general goal of the 30% preliminary design is to 'lock-in' the proposed key concepts and needs, 60% will add additional definition to the proposed upgrades, and the 90% submittal will finalize layouts and develop additional sections, schematics and specialty drawings. The 100% submittal will be for final approval before being issued for bid.

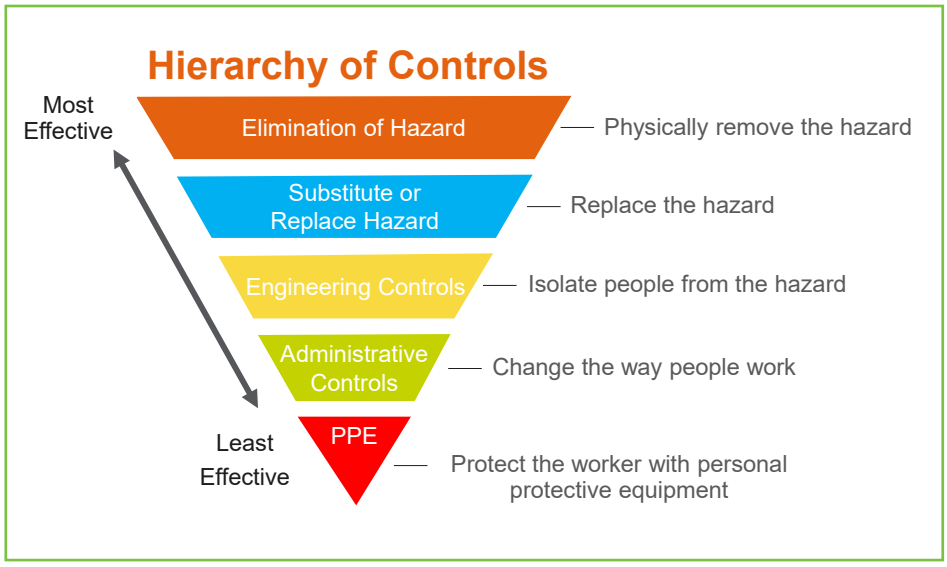
We have developed a detailed drawing list, which is included in Section 10 of this proposal, that demonstrates our design development approach for the Ball Pump Station Rehabilitation and which drawings will be included in each submission. This will allow ECWA staff to focus on key decisions and avoids potential rework to ensure the project gets completed as quickly and effectively as possible.

Prevention through Design (PtD) Workshops

SCHEMATIC 2.1

H&S is a core value at Arcadis and as such we bring an acute H&S focus to all of our work whether planning, design, or construction. During the design phase we will hold specific PtD Workshops at the 30%, 60% and 90% design phase to ensure that the design documents create a facility that is as safe to construct, safe to operate, and easy to maintain as possible.

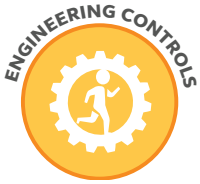
These workshops focus on the hierarchy of control, where the business value and effectiveness, are highest at the top — i.e. can we completely eliminate the risk by designing it out of the project down to administrative controls and personal protective equipment (PPE) as a last resort.



Using our knowledge of pumping station operations and maintenance, our 3D design tools, and application of PtD principles, Arcadis was able to dramatically improve the safety of the rehabilitated Pine Hill Pump Station for ECWA. Key design concepts that were used to improve the renovated facility included:

- Relocation of monitoring instruments and sample lines so they were no longer at the bottom landing of the stairs which posed a trip hazard and also made access and maintenance difficult.
- The preliminary design indicated the need for a 6" curb on the discharge header pipe chase. This curb and potential tripping hazard was eliminated in detailed design through additional hydraulic analyses which proved that a 24" pipe was sufficient for current and future operating conditions.

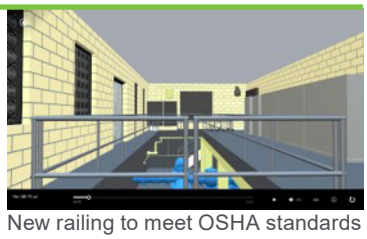
- We placed the pump and motor directly below the overhead beam and hoist and aligned them with the double doors which will be used for their placement, maintenance and removal which avoided the need to 'swing' heavy equipment (pump, motor, and base plate were each 1,000 – 2,500 #'s each) into place.
- Revised elevation of discharge header so that the downstream control valve had sufficient clearance off the floor so that the bottom flange can more be easily removed to replace valve internals (annual maintenance activity).



- A new meter pit was constructed as part of the project and the hatch include safety grating to prevent workers from falling into the pit when first opening the hatch and a 'ladder up' device to make accessing the ladder and entering/exiting the vault easier and safer for ECWA personnel.
- Relocation of electrical panels to improve access for routine maintenance and provide increased clearance between the panels and mezzanine railing.

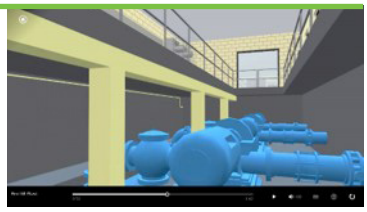
- New ArcFlash signage was added to ensure workers understand hazards of electrical equipment.

E



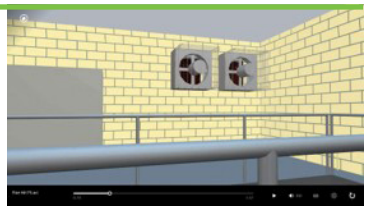
New railing to meet OSHA standards and improved access in front of electrical panels.

S



Placing the pumps and motors to be directly under the overhead monorail and aligned with the door allowed for safe construction and future maintenance and raising the header improved access underneath the bottom of the control valve making future maintenance less awkward for ECWA.

EC



Adding guarding around the replacement exhaust fans to avoid workers being exposed to rotating fan blades.

2.B.3: Task 3 – General Services

This task will include both bidding and construction administration for the project. The Arcadis team proposes to assign the same construction phase services team that delivered the Sturgeon Point and Van de Water Coagulation Basins projects and the Pine Hill Pump Station Project. Our team also includes the recent addition of Mike Chirico who delivered the design and construction phase services for the Ball Electrical Substation Replacement Project. Tim Shafer will work under the management of Dan Seider, Mike Chirico and Mark Lenz. They will leverage their knowledge of delivering an ECWA project and specifically pump station construction with Mike Chirico supporting key submittal review and construction administration activities.

Change Orders During Construction

Our proposed project team has a track record of outstanding performance in developing bid documents that are thorough, comprehensive and well-coordinated, and as such result in competitive bidding and a low change order record. This strength is critical to maintaining our client's project budgets. The industry standard for change orders during construction is more than 5% for water and wastewater plant renovation work. Our firm's national change order rate of one percent is among the lowest in the industry and our local team has exceeded that benchmark. We have demonstrated first-hand to ECWA our fitness in developing contract documents that are thorough and can be constructed and our ability to work with contractors in controlling change issues before they become costly.

The Arcadis team has completed over $95 million dollars of improvements with a change order record of less than 1%. This team continues value engineering efforts throughout construction such that our overall final project costs are often close and sometimes less than the original bid.

2.B.4: Task 4 – Resident Inspection

This task will be provided upon authorization from ECWA and includes technical inspection of the construction by N&C with support from Arcadis, including all activities listed in the project RFP.

2.B.5: Task 5 – Record Drawings

This task will include the provision of electronic and hard copy record drawings as defined in the project RFP.

2.B.6: Task 6 – Authority Program/ Procedure Updates

This task will include revising and updating ECWA's Standard Operating Procedures (SOPs), Arc Flash Program, and Lockout/Tagout (LOTO) procedures for Ball Pump Station. Arcadis has completed several Arc Flash programs for ECWA at VDWTP and Ball Pump Station and is currently leading the LOTO program for all of ECWA's sites. Our experienced team will deliver these seamlessly. We will also leverage laser-scanning as part of our record drawing process so that ECWA has a complete set of record documents at completion.

2.B.7: Task 7 – Special Services

This task is reserved for the listed special services which ECWA may require during the project, including hazardous materials testing and assessment, if required under Task 1. We have also defined other engineering services that we believe are important to the completion of this project. These are defined further in Section 2.B.1 and 2.B.2 and could be included under Special Services if ECWA determines that a more extensive analysis is desired.

2.C Detailed Scope of Services

Arcadis' scope of services includes all work necessary to complete the work including meetings, review of historical documents, conceptual planning, regulatory coordination, and detailed design, bidding, and construction phase services. We do not take any exceptions to any tasks or deliverables listed in the RFP and addenda.

ARCADIS

SECTION 3
Project Staffing

Erie County
Water Authority

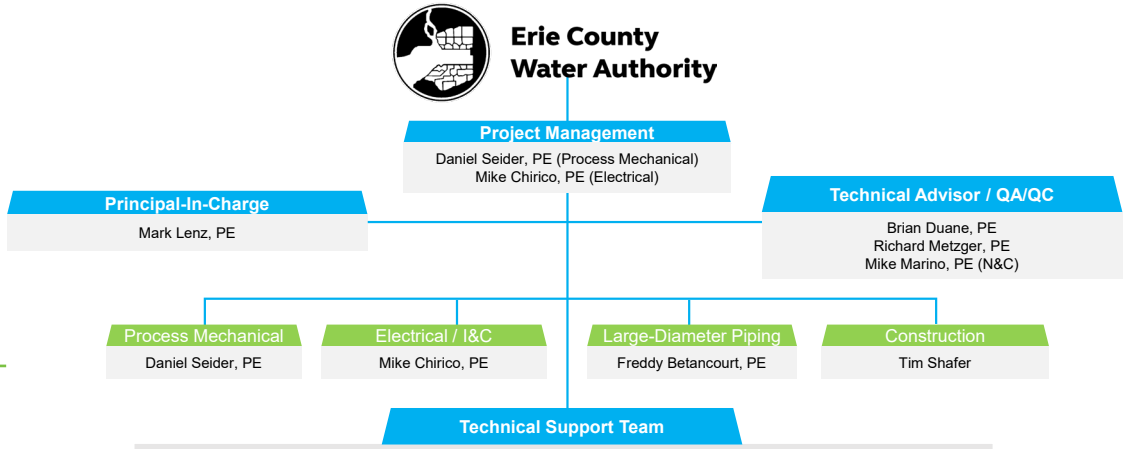
SECTION 3 Project Staffing

Our project team is local, committed, responsive, experienced, knowledgeable, and available to deliver this project for you NOW!

Arcadis believes that a successful project can only be delivered if the project team has the following traits:

- **Responsive** – It begins with the project manager, but needs to be embodied throughout the team. Dan has delivered multiple major WTP design projects for you and your peers. He is anxious to do so again on this project!
- **Experienced** – Our team includes staff who have a deep history of directly relevant experience. This is demonstrated in their resumes and their participation in the key projects referenced in Section 1.
- **Knowledgeable** – Knowledge of ECWA staff, facilities and procedures is critical to efficiently evaluate alternatives, develop concise contract documents and lead a successful construction process. More than 20 of our project team members have direct ECWA experience with most having more than 15 years working on ECWA projects.
- **Available** – Resumes do not mean much if the actual people are not available to execute the project. We routinely do detailed workload planning and have confirmed that this team is available now to execute this project.

Our project organizational chart is below. On the following pages we provide further information on key staff availability, their history of delivering for ECWA and the experience and value they offer on this project. Detailed resumes are provided in Appendix A.



Design Criteria / Regulatory Requirements
Marnie Bell, PE, ENV SP
Rebecca Slabaugh, PE, ENV SP

Process Mechanical / Pumps
Jason Williams, PE
Matt Czora, PE
John Salvagno, EIT

Buried Piping
Freddy Betancourt, PE
Hannah Rockwell, EIT
Andrew J. Klettke, PE (M&M)

Electrical
Mike Chirico, PE
Greg Moore, PE

I&C / Automation / Security
Ryan Kowalski, PE
Alex Misiaszek, PE

Building Mechanical
Teresa Liddle, PE (N&C)
Vincent Vitale, PE

Structural / Architectural
Karl Rohde, PE (N&C)
Iain Ramage, RA (N&C)
Paul DiCorso, PE

Hydraulic Analysis
Gary Muffoletto, PE (N&C)
Bill Barhorst, PE

Site/Civil
Mike Higgins, PE

Hazardous Materials
Paul Keitz

Geotechnical
SJB Empire Geo Services, Inc.
Andrew J. Klettke, PE (M&M)

Survey
Michael Ennis, PLS (N&C)

Energy Incentives
Matt Yonkin, PE

Prevention Through Design
Mark Lenz, PE

3D Laser Scanning
Barron & Associates, P.C.

Revit 3D Modeling / CADD
Matt Welshans
Craig DeWyer
Katie Kasperek

Construction Administration
Tim Shafer

Cost Estimating / MOPO Planning
Tim Shafer
Jim Raleigh, PE

RPR
Dan Calabrese (N&C)
Joe Newland (N&C)

O&M Manual / SOPs / Training
Dan Seider, PE
Mike Chirico, PE
Tim Shafer

Corrosion Protection Study
Corrosion Probe, Inc.

Our proven project management team includes Dan Seider and Mike Chirico who are both intimately familiar with the critical role of Ball Pump Station. They will be supported by Freddy Betancourt for design efforts and Tim Shafer during construction. Additionally, we have identified a comprehensive technical support team to ensure that we deliver another ECWA project on schedule.

SUBCONSULTANTS
Barron and Associates, P.C.
Corrosion Probe, Inc.
McMahon & Mann Consulting Engineering and Geology, P.C. (M&M)
Nussbaumer & Clarke, Inc. (N&C)
SJB Empire Geo Services, Inc.

Key Staff Availability

We are in unprecedented times; however, Arcadis is ready to continue to deliver for ECWA as we are on our current assignments and as we have historically for some of ECWA's largest and most complex projects. We say this confidently based on the following:

- **Knowledge & Experience –** As we have noted, our key staff are experienced and knowledgeable of your facilities, staff, procedures, and expectations. Dan, Mark, Mike, Tim, and many others on our team have completed multiple projects for ECWA and also have deep relevant pumping system and electrical experience from other major utilities.
- **Tools & Technology –** Arcadis has long embraced digital innovation and remains a leader in this area. Our use of HoloBuilder, 3D CADD and BIM models as well as providing laptops and a strong network for all staff means we are able to be productive whether at our office, your facilities or our home offices. We can move work seamlessly around the country or world as necessary to meet client demands with a commitment to quality.
- **Local & Available –** While the above provides a strong foundation for completing a project effectively there are times when you need to be present and our local leadership team can be from the Arcadis Buffalo office or their homes to your facilities in less than 20 minutes if needed.

As requested in the proposal requirements, we have reviewed our current workload against the project schedule using Arcadis' in-house resource management system. The graphic below indicates key staff availability through various project phases.

ECWA Ball Pump Station Phase I Rehabilitation
Key Staff Availability

				2020		2021				2022				2023		
		Prior ECWA	Average	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3
Key Staff	Office	Experience	Availability	BOD Reports		Detailed Design			Bidding	Construction						
Dan Seider	BUF	YES	80%	60%	70%	80%	80%	80%	80%	85%	85%	85%	85%	85%	85%	85%
Mike Chirico	BUF	YES	98%	80%	90%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Mark Lenz	BUF	YES	68%	50%	60%	70%	70%	70%	70%	70%	70%	70%	70%	70%	70%	70%
Brian Duane *	ATL	YES	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%
Dick Metzger *	ROC		40%	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%
Jason Williams	BUF	YES	90%	50%	60%	80%	90%	90%	100%	100%	100%	100%	100%	100%	100%	100%
Freddy Betancourt	ORL		80%	80%	80%	80%	80%	80%	80%	80%	80%	80%	80%	80%	80%	80%
Tim Shafer	BUF	YES	98%	80%	90%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Marnie Bell	RW	YES	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%
Rebecca Slabaugh	IND	YES	73%	40%	50%	50%	60%	60%	60%	90%	90%	90%	90%	90%	90%	90%
Matt Czora	ROC		86%	70%	70%	80%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%
Hannah Rockwell	ROC	YES	92%	80%	80%	100%	100%	100%	100%	90%	90%	90%	90%	90%	90%	90%
Jim Raleigh	BUF	YES	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%
Craig DeWyer	BUF	YES	94%	70%	80%	80%	90%	100%	100%	100%	100%	100%	100%	100%	100%	100%
John Salvagno	BUF	YES	78%	70%	70%	80%	80%	90%	90%	90%	90%	70%	70%	70%	70%	70%
Paul DiCorso	BUF	YES	92%	50%	70%	80%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Matt Welshans	BUF	YES	95%	60%	80%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

* Our Technical Advisors play roles across multiple projects and their availability to complete reviews for this project has been confirmed

Dan Seider, PE
Project Management (Process Mechanical)

Office – Buffalo, NY

Dan has broad expertise in drinking water treatment, conveyance, operations, and management. Prior to his employment at Arcadis, he worked for ECWA. Initially, he was responsible for overseeing the study and design of capital improvements before transferring to the production department where he managed the daily operation and maintenance of two conventional WTPs, 34 pump stations and 37 storage tanks. ***Dan will bring his extensive knowledge of Ball Pump Station and ECWA's water system to execute this project so that the new infrastructure meets the long-term goals of ECWA without disruption in water supply and water quality to your customers.***

Mark Lenz, PE
Principal-in-Charge

Office – Buffalo, NY

Mark has broad expertise with drinking water systems from his 24-year career and specific knowledge of ECWA's facilities and personnel through more than 15 years of successful studies and implementation of major capital programs at the SPWTP, VDWTP, Ball Pump Station, Pine Hill Pump Station, and other facilities. ***In addition to his technical leadership, Mark will ensure that staff are available to follow through on the commitments made in this proposal.***

Brian Duane, PE
Technical Advisor / QA/QC

Office – Atlanta, GA

Brian's experience includes the design of over 50 wastewater and water pumping facilities with capacities up to 740 mgd. He is a technical expert in hydraulics, pumping systems and the design of mechanical process systems, and he routinely assists with start-up and troubleshooting of mechanical systems. Throughout his career, he has partnered with clients to provide cost-effective solutions that are functional, practical, maintainable, and constructible. ***Brian's experience will be invaluable to ensure the new pumping systems are correctly sized, reliable and simple and safe to maintain.***

Mike Chirico, PE
Project Management (Electrical)

Office – Buffalo, NY

Mike specializes in commercial, industrial and municipal electrical systems, including but not limited to, the design of power distribution, medium- and high-voltage gear, generators, lighting, grounding, control schematics, and wiring interconnections. ***Mike's previous experience supporting major improvements, including the new substation at Ball Pump Station, and leading ArcFlash studies at ECWA facilities will allow the electrical work that support these projects to move forward smoothly.***

Mike Marino, PE (N&C)
Technical Advisor / QA/QC

Office – Buffalo, NY

As Chief Executive Officer, Mike oversees N&C's municipal engineering department projects in an executive/administrative capacity. He has more than 24 years of experience in the evaluation, design and construction of a wide variety of municipal infrastructure projects in New York and Pennsylvania, and is actively involved in several industry organizations, including the American Water Works Association (AWWA) at both the national and state level. ***Mike's experienced leadership will be invaluable ensuring a successful project that is thoughtful in design and construction.***

Richard Metzger, PE
Technical Advisor / QA/QC

Office – Fairport, NY

Richard has extensive experience in the evaluation, design, construction, and operation of WTPs. As executive engineer for the Monroe County Water Authority (MCWA), he directed MCWA's ongoing capital improvements and renewal and replacement programs for all aspects of MCWA's three WTPs (5, 50 and 140 mgd capacities). ***Richard's knowledge, gained from 30 years of daily plant operation and maintenance, will provide lessons learned and valuable and pragmatic assessments of alternatives being considered for the pumping, piping, electrical, and miscellaneous improvements.***

Freddy Betancourt, PE
Large-Diameter Piping Lead

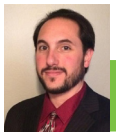
Office – Maitland, FL

Freddy has more than 19 years of experience as an engineer focusing on municipal wastewater collection, transmission, distribution, and treatment. He serves as one of Arcadis' National Discipline leader with extensive experience in large-diameter pipeline construction, having worked with pipelines up to 120 inches in diameter. ***Freddy's experience cannot be duplicated in our region. His knowledge will be critical to selecting the most appropriate pipe material, class, foundation, and trench type to ensure the piping improvements are long-lasting and maintenance free.***

Tim Shafer
Construction Lead

Office – Buffalo, NY

Tim has extensive experience with design and construction of water treatment facilities, including five major improvement projects at SPWTP where he was lead CA or RPR on the site. He has overseen more than $100 million in construction projects over the past 13 years. ***Tim is currently finishing the ECWA Control of Hazardous Energy Program and will be available to apply his in-depth knowledge from the Ball Pump Station CIP Project to support design development and then lead another 'hassle-free' construction experience for ECWA.***



Jason Williams, PE
Process Mechanical

Office – Buffalo, NY

Jason has more than 15 years of design and construction management of municipal drinking water and wastewater improvements. He has completed multiple pumping system evaluations, designs and overseen their construction. ***Jason will leverage his in-depth knowledge of pumping system evaluations and designs to drive the Ball Pump Station design to meet ECWA's long-term goals.***

Marnie Bell, PE, ENV SP
Design Criteria/Regulatory Requirements

Office – East Windsor, NJ

Marnie has broad expertise with potable water treatment, including regulatory assessment, conceptual and detailed final design, and construction administration. She has completed multiple projects for ECWA at the study, design and construction phases. ***Marnie will support the team by reviewing all Basis of Design criteria to ensure they meet regulatory requirements and support ECWA's water quality goals.***

Rebecca Slabaugh, PE, ENV SP
Design Criteria/Regulatory Requirements

Office – Indianapolis, IN

Rebecca serves as the Drinking Water Treatment Practice Leader at Arcadis. She has extensive experience supporting EPA in their rule-making processes and advising AWWA and Arcadis clients on water quality improvement projects. ***Rebecca will use her knowledge from the ECWA Corrosion Control Technology project to support the team in identifying components of this project which can further support water quality improvements, operational reporting and regulatory compliance.***

Matt Czora, PE
Process Mechanical / Pumps

Office – Rochester, NY

Matt has more than 10 years of engineering experience in the design and construction management for municipal water and wastewater projects. ***Matt will use his design experience with other NYS regional water/wastewater utilities to support Jason Williams for the design of the pumping system improvements.***

John Salvagno, EIT
Process Mechanical / Pumps

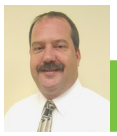
Office – Buffalo, NY

John has three years of experience working with ECWA on several recent projects. This includes MP-79: Optimal Corrosion Control Treatment, MP-80: Ball Pump Station Capital Improvement Plan, MP-81: Routing Study for Delivered Water Transmission Main projects, and he is part of the recently awarded MP-84 – Tonawanda Transmission Main. ***John will leverage his relationships with multiple ECWA staff and expertise in data analysis, design evaluations, and construction management to effectively support this project.***

Hannah Rockwell, EIT
Process Mechanical

Office – Rochester, NY

Hannah specializes in water, wastewater and green stormwater infrastructure systems evaluation, design and construction. She was a key member of Arcadis' AWIA project for data entry, risk analysis and reporting/ presentations. ***Hannah will leverage her AWIA experience and relationships which she has developed to support this project.***



Greg Moore, PE
Electrical

Office – White Plains, NY

Greg specializes in electrical engineering. His work has involved various aspects of design of large and small municipal and industrial wastewater treatment, process, and pharmaceutical facilities, including but not limited to, the design of power distribution, including medium voltage, generator, utility and generator paralleling, lighting, grounding, control schematics and wiring interconnections. In addition, he develops the Division 16/26 Electrical Specifications for projects. ***Greg will use his previous ECWA project experience to support Mike with the design of the electrical improvements.***

Ryan Kowalski, PE
I&C / Automation / Security

Office – White Plains, NY

Ryan is a professional engineer for project management, design and construction supervision of SCADA, instrumentation and automation systems for wastewater and water treatment systems. His focus is on process control automation evaluation and design, telemetry and network design, configuration, evaluation of instrument systems, system startup commissioning, and training of operators on automation systems. ***Ryan will leverage his previous work with ECWA to efficiently support automation goals for this project.***

Alexander Misiaszek, PE
I&C / Automation / Security

Office – Wakefield, MA

Alex is a professional engineer (control systems engineer) with 15 years of relevant experience in system integration, SCADA and I&C design. He is proficient in PLC/HMI/OIT programming and LAN Ethernet configuration and has a thorough working knowledge of ISA 101, Human-Machine Interface Standard and high-performance graphics. ***Alex will support the team from a SCADA and controls perspective.***

Vincent Vitale, PE, LEED AP
Building Mechanical

Office – White Plains, NY

Vinnie specializes in HVAC for municipal, commercial and industrial applications, including boiler and chiller systems, dehumidification systems, industrial ventilation and high-quality 'clean air' systems. He always brings the latest sustainability concepts to our clients and has completed multiple NYSERDA, NYPA and other energy efficient projects. ***Vinnie's vast experience in HVAC systems will ensure that the proposed building mechanical improvements are designed according to ECWA requirements and industry standards.***

Paul DiCorso, PE
Structural

Office – Buffalo, NY

Paul is experienced in the design of a vast array of steel, concrete, aluminium, and timber structures for municipal water and wastewater facilities, highway bridges, heavy industrial and steel making facilities, and industrial and commercial buildings. ***Paul's more than 30 years of experience in structural and architectural design will ensure that the proposed architectural and structural improvements are 'rock solid'.***

William Barhorst, PE
Hydraulic Analyses

Office – Columbus, OH

Bill has experience in the design and hydraulic analysis for water and wastewater treatment facilities incorporating various open-channel, pressure flow and unit processes. He has hydraulic modeling experience in various analysis programs for modeling water distribution systems, raw water delivery systems and transient pressure analysis, including model calibration to match real-world conditions. ***Bill's experience with similar pump station improvements will allow him to effectively support the team with hydraulic modeling and transient analyses.***

Michael Higgins, PE
Site/Civil

Office – Buffalo, NY

Mike has more than 16 years of experience as a project manager specializing in civil design, stormwater design, permitting and compliance, industrial stormwater management, and erosion and sediment control. Under his guidance, his teams routinely develop design drawings, reports/memos, proposals and permits for a variety of water, environmental and industrial projects. ***Mike will lead any required site/civil improvements, including a SWPPP if one is determined to be necessary for this project.***

Paul Keitz
Hazardous Materials Testing

Office – Fairport, NY

Paul is a degreed mechanical engineer with 25 years combined experience in construction, indoor air quality investigations, associated remediation and asbestos management. His work experience has included projects in large power plants, hospitals, colleges and universities, industrial manufacturing facilities, schools, corporate office buildings, and commercial real estate. ***Paul's extensive experience with HazMat testing will allow him to efficiently sample and evaluate pipeline insulation/painting and any other surfaces/ environments of concern.***

Matt Yonkin, PE
Energy Incentives

Office – Clifton Park, NY

For more than 25 years, Matt's career has focused on energy efficiency, process optimization and water resources solutions for clients. Areas of expertise include demand side energy efficiency measures; renewable generation using biogas, hydroelectric, and photovoltaic; water reuse and conservation; waste heat and wastewater heat recovery; co-digestion and solids handling; and other process optimization and cost saving measures. ***Matt will apply his depth and breadth of expertise to produce sustainable bottom line energy and operational savings using both conventional and non-conventional project delivery and financing models.***

Matt Welshans
Revit 3D Modeling / CADD

Office – Buffalo, NY

Matt has extensive design/drafting experience encompassing civil and mechanical design/drafting and production of design drawings for wastewater, water, solid waste and industrial facilities. He has also been involved with several 3D projects, using AutoCAD MEP, Civil 3D and Revit. He has been the lead CADD designer on all of the Arcadis led ECWA projects over the past ten years. ***Matt's experience with ECWA facilities and the latest BIM and 3D design tools will improve the clarity of design deliverables and support ECWA staff reviews.***

Craig DeWyer
Revit 3D Modeling / CADD

Office – Buffalo, NY

Craig has extensive design/drafting experience providing detailed design support for numerous civil/structural, mechanical and piping projects. He also has experience as a resident project representative on a broad range of construction projects, including water treatment facilities, pumping stations, waterlines, storage tanks and sanitary/storm sewer replacement. ***Craig will use his previous experience as a designer and resident project representative for many of the most recent projects at VDWTP and SPWTP to support another successful project.***

Katie Kasperek
Revit 3D Modeling / CADD

Office – Buffalo, NY

Katie is experienced in providing CADD design support for water resources and environmental design projects. She is adept at managing and coordinating design requirements among disciplines, offices and other firms, and she can efficiently address discrepancies between the different disciplines during design. She is experienced in providing Civil 3D and Revit designs on a variety of projects across the eastern U.S. ***Katie's 3D CADD and BIM experience will support an efficient design delivery.***

James Raleigh, PE
Cost Estimating / MOPO Planning

Office – Buffalo, NY

Jim's experience encompasses design, construction administration and resident engineering for water and wastewater treatment facilities and he has direct experience at the SPWTP. ***Jim will support the Arcadis team in MOPO planning and cost estimating. His almost 40 years of experience, excellent working relationship with ECWA staff and the Arcadis team will provide multiple benefits.***

Teresa Liddle, PE (N&C)
Building Mechanical

Office – Buffalo, NY

Teresa is an experienced MEP/FP designer. She is familiar with many HVAC systems, including rooftop units, closed loop water glycol systems, radiant heating systems, terminal units, split systems and variable refrigerant flow. She also has knowledge in plumbing systems, electrical power and lighting systems and control centers. She has previously been responsible for construction project management. ***Teresa's experience with similar systems will provide ECWA with an effective and efficient building mechanical system.***

Karl Rohde, PE (N&C)
Structural / Architectural

Office – Buffalo, NY

Karl is a civil/structural project manager with extensive experience, including design of several projects with the NYSTA and NYSDOT. He has performed as project manager for construction phase services. He has a broad knowledge of building and bridge design, including timber, concrete and steel structures. He also has extensive experience with building codes, including the Building Code of New York State (BCNYS), Minimum Design Loads for Buildings and other Structures (ASCE-7) and AASHTO Bridge Design Specifications. ***Karl's design experience with deign and project management of similar work for ECWA will support this project and provide for robust design.***

Iain Ramage, RA, LEED AP (N&C)
Structural / Architectural

Office – Buffalo, NY

Iain is a registered architect with expertise in civil and transportation engineering. His experience includes many areas of architectural and civil project management. Iain has obtained his LEED accreditation for designing "green" buildings, as defined by the U.S. Green Building Council's (USGBC) Green Building Rating System. He has worked with the LEED rating system and frequently assists clients with exploring sustainable, environmentally responsible and energy efficient building strategies. ***Iain's design experience and previous work with ECWA will ensure functional and energy efficient building improvements.***

Dan Calabrese, NICET IV (N&C)
RPR

Office – Buffalo, NY

Dan has over 33 years of experience in construction inspection management. He has performed as construction manager, resident engineer, chief inspector, or office engineer on various major construction projects. Dan has reviewed contract proposal and plans, the contractor's CPM, and means and methods to identify errors, omissions and conflicting information that could lead to potential problems. ***Dan's recent experience with ECWA for the Ball Substation project will provide high-quality inspection services with minimal learning curve.***

Michael Ennis, PLS (N&C)
Survey

Office – Buffalo, NY

Mike has over 33 years of experience in both field work and boundary line determination. He is well versed in the operation of Total Stations, Data Collectors, Microstation, Land Desktop, AutoCad, Carlson and Inroads. Mike's experience includes topographical surveys, boundary determination, wetland delineations, highway boundary determinations, hazardous waste studies, bridge and highway design and various other construction projects. He has drafted topographical, boundary, wetlands mapping, and acquisition maps. He is responsible for coordinating field and office personnel. He also reviews the projects completed by the survey department. ***Mike's leadership and experience will provide quality survey data collection that will be used to prepare accurate designs.***

Gary Muffoletto, PE (N&C)
Hydraulic Analysis

Office – Buffalo, NY

As Vice President of Engineering, Gary oversees N&C's engineering department projects in an executive/ administrative capacity. In addition, he continues to serve as project manager for select civil engineering projects. ***Gary's years of design and hydraulic analysis with the City of Buffalo will provide an in-depth applied knowledge to this project.***

Joe Newland, NICET IV (N&C)
RPR

Office – Buffalo, NY

Joe has performed as resident engineer, chief inspector, or office engineer on various major construction projects. He has reviewed contract proposal and plans, the contractor's CPM, and means and methods to identify errors, omissions and conflicting information that could lead to potential problems. Joe has tabulated these findings and worked with the owner and the contractor to identify solutions early to avoid problems before they surface. His proactive approach has resulted in many issues being resolved at the project level, thus reducing delays and claims. He understands the importance of working with the owner's representative to maintain an accurate and open line of communication. ***Joe's experience and leadership during construction for projects such as ECWA's Sturgeon Point Raw Water Upgrades provide a high-level of accuracy and attention to detail.***

Andrew J. Klettke, PE (M&M)
Geotechnical

Office – Buffalo, NY

Andrew has over ten years of experience on various projects involving civil, structural and geotechnical engineering, all with McMahon & Mann. His work has included involvement in as design and construction monitoring of several civil works and embankment stabilization projects. He also has experience with structural evaluations of various foundation elements and geotechnical evaluations for foundations, earth slopes, earth retention systems and landfill embankments. ***Andrew's recent experience with ECWA at Ball Pump Station will be invaluable to this project's design and construction efforts.***

SUBCONSULTANTS

Barron & Associates, P.C.

Barron & Associates (B&A) will provide 3D laser scanning services for your project. B&A is an engineering consulting, testing and mapping firm located in Clarence, NY specializing in subsurface studies, project management, environmental regulations, permitting and material testing. B&A recently added unmanned aerial vehicle (drone) and geospatial sciences to its list of services. B&A will provide 3D laser scanning of the Ball Pump Station. The laser scanning will be referenced to the New York State West NAD83, NGVD 29 coordinate system.

Corrosion Probe, Inc.

Corrosion Probe, Inc. (CPI) will perform a corrosion protection study for your project. For more than 35 years, CPI has built an international reputation for providing consulting, engineering design and technical support to municipal water/wastewater industry throughout the U.S. and Canada. Their extensive experience and multi-disciplinary capabilities provide a complete engineering approach to mechanical and structural rehabilitation, materials/corrosion/coating consulting, project management, quality assurance, mechanical integrity and testing services as well as solid forensic expertise in failure analysis and accident investigation. CPI will provide expertise for the corrosion protection analyses and design to minimize the potential for stray DC current and AC interference corrosion particularly near the high voltage towers. They will also assist with supporting additional corrosion protection efforts based on the existing soil corrosivity within the project limits.

McMahon & Mann Consulting Engineering and Geology, P.C.

McMahon & Mann Consulting Engineering and Geology, P.C. (M&M) will provide buried piping and geotechnical services for your project. Since 1993, M&M has provided civil engineering consultation and design services for geotechnical and geo-environmental projects throughout the Northeastern United States. The firm's staff of 19 includes nine professional engineers and one professional geologist. M&M is familiar with the subsurface conditions in Western New York and the geotechnical issues associated with the design and construction of underground facilities. They have completed subsurface explorations, prepared geotechnical engineering reports and designs for many notable projects in Western New York. This experience provides them with a unique insight into the subsurface conditions in the vicinity of the site and the issues that will affect design and construction. This allows them to tailor our approach to the subsurface exploration program, design, and construction.

Nussbaumer & Clarke, Inc.

Nussbaumer & Clarke, Inc. (N&C) will provide technical advisory, building mechanical, structural/architectural, hydraulic analysis, survey, and RPR services for your project. Established in May 1933, N&C has been providing engineering services to public sector clients in the Western New York area, including ECWA. Their support of ECWA dates back to the ECWA's creation in 1949, with the earliest project recorded on August 23, 1949. N&C's qualifications include knowledgeable staff, experience on projects of similar scope and nature, and a commitment to providing smart design solutions to clients with respect to engineering studies, design, construction cost estimating, scheduling, bidding, resident inspection, as well as architectural design and professional survey services. They are locally owned and operated, with their main office (headquarters) located in Buffalo, Erie County.

SJB Empire Geo Services, Inc.

SJB Empire Geo Services, Inc. (SJB) will provide geotechnical services for your project. SJB is a full service geotechnical and environmental testing and consulting company operating four offices in New York State – Buffalo, Henrietta (Rochester), Cortland and Albany. A multidisciplinary organization with a team of over 100 personnel, including engineers, geologists, environmental scientists, hydrogeologists, technicians, drillers, and administrative staff, SJB offers subsurface exploration, geotechnical and environmental engineering and consulting services. SJB maintains an extensive inventory of field equipment and instrumentation including truck-mounted and all-terrain drilling rigs.

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SECTION 4
Qualifications of Resident Inspector(s)

Erie County Water Authority

Qualifications of Resident Inspector(s)

Nussbaumer & Clarke, Inc.'s (N&C) inspection staff includes 15 NICET Certified personnel and three Engineers-In-Training. Dan Calabrese, NICET IV is being proposed to provide inspection services for this project. Mr. Calabrese has over 33 years of experience and extensive working knowledge of the Ball Pump Station and site having recently provided such services for the NC-35 Ball Pump Station Substation Upgrade Project. Mr. Calabrese is familiar with ECWA safety and security protocols and has established a solid working relationship with ECWA staff key to this project.

Given the challenging site work required to successfully complete the NC-35 project, Mr. Calabrese is uniquely qualified to proactively consider the implications of the site staging and management needed to protect the critical underground infrastructure on the Ball Pump Station site.

Further, access and mobility within the Ball Pump Station itself is challenging. Based on experience working within the Ball Pump Station, Mr. Calabrese and N&C staff are aware that careful consideration must be given to the movement of equipment in and around the Ball Pump Station since there are many floor openings covered by grating which limits the load carrying ability in those areas.

In addition to Mr. Calabrese, should alternate/additional inspection personnel be required, Joseph Newland, NICET IV and James Grzeskiewicz, NICET IV are anticipated to be available to provide support for the project. Both Mr. Newland and Mr. Grzeskiewicz have successfully completed project with ECWA and understand ECWA requirements.

Client/Project	Construction Period	Contract Value ($)
Erie County Water Authority-NC-30 Sturgeon Point Water Treatment Plant - 35 KV Substation Upgrade (#2006.00113)	2009	$6,808,000
Erie County Water Authority-NC-33 (A,B,C) - Standby Power Generators (#2010.00106)	2010 - 2011 2013	$1,600,000
Erie County Water Authority-NC-34 Sturgeon Point Raw Water Pump Station (#2015.00175)	2017 - 2018	$3,512,506
Erie County Water Authority-NC-35 Ball Pump Station - New Electrical Substation (#2016.00238)	2018 - Ongoing	$5,750,000
Erie County Water Authority-NC-36 Water System Improvements 2017/2018 [T-Cheektowaga & T-Clarence] (#2017.00090)	2018 - 2019	$2,000,000
City of Buffalo-DPW-Div of Water-Pump Equip Rehab at Ward Filter Plant (#93000257)	2016	$3,977,225
City of Buffalo-DPW-Div of Water-Manhattan Ave Pump Station Improvements - Phase 4 & 5 (#93002139)	2019	$1,427,500
Chautauqua Utility District-Chautauqua Utility District - WWTP Rehabilitation Design	2017 - 2018	$7,489,550
Village of Little Valley-Wastewater Treatment Plant Upgrades	2018 - 2019	$3,889,300
City of Lockport-Water Treatment Plant Intake Crib Repair and Screen Replacement	2017 - 2018	$1,000,000
City of Lockport-Raw Transmission Main Replacement	2019 - near completion	$7,200,000
City of North Tonawanda-Standby Generator Replacement - Water Pumping Station	2019 - Ongoing	$1,500,000

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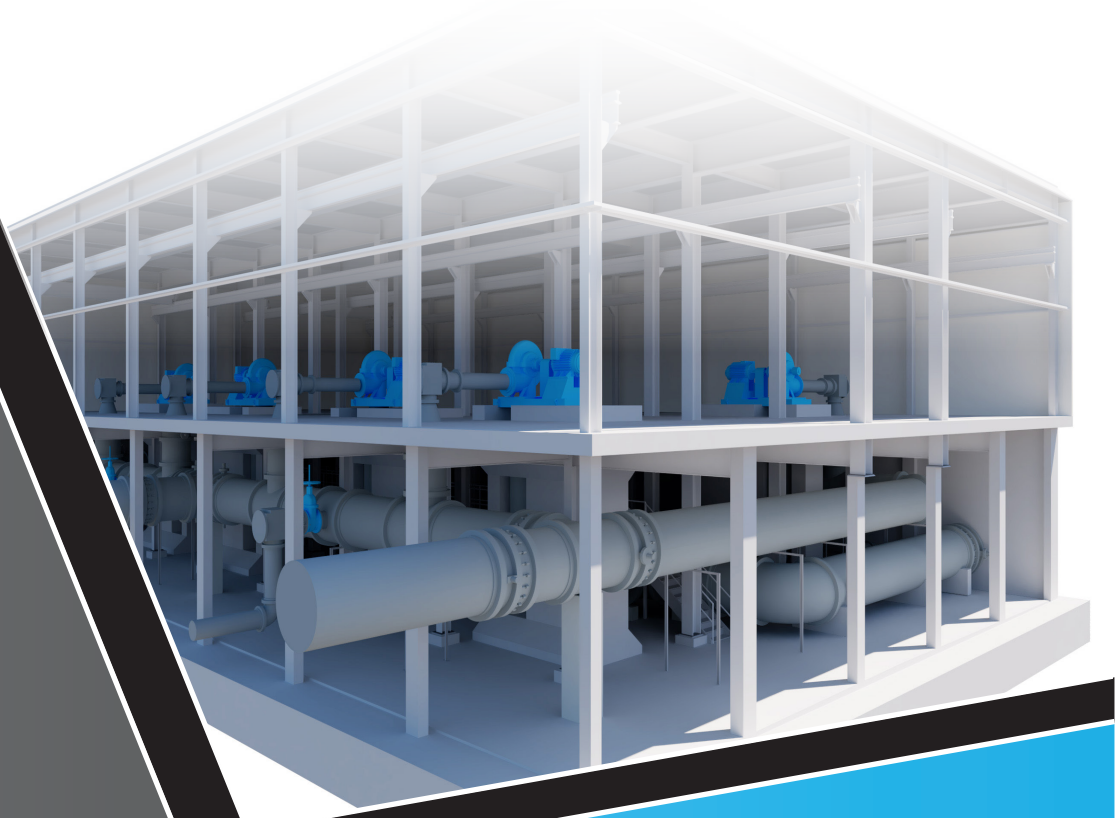
SECTION 5
Work Performed for ECWA In 2017, 2018 and 2019



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Erie County Water Authority

Work Performed for ECWA in 2017, 2018 and 2019

OUR HISTORY WITH ECWA

Our Buffalo office was established to provide service to ECWA, whose relationship with Arcadis began in the mid-1960s with a contract to prepare a water supply master plan. This project included a phased program for rehabilitating several treatment plants and pumping stations. The assignment grew into several design and construction phase projects to expand, and later high rate the SPWTP and then design of a new VDWTP to satisfy growing demands in the system.

We have since performed 80 contracts for ECWA, and we look forward to the opportunity to continue to provide nationally recognized expertise to you via our qualified local staff. Listed below are the most recent services which Arcadis has performed for ECWA from 2017 to 2019.

Optimal Corrosion Control Treatment Study, 2017–2019

ECWA retained Arcadis to perform an evaluation of its existing corrosion control practices and perform an updated corrosion control desktop evaluation to address the current water quality at the VDWTP and SPWTP. ECWA last conducted a corrosion control evaluation in 1994 (Bench-Scale Corrosion Control Study, EE&T,1994). The results of that study concluded that ECWA's then and still corrosion control strategy of adjusting the finished water pH to approximately eight was effective and no changes were necessary unless ECWA were to implement enhanced coagulation. The main objectives of this project were to evaluate the impacts of various system changes since 1995 on corrosion control treatment effectiveness and ensure ECWA continues to provide the safest water practical to its more than 500,000 customers.

The study considered the following impacts to corrosion control effectiveness:

- Source and finished water quality changes.
- Changes in system operation on corrosion control treatment.
- Changes in pipe materials inventories (i.e., different pipe materials).
- Blending of water from the City of Buffalo or Town of Tonawanda during water supply emergencies.
- Primary corrosion control mechanism (i.e., carbonate passivation versus lead (IV) scales).

Data and physical samples were collected from ECWA, Town of Tonawanda and City of Buffalo in 2017 and early 2018. Samples were analyzed at a University of Florida laboratory by Arcadis' subconsultant Cornwell Engineering using advanced materials testing equipment and procedures. A series of meetings and workshops were held with ECWA to establish priorities for evaluating corrosion control treatment alternatives. Each alternative was fully reviewed and evaluated using Rothberg, Tamburini and Winsor (RTW) modeling, Power Business Intelligence, and existing GIS-related data. Summaries of each alternative were developed in the context of current regulatory, academic and industry understanding of corrosion control treatment. A final report was submitted to ECWA in January 2020.

Ball Pump Station Capital Improvement Program, 2018–2019

ECWA retained Arcadis to provide a 15-year capital improvement program (CIP) to develop recommended annual improvements for the first five years with long-term improvements for years six through 15. The Arcadis team completed the on-site field investigations and condition assessments of the existing equipment, structures, buildings, process piping, yard piping, and supporting facilities to evaluate their current function and estimating remaining useful life. The assessments also included a performance evaluation conducted with ECWA personnel to understand operational concerns that are not readily evident from a physical inspection.

Another part of the CIP development was a hydraulic evaluation of the pumps to develop alternatives for improving reliability, increasing energy efficiency, and operational flexibility. This work included a review of five years of operational SCADA data to understand current operating practices. It also included an analysis of system demands under average day, max day, and peak hour conditions and pump combinations needed to meet those demands now and in the future. Recommendations included additional variable frequency drives and pump replacements to provide more energy efficient pumping systems that will also increase operational flexibility.

Arcadis submitted the final CIP in early 2020 that incorporated all prioritization scoring, hydraulic analyses, alternatives, evaluation and final rankings. Going forward, as needs and budgets change, ECWA will be able to select projects to accelerate or defer to confidently understand and manage the overall risk profile of ECWA's water system.

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SECTION 6
Current Remaining Workload with EWCA

Erie County Water Authority

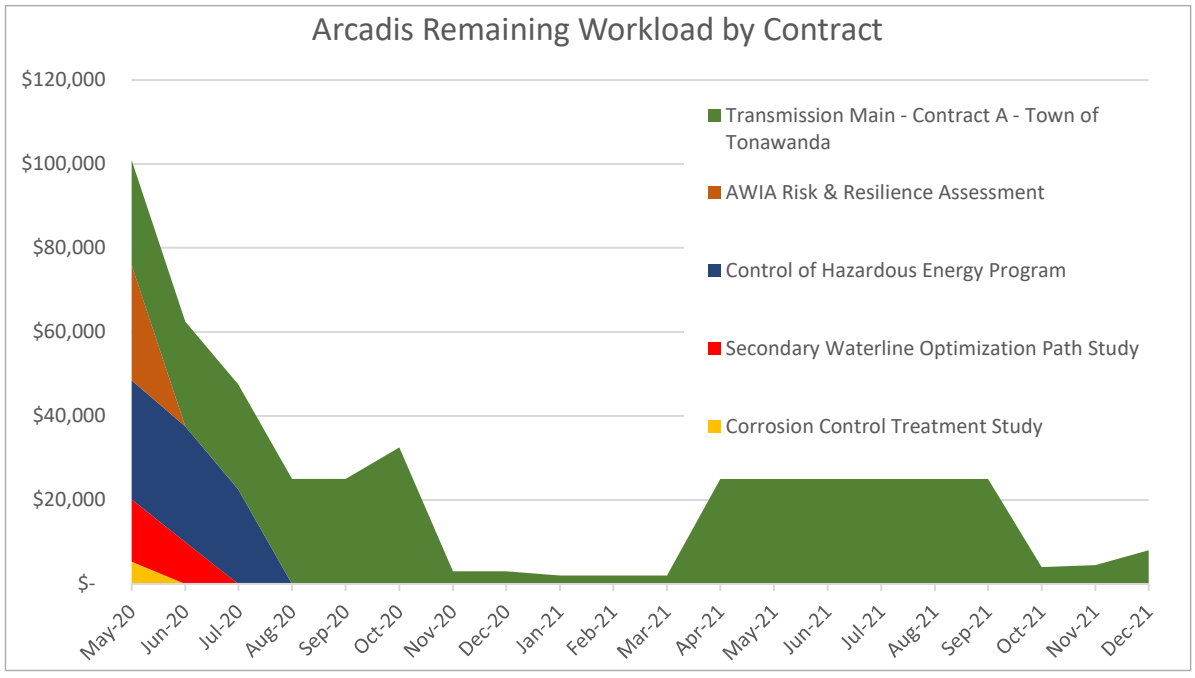
Current Remaining Workload with ECWA

Arcadis actively reviews our workload and staffing assignments to ensure that we are ***proactively*** planning and making decisions on who works on what so that ***we meet ALL of our clients' project deliverables*** instead of choosing weekly priorities. This not only provides schedule assurance to our clients but also ensures that we are able to complete vital quality reviews so that ***YOUR schedule is maintained and YOUR time is respected***.

The table below provides a summary of Arcadis' remaining workload directly with ECWA, including key staff who are assigned on each project. We also have reviewed these projects upcoming deliverables and project schedules and developed a cumulative cash flow estimate that shows the vast majority of these projects will be completed in the Spring of 2020.

Contract No.	Contract Name	Contract Amount	% Complete at end of April 2020	Remaining Contract Capacity	Key Staff
MP-79	Corrosion Control Treatment Study	$283,700	98%	$6,000	Slabaugh
MP-81	Secondary Waterline Optimization Path Study	$83,000	70%	$24,900	Seider, Salvagno
MP-82	Control of Hazardous Energy Program	$223,900	65%	$78,365	Salvagno, Shafer
MP-83	AWIA Risk & Resilience Assessment	$183,000	85%	$27,450	Barnes, Delzio
MP-84	Transmission Main - Contract A - Town of Tonawanda	$386,000	10%	$347,400	Seider, DeWyer

Our project team has availability NOW to support the Ball Pump Station Phase I Rehabilitation.



Our motto is "to deliver world-class results locally" — this means that while we understand the importance of local relationships, we also are committed to delivering ***ALL*** of Arcadis' resources. We have routinely done this for ECWA, including on the Corrosion Control Treatment Study, AWIA Risk & Resilience Assessment and others and will do so again here.

We are fortunate that our Buffalo, NY office with more than 45+ staff (over 50% of which have direct ECWA project experience) have ***exceptional relevant experience*** for this project, including Dan Seider, Mike Chirico, Mark Lenz, Tim Shafer, Jason Williams, Matt Welshans, John Salvagno, and others. However, they will also be supported by Freddy Betancourt, Matt Czora, Greg Moore, Alex Misiaszek, Ryan Kowalski and others who will again bring valuable insights and lessons learned from projects outside of Buffalo.

Optimal Corrosion Control Treatment Study, Coupon Testing Special Services, 2019–2020

ECWA retained Arcadis to perform an evaluation of its existing corrosion control practices and perform an updated corrosion control desktop evaluation to address the current water quality at the VDWTP and SPWTP. The main objectives of this project were to evaluate the impacts of various system changes since 1995 on corrosion control treatment effectiveness and ensure ECWA continues to provide the safest water practical to its more than 500,000 customers.

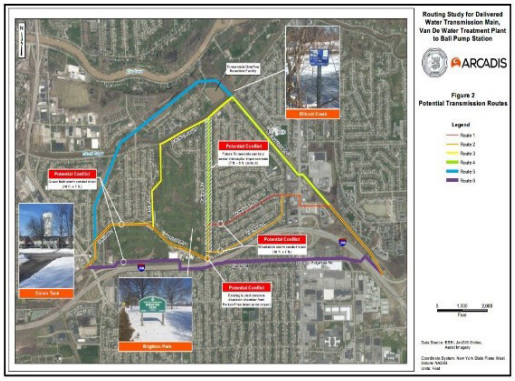
Based on recommendations provided in the final report, Corrosion Control Treatment Desktop Evaluation submitted in January 2020, Arcadis with subconsultant Cornwell Engineering Group (Cornwell) is currently completing coupon testing to achieve several objectives, namely:

- Evaluate various orthophosphate doses at two different pH values using ECWA water (Phase 1).
- Assess the impact of blending Buffalo water with ECWA water at a range of blend ratios (Phase 2).

The scope of work includes coupon testing conducted by Cornwell at the Cornwell Laboratory in Newport News, VA and the development of a technical memorandum prepared by Cornwell and Arcadis. Most Phase 1 testing is complete or will conclude shortly. Phase 2 has been completed and results are being summarized for ECWA. Following the conclusion of all testing procedures, a technical memorandum will be submitted for review to ECWA.

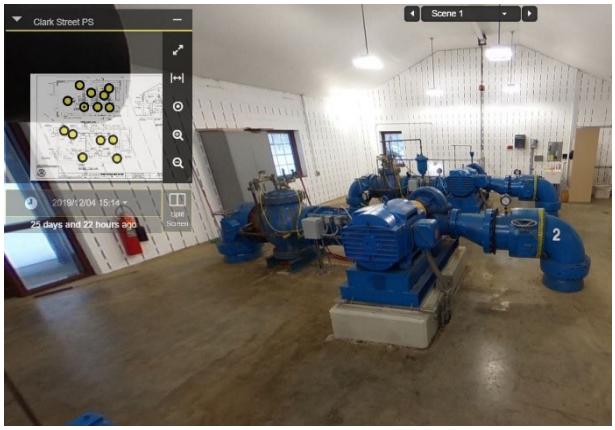
Routing Study for Delivered Water Transmission Main, VDWTP to Ball Pump Station, 2019–2020

ECWA retained Arcadis to complete a routing study that identifies the best option for completing the second transmission main from VDWTP to Ball Pump Station. To ensure that this approach addresses both the technical and human elements of construction, Arcadis is using digital tools to organize and analyze large volumes of data from diverse sources. The Arcadis team has digitized all received utility information from the New York State Dig Safely program to GIS compatible shapefiles and developed a unique decision support system, or scoring tool, to describe non-cost criteria. This analysis is being supported by traditional (i.e., AACE Class 4) cost estimating techniques. Arcadis has completed stakeholder meetings with the Town of Tonawanda and National Grid. Two workshops have been held with the ECWA to review the latest cost and non-cost criteria for each routing alternative. The project deliverable will be a report that will serve as a benchmark for future transmission main design and construction efforts in this study area.



Control of Hazardous Energy Program, 2019–2020

ECWA retained Arcadis to conduct an update to their Control of Hazardous Energy Program, also referred to as a Lockout/Tagout (LOTO) program. The project includes LOTO documentation for approximately 2,500 energized assets across ECWA owned water treatment facilities, tanks, and pumping stations. The project also includes developing an electrical policy to classify and protect employees from electrical hazards. Digital applications include Fulcrum, a data collection platform that provides field staff with customizable mobile forms, HoloBuilder, a 360-degree reality capture solution, and Power Business Intelligence, a data visualization tool. Fulcrum is being used by field staff to collect, document and submit asset information, and develop the detailed LOTO procedures. HoloBuilder is used to capture 360-degree photos spatially linked on the facility's floorplan. A Power Business Intelligence dashboard was created at the project onset to update the ECWA, field, and office teams of project status across the various facilities and included automated data refreshes, geospatial mapping and field documented LOTO procedures for office staff review. The use of these applications provides a complete data life cycle that improves coordination, documentation and collaboration. Arcadis has completed over 1,000 LOTO procedures and are working with ECWA staff to finalize and submit the remaining procedures and project tasks.



AWIA – Risk and Resilience Assessment, 2020

ECWA retained Arcadis to support completion of the Risk and Resilience Assessment (RRA) required by the 2018 American Water Infrastructure Act (AWIA). This work must be completed before March 31, 2020. Arcadis is following the AWWA J100-10 Standard as we work with ECWA staff to identify critical assets, characterize threats, analyze consequences, assess vulnerability and threats and then calculate an overall risk/resilience assessment and management plan. The project covers both ECWA's physical assets and also looks at business continuity and cyber risks as well. The project is being completed on a fast-track basis (two months) using online survey tools, secure data sharing, facilitated workshops, site visits and Arcadis developed Power Business Intelligence tools to securely and efficiently complete the project.

Transmission Main – Contract A – Town of Tonawanda, 2020–2021

ECWA retained Arcadis to design a new 48-inch diameter transmission main from the southernmost point on Brookside Terrace West (in the City of Tonawanda) to a point west of Military Road (in the Town of Tonawanda). This new transmission main will parallel the existing 48-inch transmission main and increase redundancy and reliability. This project builds upon the Routing Study which Arcadis is currently completing. Design will occur in 2020 and Construction will be completed in 2021. both ECWA's physical assets and also looks at business continuity and cyber risks as well.

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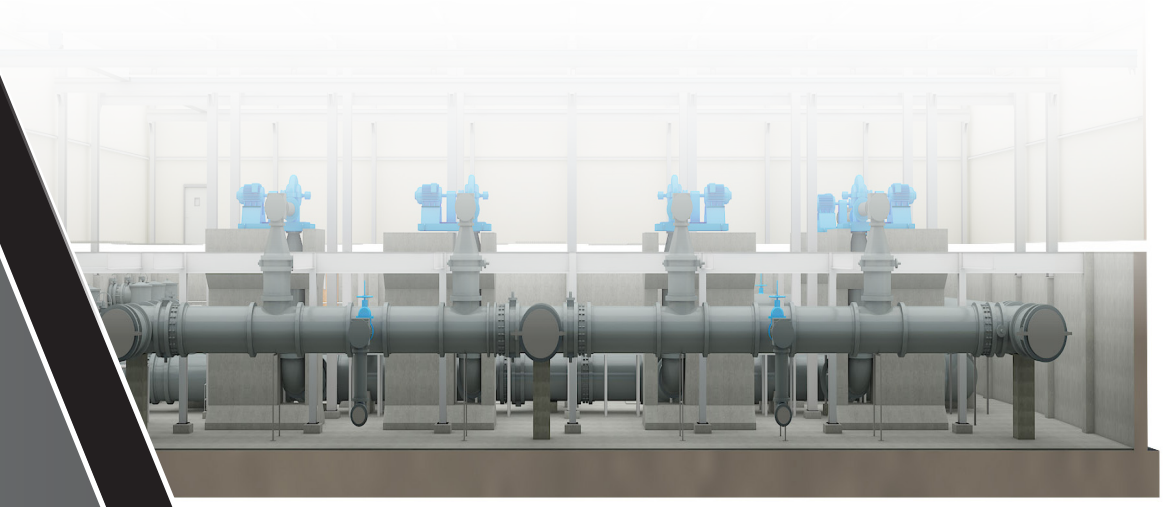
SECTION 7
Required Forms



Erie County Water Authority

Required Forms

Our completed forms are included next.

FORM A

Offerer's Affirmation of Understanding of, and Agreement to Comply with, the Permissible Contact Requirements During the Restricted Period

Instructions:

The Erie County Water Authority (the "Authority") is a government entity, as that term is defined in State Finance Law §§ 139-j(1)(a) and 139-k(1)(a). The Authority must obtain a written affirmation of understanding and agreement to comply with procedures regarding permissible contacts with the Authority in the restricted period for a procurement contract in accordance with State Finance Law §139−j and §139−k. It is required that this affirmation be obtained as early as possible in the procurement process, but no later than when the Offerer submits its proposal.

Offerer affirms that it understands and agrees to comply with the procedures of the Authority relative to permissible contacts as required by State Finance Law §139−j(3) and §139−j(6)(b).

By: _____ Date: May 7, 2020

Name: Mark Lenz, PE

Title: Senior Vice President

Contractor Name: Arcadis of New York, Inc.

Contractor Address: 50 Fountain Plaza, Suite 600, Buffalo, NY 14202

FORM B

Offerer's Certification of Compliance
With State Finance Law §139−k(5)

Instructions:

The Erie County Water Authority (the "Authority") is a government entity, as that term is defined in State Finance Law §§ 139-j(1)(a) and 139-k(1)(a). The Authority must obtain a Certification that the information submitted for a procurement contract is complete, true, and accurate regarding any prior findings of non-responsibility, such as non-responsibility pursuant to State Finance Law §139−j. The Offerer must agree to sign the Certification, under penalty of perjury, and to provide the Certification to the Authority. The Certification should be obtained as early as possible in the process, but no later than when an Offerer submits its proposal.

Offerer Certification:

I certify that all information provided to the Authority relating to the awarding of a procurement contract is complete, true, and accurate.

By: _____ Date: May 7, 2020

Name: Mark Lenz, PE

Title: Senior Vice President

Contractor Name: Arcadis of New York, Inc.

Contractor Address: 50 Fountain Plaza, Suite 600, Buffalo, NY 14202

FORM C

Offerer's Disclosure of Prior Non-Responsibility Determinations

Background:

The Erie County Water Authority (the "Authority") is a government entity, as that term is defined in State Finance Law §§ 139-j(1)(a) and 139-k(1)(a). New York State Finance Law §139−k(2) obligates the Authority to obtain specific information regarding prior non-responsibility determinations with respect to State Finance Law §139−j. In accordance with State Finance Law §139−k, an Offerer must be asked to disclose whether there has been a finding of non-responsibility made within the previous four (4) years by any Governmental Entity due to: (a) a violation of State Finance Law §139−j; or (b) the intentional provision of false or incomplete information to a Government Entity.

The terms "Offerer" and "Governmental Entity" are defined in State Finance Law §§139−j(1). and §139−k(1), These sections also set forth detailed requirements about the restrictions on contacts during the procurement process. A violation of State Finance Law §139−j includes, but is not limited to, an impermissible contact during the restricted period (for example, contacting a person or entity other than the designated contact person, when such contact does not fall within one of the exemptions).

As part of its responsibility determination, State Finance Law §139−k(3) mandates consideration of whether an Offerer fails to timely disclose accurate or complete information regarding the above non-responsibility determination. In accordance with law, no Procurement Contract shall be awarded to any Offerer that fails to timely disclose accurate or complete information under this section, unless a finding is made that the award of the Procurement Contract to the Offerer is necessary to protect public property or public health safety, and the Offerer is the only source capable of supplying the required Article of Procurement, as that term is defined in State Finance Law §§ 139-j(1)(b) and 139-k(1)(b), within the necessary timeframe. See State Finance Law §139−j(10)(b) and §139−k(3).

Instructions:

The Authority must include a disclosure request regarding prior non-responsibility determinations in accordance with State Finance Law §139−k in its solicitation of proposals or bid documents or specifications or contract documents, as applicable, for procurement contracts. The attached form is to be completed and submitted by the individual or entity seeking to enter into a Procurement Contract. It shall be submitted to the Authority conducting the Governmental Procurement no later than when the Offerer submits its proposal.

FORM C (Continued)

Offerer's Disclosure of Prior Non-Responsibility Determinations

Name of Individual or Entity Seeking to Enter into the Procurement Contract:

Arcadis of New York, Inc.

Address: 50 Fountain Plaza, Suite 600, Buffalo, NY 14202

Name and Title of Person Submitting this Form: Mark Lenz, PE, Senior Vice President

Contract Procurement Number: 202000046

Date: May 7, 2020

1. Has any Governmental Entity made a finding of non-responsibility regarding the individual or entity seeking to enter into the Procurement Contract in the previous four years? (Please circle): (No) Yes

   If yes, please answer the next questions:

2. Was the basis for the finding of non-responsibility due to a violation of State Finance Law §139–j (Please circle): No Yes

3. Was the basis for the finding of non-responsibility due to the intentional provision of false or incomplete information to a Governmental Entity? (Please circle) No Yes

4. If you answered yes to any of the above questions, please provide details regarding the finding of non-responsibility below.

Governmental Entity: _____

Date of Finding of Non-Responsibility: _____

Basis of Finding of Non-Responsibility: _____

(Add additional pages as necessary)

FORM C (Continued)

5. Has any Governmental Entity or other governmental agency terminated or withheld a Procurement Contract with the above-named individual or entity due to the intentional provision of false or incomplete information? (Please circle): (No) Yes

6. If yes, please provide details below.
   Governmental Entity: _____

   Date of Termination or Withholding of Contract: _____

   Basis of Termination or Withholding:

   _____
   _____
   _____
   _____
   _____
   _____
   _____
   _____

   (Add additional pages as necessary)

Offerer certifies that all information provided to the Erie County Water Authority with respect to State Finance Law §139−k is complete, true, and accurate.

By: _____ Date: May 7, 2020
Signature

Name: Mark Lenz, PE

Title: Senior Vice President

CONTRACT TERMINATION PROVISION

Instructions:

A Contract Termination Provision will be included in each procurement contract governed by State Finance Law §139−k. New York State Finance Law §139-k(5) provides that every procurement contract award subject to the provisions of State Finance Law §§139−k and 139−j shall contain a provision authorizing the governmental entity to terminate the contract in the event that the certification is found to be intentionally false or intentionally incomplete. This statutory contract language authorizes, but does not mandate, termination. "Government Entity" and "procurement contract" are defined in State Finance Law §§ 139 j(1) and 139−k(l).

This required clause will be included in a covered procurement contract.

A sample of the Termination Provision is included below. If a contract is terminated in accordance with State Finance Law §139−k(5), the Erie County Water Authority, as a governmental entity, is required to include a statement in the procurement record describing the basis for any action taken under the termination provision.

Sample Contract Termination Provision

The Erie County Water Authority, as a governmental entity, reserves the right to terminate this contract in the event it is found that the certification filed by the Offerer in accordance with New York State Finance Law §139−k was intentionally false or intentionally incomplete. Upon such finding, the Authority may exercise its termination right by providing written notification to the Offerer in accordance with the written notification terms of this contract.

SECTION 139-L OF THE STATE FINANCE LAW
STATEMENT RELATING TO SEXUAL HARASSMENT POLICY

1. "Bidder" has the same meaning as the term, "Offerer," as that terms is defined in State Finance Law § 139-k(1)(h), and includes anyone who submits a bid or proposal.

2. Every proposal or bid hereafter made and submitted to the Erie County Water Authority, where competitive bidding or a sealed proposal is required by statute, rule or regulation, for work or services performed or to be performed or goods sold or to be sold, shall contain the following statement subscribed by the Bidder and affirmed by such Bidder as true under penalty of perjury:

SEXUAL HARASSMENT BIDDING CERTIFICATION

(a) "By submission of this bid/proposal, EACH BIDDER AND EACH PERSON SIGNING ON BEHALF OF ANY BIDDER CERTIFIES, AND IN THE CASE OF A JOINT BID EACH PARTY THERETO CERTIFIES AS TO ITS OWN ORGANIZATION, under penalty of perjury, that the Bidder has and has implemented a written policy addressing sexual harassment prevention in the workplace and provides annual sexual harassment prevention training to all its employees. Such policy shall, at a minimum, meet the requirements of Section two hundred one-g of the Labor Law."

3. A bid/proposal shall not be considered for award nor shall any award be made to a Bidder who has not complied with subdivision one of this section; provided, however, that if in any case the Bidder cannot make the foregoing certification, the Bidder shall so state and shall furnish with the bid/proposal a signed statement which sets forth in detail the reasons therefore.

The undersigned CERTIFIES, under penalty of perjury, that he is authorized to make this bid/proposal and execute this statement on sexual harassment; that he is familiar with the statements contained in ¶2(a) of this document, as well as the provisions of State Finance Law §139-L and Labor Law §201-g, and such statements are true and have been complied with by the Bidder.

Arcadis of New York, Inc.

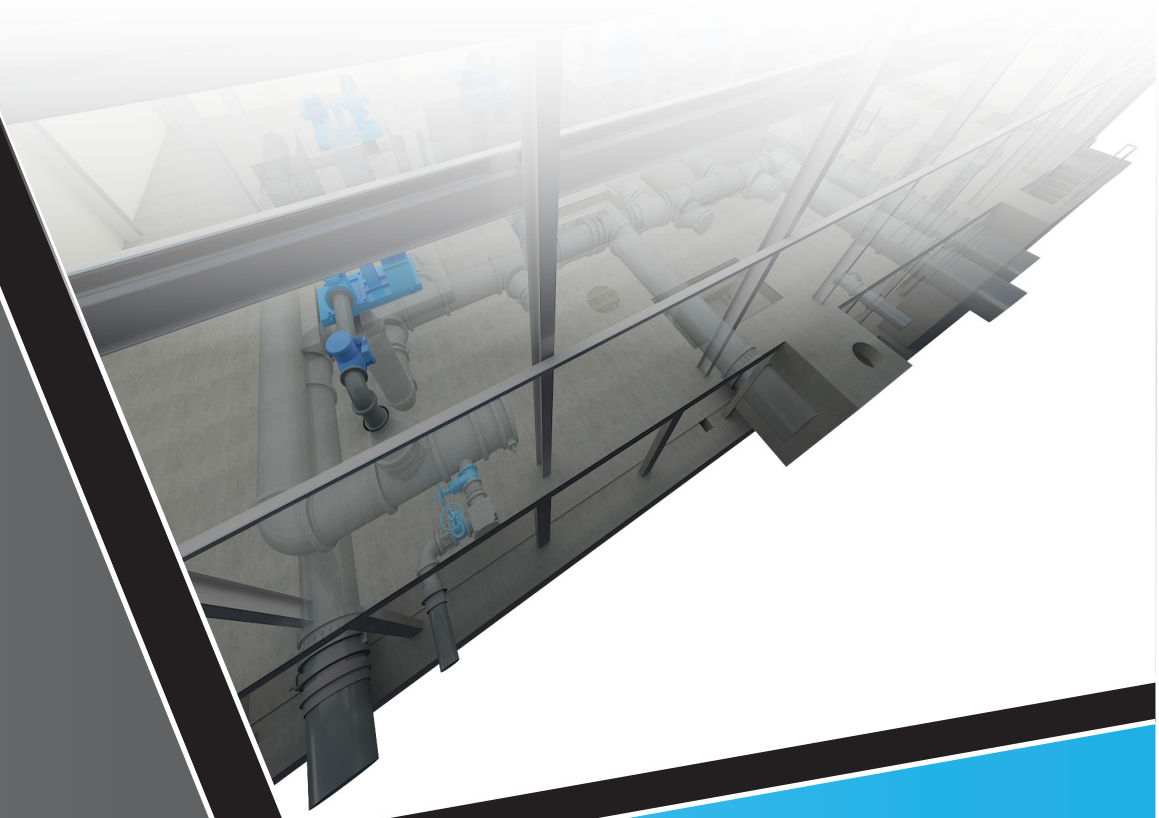
(Name of Individual, Partnership or Corporation)

By _____

(Person authorized to sign)

ARCADIS

SECTION 8
Proof of Insurance



Erie County Water Authority

Proof of Insurance

Please find our insurance certificates on the following pages.

CERTIFICATE OF LIABILITY INSURANCE

DATE(MM/DD/YYYY)
03/27/2020

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must have ADDITIONAL INSURED provisions or be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

PRODUCER
Aon Risk Services South, Inc.
Franklin TN Office
501 Corporate Centre Drive
Suite 300
Franklin TN 37067 USA

CONTACT NAME:
PHONE (A/C. No. Ext): (866) 283-7122 **FAX (A/C. No.):** 800-363-0105
E-MAIL ADDRESS:

INSURER(S) AFFORDING COVERAGE		NAIC #
INSURER A:	Greenwich Insurance Company	22322
INSURER B:	XL Specialty Insurance Co	37885
INSURER C:	XL Insurance America Inc	24554
INSURER D:		
INSURER E:		
INSURER F:		

INSURED
Arcadis of New York, Inc.
One Lincoln Center
110 West Fayette St., Suite 300
Syracuse NY 13202 USA

COVERAGES **CERTIFICATE NUMBER:** 570078928179 **REVISION NUMBER:**

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS. **Limits shown are as requested**

INSR LTR	TYPE OF INSURANCE	ADDL INSD	SUBR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS	
A	X COMMERCIAL GENERAL LIABILITY CLAIMS-MADE / X OCCUR GEN'L AGGREGATE LIMIT APPLIES PER: POLICY / X PRO-JECT / X LOC OTHER:			GEC001076118 General Liability SIR applies per policy terms & conditions	10/01/2019	10/01/2020	EACH OCCURRENCE DAMAGE TO RENTED PREMISES (Ea occurrence) MED EXP (Any one person) PERSONAL & ADV INJURY GENERAL AGGREGATE PRODUCTS - COMP/OP AGG	$1,000,000 $1,000,000 $10,000 $1,000,000 $2,000,000 $2,000,000
B	AUTOMOBILE LIABILITY X ANY AUTO OWNED AUTOS ONLY / SCHEDULED AUTOS HIRED AUTOS ONLY / NON-OWNED AUTOS ONLY			AEC001075818 Auto (AOS)	10/01/2019	10/01/2020	COMBINED SINGLE LIMIT (Ea accident) BODILY INJURY (Per person) BODILY INJURY (Per accident) PROPERTY DAMAGE (Per accident)	$1,000,000
B	X UMBRELLA LIAB / X OCCUR EXCESS LIAB / CLAIMS-MADE DED / X RETENTION $10,000			UEC001075918	10/01/2019	10/01/2020	EACH OCCURRENCE AGGREGATE	$1,000,000 $1,000,000
C B	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY ANY PROPRIETOR / PARTNER / EXECUTIVE OFFICER/MEMBER EXCLUDED? (Mandatory in NH) Y/N: N If yes, describe under DESCRIPTION OF OPERATIONS below	N / A		RWD943516314 AOS RWR943516714 AK, WI	10/01/2019 10/01/2019	10/01/2020 10/01/2020	X PER STATUTE / OTH-ER E.L. EACH ACCIDENT E.L. DISEASE-EA EMPLOYEE E.L. DISEASE-POLICY LIMIT	$1,000,000 $1,000,000 $1,000,000

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (ACORD 101, Additional Remarks Schedule, may be attached if more space is required)
Evidence of Insurance.

CERTIFICATE HOLDER

Arcadis of New York, Inc.
One Lincoln Center
110 West Fayette St., Suite 300
Syracuse NY 13202 USA

CANCELLATION

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS.

AUTHORIZED REPRESENTATIVE

Aon Risk Services South Inc.

Holder Identifier :

Certificate No : 570078928179

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CERTIFICATE OF LIABILITY INSURANCE

DATE(MM/DD/YYYY)
05/01/2020

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must have ADDITIONAL INSURED provisions or be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

PRODUCER
Aon Risk Services South, Inc.
Franklin TN Office
501 Corporate Centre Drive
Suite 300
Franklin TN 37067 USA

CONTACT NAME:
PHONE (A/C. No. Ext): (866) 283-7122
FAX (A/C. No.): (800) 363-0105
E-MAIL ADDRESS:

INSURER(S) AFFORDING COVERAGE		NAIC #
INSURER A:	Indian Harbor Insurance Company	36940
INSURER B:	Lexington Insurance Company	19437
INSURER C:		
INSURER D:		
INSURER E:		
INSURER F:		

INSURED
Arcadis of New York, Inc.
One Lincoln Center
110 West Fayette St., Suite 300
Syracuse NY 13202 USA

COVERAGES **CERTIFICATE NUMBER:** 570081618427 **REVISION NUMBER:**

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

Limits shown are as requested

INSR LTR	TYPE OF INSURANCE	ADDL INSD	SUBR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS	
	COMMERCIAL GENERAL LIABILITY						EACH OCCURRENCE	
	☐ CLAIMS-MADE ☐ OCCUR						DAMAGE TO RENTED PREMISES (Ea occurrence)	
							MED EXP (Any one person)	
							PERSONAL & ADV INJURY	
	GEN'L AGGREGATE LIMIT APPLIES PER:						GENERAL AGGREGATE	
	☐ POLICY ☐ PRO-JECT ☐ LOC						PRODUCTS - COMP/OP AGG	
	OTHER:							
	AUTOMOBILE LIABILITY						COMBINED SINGLE LIMIT (Ea accident)	
	☐ ANY AUTO						BODILY INJURY (Per person)	
	☐ OWNED AUTOS ONLY ☐ SCHEDULED AUTOS						BODILY INJURY (Per accident)	
	☐ HIRED AUTOS ONLY ☐ NON-OWNED AUTOS ONLY						PROPERTY DAMAGE (Per accident)	
	☐ **UMBRELLA LIAB** ☐ OCCUR						EACH OCCURRENCE	
	☐ **EXCESS LIAB** ☐ CLAIMS-MADE						AGGREGATE	
	☐ DED ☐ RETENTION							
	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY Y / N						☐ PER STATUTE ☐ OTH-	
	ANY PROPRIETOR / PARTNER / EXECUTIVE OFFICER/MEMBER EXCLUDED? ☐ **(Mandatory in NH)**	N / A					E.L. EACH ACCIDENT	
	If yes, describe under DESCRIPTION OF OPERATIONS below						E.L. DISEASE-EA EMPLOYEE	
							E.L. DISEASE-POLICY LIMIT	
A	Env Contr Poll			US00090310EO19A Professional & Pollution SIR applies per policy terms & conditions	06/01/2019	06/01/2020	Each Claim Annual Aggregate	$2,000,000 $2,000,000

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (ACORD 101, Additional Remarks Schedule, may be attached if more space is required)

RE: Evidence of Insurance.
For Professional Liability and Pollution Liability coverage, the Aggregate Limit is the total insurance available for claims presented within the policy period for all operations of the insured. The Limit will be reduced by payments of indemnity and expense.

CERTIFICATE HOLDER

Arcadis of New York, Inc.
One Lincoln Center
110 West Fayette St., Suite 300
Syracuse NY 13202 USA

CANCELLATION

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS.

AUTHORIZED REPRESENTATIVE

Aon Risk Services South Inc.

Holder Identifier :

Certificate No : 570081618427

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AGENCY CUSTOMER ID: 570000005571

LOC #:

ADDITIONAL REMARKS SCHEDULE

AGENCY	NAMED INSURED
Aon Risk Services South, Inc.	Arcadis of New York, Inc.
POLICY NUMBER	
See Certificate Number: 570081618427	
CARRIER / NAIC CODE	EFFECTIVE DATE:
See Certificate Number: 570081618427	

ADDITIONAL REMARKS

THIS ADDITIONAL REMARKS FORM IS A SCHEDULE TO ACORD FORM,

FORM NUMBER: ACORD 25 **FORM TITLE:** Certificate of Liability Insurance

INSURER(S) AFFORDING COVERAGE	NAIC #
INSURER	
INSURER	
INSURER	
INSURER	

ADDITIONAL POLICIES If a policy below does not include limit information, refer to the corresponding policy on the ACORD certificate form for policy limits.

INSR LTR	TYPE OF INSURANCE	ADDL INSD	SUBR WVD	POLICY NUMBER	POLICY EFFECTIVE DATE (MM/DD/YYYY)	POLICY EXPIRATION DATE (MM/DD/YYYY)	LIMITS	
	OTHER							
	[X] Claims-Made							
	[X] Professional Liabil							
	[X] and Contractors							
	[X] Pollution Liability							

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NEW YORK STATE | Workers' Compensation Board

CERTIFICATE OF INSURANCE COVERAGE
under the NYS DISABILITY AND PAID FAMILY LEAVE BENEFITS LAW

PART 1. To be completed by Disability and Paid Family Leave Benefits Carrier or Licensed Insurance Agent of that Carrier

1a. Legal Name & Address of Insured (use street address only)
Arcadis of New York
110 W. Fayette St. Suite 300
Syracuse, NY 13202

Work Location of Insured *(Only required if coverage is specifically limited to certain locations in New York State, i.e., Wrap-Up Policy)*

1b. Business Telephone Number of Insured
3154469120

1c. Federal Employer Identification Number of Insured or Social Security Number
161448024

2. Name and Address of Entity Requesting Proof of Coverage (Entity Being Listed as the Certificate Holder)
Erie County Water Authority
Attn: Molly Jo Musarra
295 Main St. Room 350
Buffalo, NY 14203

3a. Name of Insurance Carrier
CIGNA LIFE INSURANCE COMPANY OF NEW YORK

3b. Policy Number of Entity Listed in Box "1a"
NYD067857

3c. Policy effective period
1/1/2020 to 1/1/2021

4. Policy provides the following benefits:
- ☒ A. Both disability and paid family leave benefits.
- ☐ B. Disability benefits only.
- ☐ C. Paid family leave benefits only.

5. Policy covers:
- ☒ A. All of the employer's employees eligible under the NYS Disability and Paid Family Leave Benefits Law.
- ☐ B. Only the following class or classes of employer's employees: _____

Under penalty of perjury, I certify that I am an authorized representative or licensed agent of the insurance carrier referenced above and that the named insured has NYS Disability and/or Paid Family Leave Benefits insurance coverage as described above.

Marcelina E. Reilly

Date Signed December 16, 2019 By _____
(Signature of insurance carrier's authorized representative or NYS Licensed Insurance Agent of that insurance carrier)

Telephone Number 1-866-761-4236 Name and Title Underwriting Director

IMPORTANT: If Boxes 4A and 5A are checked, and this form is signed by the insurance carrier's authorized representative or NYS Licensed Insurance Agent of that carrier, this certificate is COMPLETE. Mail it directly to the certificate holder.

If Box 4B, 4C or 5B is checked, this certificate is NOT COMPLETE for purposes of Section 220, Subd. 8 of the NYS Disability and Paid Family Leave Benefits Law. It must be mailed for completion to the Workers' Compensation Board, Plans Acceptance Unit, PO Box 5200, Binghamton, NY 13902-5200.

PART 2. To be completed by the NYS Workers' Compensation Board (Only if Box 4C or 5B of Part 1 has been checked)

State of New York
Workers' Compensation Board

According to information maintained by the NYS Workers' Compensation Board, the above-named employer has complied with the NYS Disability and Paid Family Leave Benefits Law with respect to all of his/her employees.

Date Signed _____ By _____
(Signature of Authorized NYS Workers' Compensation Board Employee)

Telephone Number _____ Name and Title _____

Please Note: Only insurance carriers licensed to write NYS disability and paid family leave benefits insurance policies and NYS licensed insurance agents of those insurance carriers are authorized to issue Form DB-120.1. ***Insurance brokers are NOT authorized to issue this form.***

Additional Instructions for Form DB-120.1

By signing this form, the insurance carrier identified in Box 3 on this form is certifying that it is insuring the business referenced in box "1a" for disability and/or paid family leave benefits under the New York State Disability and Paid Family Leave Benefits Law. The Insurance Carrier or its licensed agent will send this Certificate of Insurance to the entity listed as the certificate holder in Box 2.

The insurance carrier must notify the above certificate holder and the Workers' Compensation Board within 10 days IF a policy is cancelled due to nonpayment of premiums or within 30 days IF there are reasons other than nonpayment of premiums that cancel the policy or eliminate the insured from coverage indicated on this Certificate. (These notices may be sent by regular mail.) Otherwise, this Certificate is valid for one year after this form is approved by the insurance carrier or its licensed agent, or until the policy expiration date listed in Box 3c, whichever is earlier.

This certificate is issued as a matter of information only and confers no rights upon the certificate holder. This certificate does not amend, extend or alter the coverage afforded by the policy listed, nor does it confer any rights or responsibilities beyond those contained in the referenced policy.

This certificate may be used as evidence of a Disability and/or Paid Family Leave Benefits contract of insurance only while the underlying policy is in effect.

Please Note: Upon the cancellation of the disability and/or paid family leave benefits policy indicated on this form, if the business continues to be named on a permit, license or contract issued by a certificate holder, the business must provide that certificate holder with a new Certificate of NYS Disability and/or Paid Family Leave Benefits Coverage or other authorized proof that the business is complying with the mandatory coverage requirements of the New York State Disability and Paid Family Leave Benefits Law.

DISABILITY AND PAID FAMILY LEAVE BENEFITS LAW

§220. Subd. 8

(a) The head of a state or municipal department, board, commission or office authorized or required by law to issue any permit for or in connection with any work involving the employment of employees in employment as defined in this article, and not withstanding any general or special statute requiring or authorizing the issue of such permits, shall not issue such permit unless proof duly subscribed by an insurance carrier is produced in a form satisfactory to the chair, that the payment of disability benefits and after January first, two thousand and twenty-one, the payment of family leave benefits for all employees has been secured as provided by this article. Nothing herein, however, shall be construed as creating any liability on the part of such state or municipal department, board, commission or office to pay any disability benefits to any such employee if so employed.

(b) The head of a state or municipal department, board, commission or office authorized or required by law to enter into any contract for or in connection with any work involving the employment of employees in employment as defined in this article and notwithstanding any general or special statute requiring or authorizing any such contract, shall not enter into any such contract unless proof duly subscribed by an insurance carrier is produced in a form satisfactory to the chair, that the payment of disability benefits and after January first, two thousand eighteen, the payment of family leave benefits for all employees has been secured as provided by this article.

ARCADIS

SECTION 9
Proposed Project Schedule

10334013 | COL

Erie County
Water Authority

Proposed Project Schedule

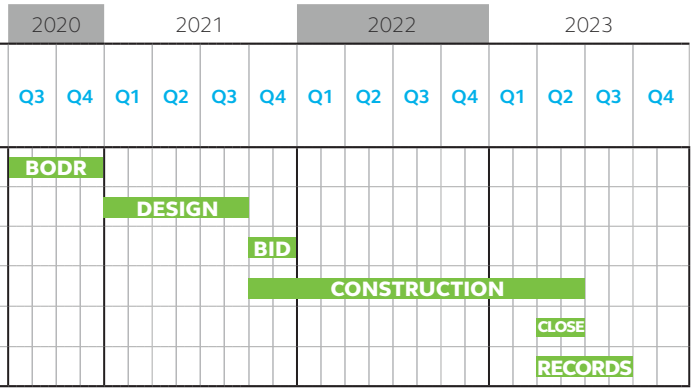
We understand that the development of the BODR and the design and construction for the Ball Pump Station Phase 1 Rehabilitation are priorities for ECWA. We believe our approach is efficient and effective in maintaining the desired schedule requested by ECWA while providing consistency amongst all tasks. Below we have provided a high-level schedule which highlights our major tasks with the detailed project schedule provided on the following page.

Please note the construction phasing accounts for limited work during the peak summer demand periods of Memorial Day through Labor Day. Only work that can be safely performed without risk of interruption to ECWA operations will be performed during this period.

*Arcadis has reviewed ECWA's milestones and we are confident based on our knowledge of ECWA's facilities, previous similar experience and availability of our key staff that we will be able to deliver **EARLY on all Contract Milestones.** Additionally, as we understand the importance of getting these improvements in place from an operational and capital spend perspective, we will quickly move Task 2 through detailed design in 2021 so that bidding and award can occur in Q4 and **all improvements can be operational before Memorial Day 2023.***

High-Level Schedule

PROJECT TASKS	ECWA Due Date	Arcadis Delivery Date
Basis of Design Report	1/1/2021	12/23/2020
Design Documents	9/28/2021	9/24/2021
Bidding	N/A	12/10/2021
Construction	N/A	5/22/2023
Construction Closeout	N/A	6/12/2023
Records and Program Updates	N/A	7/14/2023

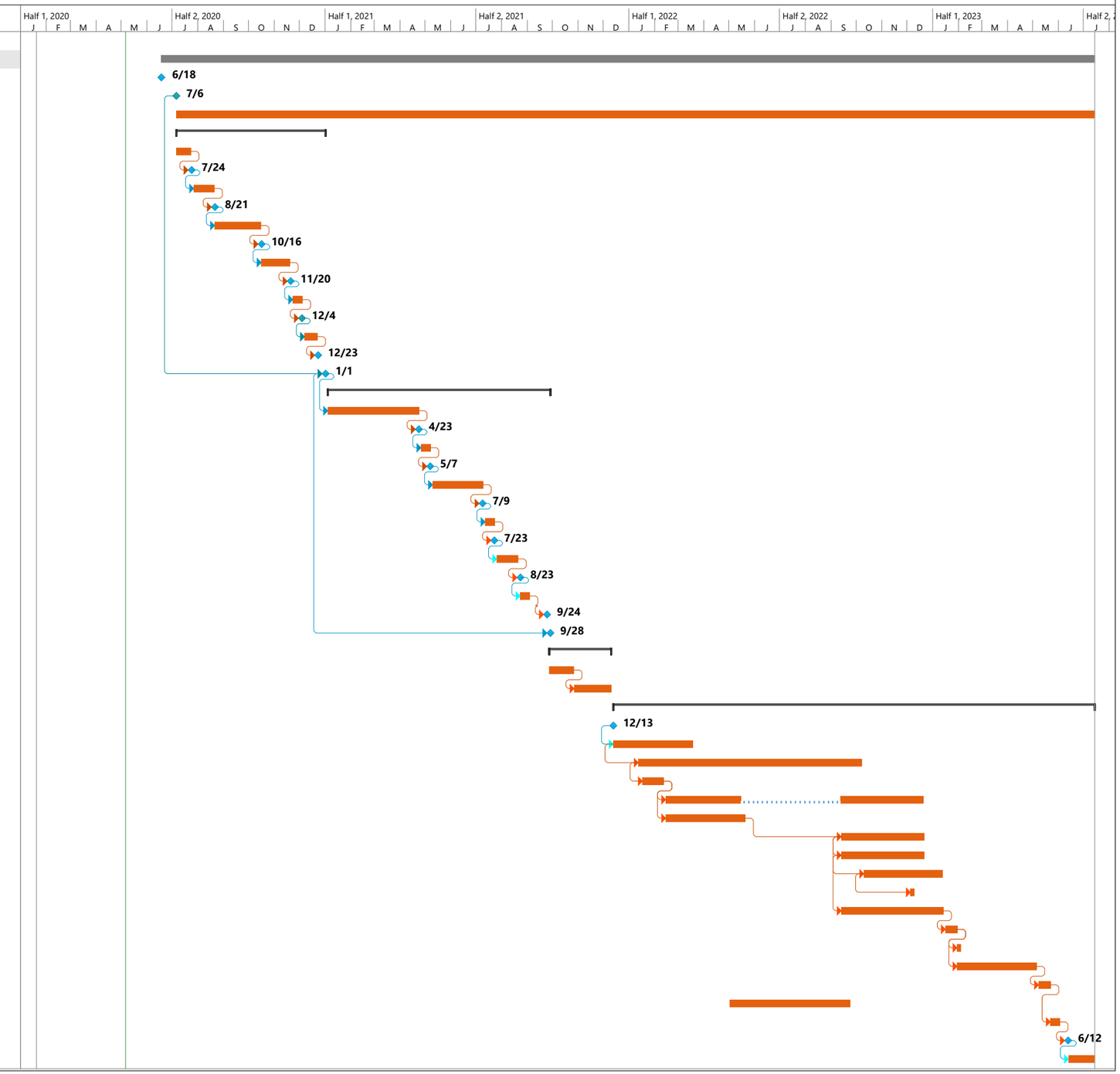


Erie County Water Authority

Erie County Water Authority Project No. 202000046
Ball Pump Station
Phase 1 Rehabilitation

ARCADIS Design & Consultancy for natural and built assets

ID	Task Name	Duration	Start	Finish
1				
2	**Project A - Ball Station Phase 1 Rehabilitation**	**1122 days**	**Thu 6/18/20**	**Fri 7/14/23**
3	Project Award	0 days	Thu 6/18/20	Thu 6/18/20
4	Notice to Proceed	0 days	Mon 7/6/20	Mon 7/6/20
5	Biweekly Progress Reports	1104 days	Mon 7/6/20	Fri 7/14/23
6	**BOD Report**	**180 days**	**Mon 7/6/20**	**Fri 1/1/21**
7	Information Review	18 days	Mon 7/6/20	Thu 7/23/20
8	Site Walkthrough & Kick Off Meeting	0 days	Fri 7/24/20	Fri 7/24/20
9	Process Design and Construction Sequencing	25 days	Mon 7/27/20	Thu 8/20/20
10	Progress Meeting #2	0 days	Fri 8/21/20	Fri 8/21/20
11	BODR Dwgs	56 days	Fri 8/21/20	Thu 10/15/20
12	Progress Meeting #3	0 days	Fri 10/16/20	Fri 10/16/20
13	Basis of Design Report Development	35 days	Fri 10/16/20	Thu 11/19/20
14	Submit Draft Basis of Design Report to ECWA	0 days	Fri 11/20/20	Fri 11/20/20
15	ECWA Review	12 days	Mon 11/23/20	Fri 12/4/20
16	Basis of Design Report Review Meeting	0 days	Fri 12/4/20	Fri 12/4/20
17	Finalize Basis of Design Report	16 days	Mon 12/7/20	Tue 12/22/20
18	Submit Final Basis of Design Report to ECWA	0 days	Wed 12/23/20	Wed 12/23/20
19	ECWA Contract Milestone (180 days from award)	0 days	Fri 1/1/21	Fri 1/1/21
20	**Detailed Design**	**268 days**	**Mon 1/4/21**	**Tue 9/28/21**
21	Develop 60% Contract Documents	110 days	Mon 1/4/21	Fri 4/23/21
22	Submit 60% Contract Documents	0 days	Fri 4/23/21	Fri 4/23/21
23	ECWA Review of 60% Contract Documents	12 days	Mon 4/26/21	Fri 5/7/21
24	60% Design Workshop	0 days	Fri 5/7/21	Fri 5/7/21
25	Develop 90% Contract Documents	61 days	Mon 5/10/21	Fri 7/9/21
26	Submit 90% Contract Documents	0 days	Fri 7/9/21	Fri 7/9/21
27	ECWA Review of 90% Contract Documents	12 days	Mon 7/12/21	Fri 7/23/21
28	90% Design Workshop	0 days	Fri 7/23/21	Fri 7/23/21
29	Develop 100% Contract Documents	26 days	Mon 7/26/21	Fri 8/20/21
30	Submit Application Package to ECHD	0 days	Mon 8/23/21	Mon 8/23/21
31	ECHD Review of Application	12 days	Mon 8/23/21	Fri 9/3/21
32	Submit Final Bid Documents to ECWA	0 days	Fri 9/24/21	Fri 9/24/21
33	ECWA Contract Milestone (270 days from final BODR)	0 days	Tue 9/28/21	Tue 9/28/21
34	**Bidding & Contract Award**	**75 days**	**Mon 9/27/21**	**Fri 12/10/21**
35	Bidding Services	30 days	Mon 9/27/21	Tue 10/26/21
36	Contract Award, Insurance & Signing	45 days	Wed 10/27/21	Fri 12/10/21
37	**Construction Services**	**579 days**	**Mon 12/13/21**	**Fri 7/14/23**
38	Contractor NTP	0 days	Mon 12/13/21	Mon 12/13/21
39	Submittals and Contractor Prep	96 days	Mon 12/13/21	Fri 3/18/22
40	Equipment Fabrication & Delivery	269 days	Wed 1/12/22	Fri 10/7/22
41	Contractor Mobilization	26 days	Mon 1/17/22	Fri 2/11/22
42	Phase 1 - Discharge Piping	191 days	Mon 2/14/22	Tue 12/20/22
43	Phase 2 - South Tank 48" Piping and Valves	96 days	Mon 2/14/22	Fri 5/20/22
44	Phase 3 - North Tank 48" Piping and Valves	100 days	Tue 9/13/22	Wed 12/21/22
45	Phase 4 - 48" & 54" Yard Piping to Pump Station	100 days	Tue 9/13/22	Wed 12/21/22
46	Phase 5 -New VFDs, Room, HVAC	95 days	Mon 10/10/22	Thu 1/12/23
47	Phase 6 - Bus-5-B-2 Retrofit	5 days	Mon 12/5/22	Fri 12/9/22
48	Phase 7 - Install New Pumps 3 and 4	123 days	Tue 9/13/22	Fri 1/13/23
49	Performance test	15 days	Mon 1/16/23	Mon 1/30/23
50	Phase 8 - Bus-5-A-1 Retrofit	5 days	Mon 1/30/23	Fri 2/3/23
51	Phase 9 - Install New Pumps 1, 2 and 5	96 days	Mon 1/30/23	Fri 5/5/23
52	Performance test	15 days	Mon 5/8/23	Mon 5/22/23
53	Phase 10 - Misc. Improvements	145 days	Mon 5/2/22	Fri 9/23/22
54	Punchlist	12 days	Mon 5/22/23	Fri 6/2/23
55	Final Walkthrough and Project Closeout	0 days	Mon 6/12/23	Mon 6/12/23
56	Submit ECWA Program / Procedure Updates	32 days	Tue 6/13/23	Fri 7/14/23



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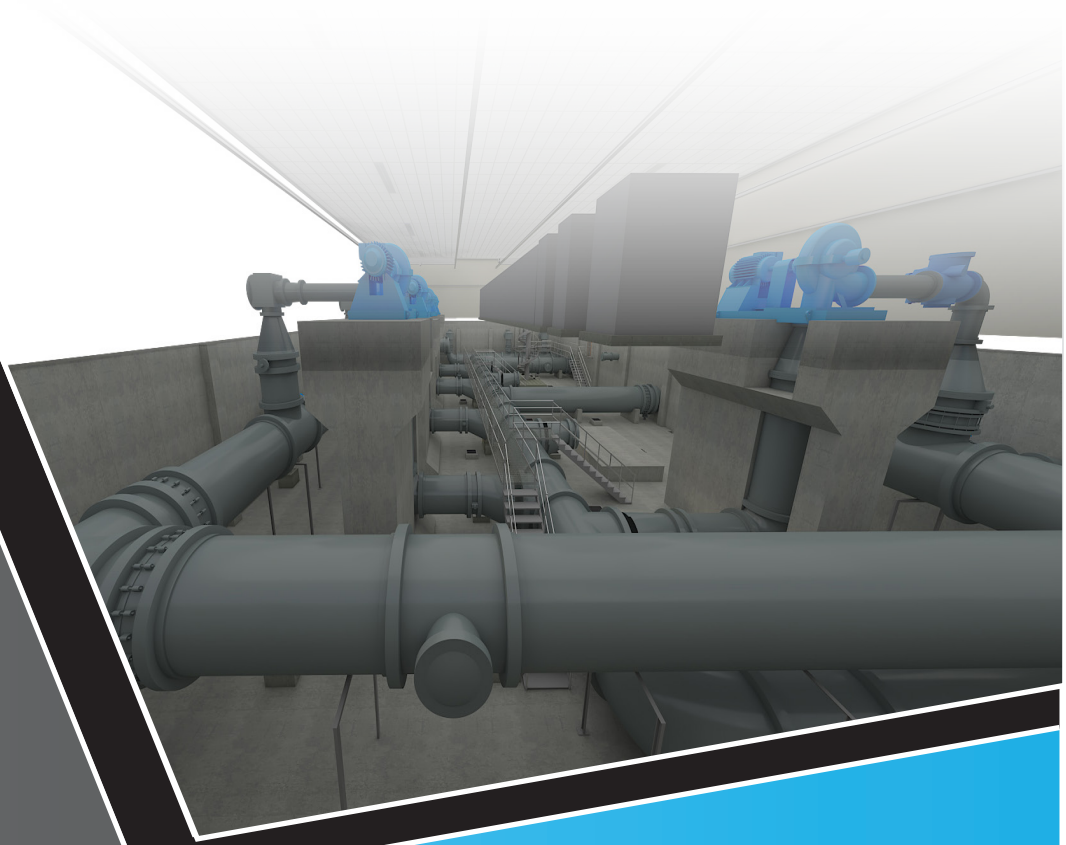
SECTION 10
Fee Proposal



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Erie County Water Authority

Project Management

Delivering a successful project requires both technical excellence and outstanding project management capabilities. With Dan Seider and Mike Chirico as your project management team and Tim Shafer as construction lead, ECWA will have individuals working on your project who are familiar with ECWA's way of doing business and will always be available and responsive, regardless of the topic. This staff will be supported by many others that have worked on similar projects regionally and across the country. This experience will be critical to your success in delivering a project that meets regulatory requirements, is easy to operate, and improves reliability and redundancy. Arcadis follows an integrated project management approach based on best practices from the Project Management Institute (PMI). Our management approach integrates scope, schedule and budget management with timely communications and effective quality controls to provide the following benefits to ECWA:

- **Effective management of schedule, resources and budget.** We use a work breakdown structure detailing the schedule and resource allocation for each task so that deadlines are met.
- **Clear and concise communications with all stakeholders.** Our communications approach ensures timely delivery of the right information to the right project participants and stakeholders. Outstanding issues will be tracked until resolved.
- **High-quality data and deliverables.** Our project manager will be responsible for verifying that deliverables receive appropriate quality control review prior to submittal to ECWA.

Project Fee Schedule

Fees for this project are based on the following rate schedule, overhead and mark-ups are noted in the following table.

Arcadis Project Staff Proposed Hourly Rates
ECWA Project No. 202000046

Grade	Hourly Rate
Project/Administrative Assistant I	$65
Design Tech II/Field Technician II	$80
Drafter I/Field Technician III and IV	$90
Drafter II/Field Technician V	$115
CADD Designer	$125
Field Supervisor	$150
Engineer/Scientist	$120
Staff Engineer/Scientist/Architect	$130
Project Engineer/ Scientist/Architect	$145
Senior Engineer/ Scientist/Architect I	$165
Senior Engineer/Scientist/Architect II	$180
Principal Engineer/Scientist/Architect I	$200
Principal Engineer/Scientist/Architect II	$220
Engineer/Scientist Director	$240

Hourly rates shown are based on staff salary, anticipated hours, and the specific scope of the currently proposed projects for ECWA. This is not a general 'rate sheet' for these staff.

Overhead Rate and Basis of Fee Development

Arcadis' audited overhead rate for the Water Business Line for 2020 is 1.75.

All indirect costs are included in the overhead rate, including computers, reproduction and communication fees — as well as all taxes, benefits, rent, utilities, and administrative support services. The overhead rate shown above does not include other direct costs (ODCs) and transportation costs, which are billed separately as shown below.

Other Direct Costs. All expenses incurred for a project will be invoiced at cost plus 10 percent to cover administrative expenses. Other direct costs include such items as, but are not limited to shipping charges, external printing, field supplies and equipment, traveling expenses, special insurance, licenses, permits, or subcontractors.

Transportation: $0.575/mile.

Equipment: A schedule of usage rates for specialty equipment is available for field assignments.

Fee Proposal

Arcadis is pleased to present our fee proposal associated with the engineering services for the Ball Pump Station Phase 1 Rehabilitation. The table below provides a detailed breakdown of engineering fees for each task showing personnel hours and costs per the scope of work. Fees include ODCs in each task. We also note the following:

- To fully develop a basis-of design that sufficiently documents the recommended improvements, we are proposing the preparation of a detailed Basis of Design Report and 43 drawings. For final design we are proposing an additional 37 drawings which will yield a total of 80 design drawings for the final set of construction documents.
- For each task, we are proposing to analyze multiple improvement options that will be reviewed and discussed in detail with ECWA staff through our workshop approach. This assures ECWA that the selected option is fully vetted with Engineering and Operations staff, is regulatory compliant, and simple to operate and maintain.

Fee Review and Negotiation

While we develop a detailed WBS for each proposal specific to the tasks, sub-tasks and assigned personnel, we also check these fees versus typical metrics. Arcadis' fee estimate shown below includes an estimate of our design fee per sheet as well as the engineering fee for each task as a percent of construction. These fees are consistent with experience on similar projects and industry standards. We also provided a breakdown of the RPR services to more accurately reflect our time on-site which includes a project inspector for all day-to-day activities as well as additional oversight from a senior-level project engineer, as necessary.

We believe our approach and fee structure will provide ECWA with the same high-value service that you expect and deserve. However, if you have any questions regarding the information we have presented, we would welcome the opportunity to sit down to review and refine our scope and fee.

Fee Estimate for Ball Pump Station Phase 1 Rehabilitation (Project No. 202000046)

Task Name	Base Scope			% of OPCC (Point Estimate $13.42M)
	Hours		Fee	
Task 1 – Basis of Design Report and 30% Preliminary Design	1,490		$195,000	*1.5%*
Task 2 – Design Documents	3,600		$470,000	*3.5%*
Based on sum of Tasks 1 and 2	*no. sheets*	*80*		*5.0%*
	$/sheet	*$8,313*		
Task 3 – General Services	1,150		$160,000	*1.2%*
Task 4 – Resident Inspection	*Engineer*	*200*	$32,000	*1.8%*
	Inspector	*2,000*	$210,000	
Task 5 – Record Drawings	80		$10,000	*0.1%*
Task 6 – Authority Program and Procedure Updates	150		$20,000	*0.1%*
TOTAL FEE	**8,670**		**$1,097,000**	***8.2%***
Special Services (TBD)			$50,000	

Drawing List and OPCC

Below we have included a preliminary drawing list identifying the completeness of each drawing as we progress through the design schedule. As noted, we are proposing to include 43 drawings as part of the Basis of Design and expand the design set to 80 drawings as part of our 60%, 90% and Bid Documents submission.

We have also included OPCCs from the Ball Pump Station CIP that identified a point estimate of approximately $13.4 million in capital construction costs for the improvements associated with Project No. 1, No. 2 and No. 3 in the CIP.

Ball Pump Station Phase 1 Rehabilitation INDEX OF DRAWINGS					
Dwg. No.	SHEET NO.	TITLE	30%	60%	90% / BID
GENERAL					
1		Cover Sheet	P	P	C
2	G-1	Index of Drawings, General Notes	P	P	C
3	G-2	Site Management Plan	P	P	C
4	G-3	Construction Sequencing Plan		P	C
5	G-4	Details & Notes		P	C
CIVIL					
6	C-1	Legend, Abbreviations, and General Notes	P	P	C
7	C-2	Existing Site Plan	P	P	C
8	C-3	Demolition - Plan	P	P	C
9	C-4	Demolition - Photos & Details	P	P	C
10	C-5	Overall Proposed Site Plan	P	P	C
11	C-6	Plan & Profile - Large Diameter Piping		P	C
12	C-7	Plan & Profile - Large Diameter Piping		P	C
13	C-8	Plan & Profile - Large Diameter Piping		P	C
14	C-9	Plan & Profile - Sanitary Sewer		P	C
15	C-10	Interconnections		P	C
16	C-11	Valve Vaults Plans & Sections	P	P	C
17	C-12	Venturi Vaults Plans & Sections	P	P	C
18	C-13	Details		P	C
19	C-14	Details		P	C
DEMOLITION					
20	D-1	Plan - Basement	P	C	C
21	D-2	Plan - First Floor	P	C	C
22	D-3	Sections		C	C
23	D-4	Sections		C	C
24	D-5	Photos	P	C	C
STRUCTURAL					
25	S-1	Legend, Abbreviations, and General Notes	P	P	C
26	S-2	Plan - Basement	P	P	C
27	S-3	Plan - First Floor	P	P	C
28	S-4	VFD Room - Plan & Elevations	P	P	C
29	S-6	Plans and Sections - Valve Vaults	P	P	C
30	S-7	Plans and Sections - Venturi Vaults	P	P	C
31	S-8	Sections & Details		P	C
32	S-9	Details		P	C
33	S-10	Details		P	C

Ball Pump Station Phase 1 Rehabilitation INDEX OF DRAWINGS					
Dwg. No.	**SHEET NO.**	**TITLE**	**30%**	**60%**	**90% / BID**
		MECHANICAL			
34	M-1	Legend, Abbreviations, and General Notes	P	P	C
35	M-2	Process Flow Diagram	P	P	C
36	M-3	Plan - Basement	P	P	C
37	M-4	Plan - First Floor	P	P	C
38	M-5	Enlarged Plans		P	C
39	M-6	Sections	P	P	C
40	M-7	Sections	P	P	C
41	M-8	Sections	P	P	C
42	M-9	Miscellaneous Details		P	C
43	M-10	Miscellaneous Details		P	C
44	M-11	Miscellaneous Details		P	C
		HVAC			
45	H-1	Legend, Abbreviations, and General Notes	P	P	C
46	H-2	Demolition Plan - Basement	P	P	C
47	H-3	Demolition Plan - First Floor	P	P	C
48	H-4	Demolition - Plan - Mezzanine & Boiler Room	P	P	C
49	H-6	Demolition Photos		P	C
50	H-7	Plan - Basement	P	P	C
51	H-8	Plan - First Floor	P	P	C
52	H-9	Plan - Mezzanine & Boiler Room	P	P	C
53	H-10	Schematics & Schedules		P	C
54	H-11	Details		P	C
		PLUMBING			
55	P-1	Legend, Abbreviations, and General Notes	P	P	C
56	P-2	Plan - Basement	P	P	C
57	P-3	Plan - First Floor	P	P	C
58	P-4	Details		P	C
		INSTRUMENTATION			
59	I-1	Legend, Abbreviations, and General Notes	P	P	C
60	I-2	P&ID's	P	P	C
61	I-3	P&ID's	P	P	C
62	I-4	Block Diagram		P	C
63	I-5	Instrument Details - Sheet 1		P	C
64	I-6	Instrument Details - Sheet 2		P	C

Ball Pump Station Phase 1 Rehabilitation INDEX OF DRAWINGS					
Dwg. No.	**SHEET NO.**	**TITLE**	**30%**	**60%**	**90% / BID**
		ELECTRICAL			
65	E-1	Legend, Abbreviations, and General Notes	P	P	C
66	E-2	Existing One Line Diagram-Demoliton Sheet	P	P	C
67	E-3	One Line Diagram Sheet	P	P	C
68	E-4	Demolition Plan-Site		P	C
69	E-5	Demolition Plan-Basement		P	C
70	E-6	Demolition Plan-Operating Floor		P	C
71	E-7	Plan-Site		P	C
72	E-8	Plan-Basement		P	C
73	E-9	Plan-Operating Floor	P	P	C
74	E-10	Plan-Mezzanine and Roof Levels		P	C
75	E-11	Block Diagram		P	C
76	E-12	Control Schematics 1		P	C
77	E-13	Control Schematics 2		P	C
78	E-14	Panel Schedules		P	C
79	E-15	Miscellaneous Details		P	C
80	E-17	Miscellaneous Details		P	C

ECWA Ball PS Capital Improvement Plan — **Opinion of Probable Project Cost Summary**

Project No. 1B: Pumping System Improvements — **Prepared By:** JDS

Date: **June-19** — **Checked By:** TS

Division	Description	Design Parameters	Engineer's Opinion of Probable Construction Cost	% of Total
0	Insurance and Bonds, 5% total bid		$408,099	4.3%
1	Mob/Demob/Div 01 Gen Requirements, 10% bid items		$609,407	6.5%
	Four new 1250 HP pumps		$4,562,500	48.4%
	Demo pumps 1-5, suction and discharge piping		$25,000	0.3%
	New enclosed room to house VFDs with separate HVAC system		$200,000	2.1%
	Cushioned swing check valves on each new pump		$77,625	0.8%
	New suction and discharge piping from isolation butterfly valves		$225,540	2.4%
	Improvements to the surge relief system		$233,400	2.5%
	Electrical (10%)		$510,000	5.4%
	I/C (5%)		$260,000	2.8%
	25% contingency for conceptual estimate		$1,458,516	15.5%
	GC O&P, 10% preceding items		$857,009	9.1%
	Total Construction		$ 9,428,000	100.0%
Opinion of Probable Current Construction Cost (Point Estimate)			**$ 9,430,000**	**100.0%**
Opinion of Probable Current Construction Cost (Low Estimate (-30%))			**$ 6,610,000**	**70.1%**
Opinion of Probable Current Construction Cost (High Estimate (+50%))			**$ 14,150,000**	**150.1%**

Engineering, Legal, and Administrative Costs	**25.0%**
Contingency Factor (to cover typical change orders)	**5.0%**
Escalation Factor to midpoint of construction	**6.1%**

		Point Estimate
Opinion of Probable Project Cost		**$12,840,000**
Low Range Estimate (-30%)		**$8,990,000**
High Range Estimate (+50%)		**$19,260,000**

Escalation

Annual Rate of Inflation		2%
Mid-Point of Construction		June 1, 2022
Escalation from Date of Estimate to Mid-Point of Construction		6.1%

The following assumptions and references were used to develop the opinion of probable cost

1. This opinion of probable cost is based on Association for the Advancement of Cost Engineering (AACE) Class 5 estimate guidelines, which are typically accurate on the low range of -30% and on the high range of 50%. Level of detail and cost range will be refined as the project scope is further developed.
2. All unit costs are rounded to the nearest $1,000
3. All final opinions are rounded up to the nearest $10,000
4. This opinion of probable construction cost includes a suggested 5% Owner's construction contingency, intended to cover typical construction-phase change orders, due to unanticipated field conditions and Owner revisions in project scope.
5. Opinion of probable cost based on 2019 dollars.

ECWA Ball PS Capital Improvement Plan — **Opinion of Probable Project Cost Summary**

Project No. 2: HVAC and Miscellaneous Improvements — **Prepared By:** JDS

Date: **June-19** — **Checked By:** TS

Division	Description	Design Parameters	Engineer's Opinion of Probable Construction Cost	% of Total
0	Insurance and Bonds, 5% total bid		$47,382	4.3%
1	Mob/Demob/Div 01 Gen Requirements, 10% bid items		$69,270	6.3%
2	New man door on east side of structure near Pump 1		$3,000	0.3%
	Replacement of the exhaust fan components, unit heaters, and other outdated or inefficient components of the HVAC system		$214,700	19.5%
3	New sump pumps in the venturi pits, new instrumentation conduit between PS and venturi pits, new 2-inch water supply line with connections throughout the PS, replacement of the existing sanitary sewer drain		$45,000	4.1%
4	New 480V Motor Control Centers		$330,000	
	Electrical (10%)		$100,000	2.7%
	I&C (5%)		$20,000	
	25% contingency for conceptual estimate		$165,675	15.1%
	GC O&P, 10% preceding items		$99,503	9.0%
	Total Construction		$ 1,095,000	99.5%
Opinion of Probable Current ConstructionCost (Point Estimate)			**$ 1,100,000**	**100.0%**
Opinion of Probable Current Construction Cost (Low Estimate (-30%))			**$ 770,000**	**70.0%**
Opinion of Probable Current Construction Cost (High Estimate (+50%))			**$ 1,650,000**	**150.0%**

Engineering, Legal, and Administrative Costs	**25.0%**
Contingency Factor (to cover typical change orders)	**5.0%**
Escalation Factor to midpoint of construction	**6.1%**

		Point Estimate
Opinion of Probable Construction Cost		**$1,500,000**
Low Range Estimate (-30%)		**$1,050,000**
High Range Estimate (+50%)		**$2,250,000**

Escalation

Annual Rate of Inflation		2%
Mid-Point of Construction		June 1, 2022
Escalation from Date of Estimate to Mid-Point of Construction		6.1%

The following assumptions and references were used to develop the opinion of probable cost

1. This opinion of probable cost is based on Association for the Advancement of Cost Engineering (AACE) Class 5 estimate guidelines, which are typically accurate on the low range of -30% and on the high range of 50%. Level of detail and cost range will be refined as the project scope is further developed.
2. All unit costs are rounded to the nearest $1,000
3. All final opinions are rounded up to the nearest $10,000
4. This opinion of probable construction cost includes a suggested 5% Owner's construction contingency, intended to cover typical construction-phase change orders, due to unanticipated field conditions and Owner revisions in project scope.
5. Opinion of probable cost based on 2019 dollars.

ECWA Ball PS Capital Improvement Plan — **Opinion of Probable Project Cost Summary**

Project No. 3: Exterior Piping Improvements — **Prepared By:** JDS

Date: **June-19** — **Checked By:** TS

Division	Description	Design Parameters	Engineer's Opinion of Probable Construction Cost	% of Total
0	Insurance and Bonds, 5% total bid		$124,821	4.3%
1	Mob/Demob/Div 01 Gen Requirements, 10% bid items		$162,790	5.6%
	Replacement of the buried 48 inch piping that runs between the two tanks, west of the pump station		$200,488	6.9%
	Replacement of the buried 54 inch piping that runs between the two tanks, west of the pump station		$228,995	7.9%
	Replacement of sections of the buried 60 inch piping that runs from the west into the south side of the pump station with a 48 inch line and addition of a parallel 48 inch pipe to create redundancy		$576,835	20.0%
	Discharge piping replacements		$524,585	18.2%
	Remove Altitude Valves		$12,000	0.4%
	Two check valve chambers		$85,000	2.9%
	Replacement section of overflow piping		$320,000	11.1%
	25% contingency for conceptual estimate		$385,726	13.3%
	GC O&P, 10% preceding items		$262,124	9.1%
Item 1	Total Construction		$ 2,884,000	99.8%
Opinion of Probable Current Construction Cost (Point Estimate)			**$ 2,890,000**	**100.0%**
Opinion of Probable Current Construction Cost (Low Estimate (-30%))			**$ 2,030,000**	**70.2%**
Opinion of Probable Current Construction Cost (High Estimate (+50%))			**$ 4,340,000**	**150.2%**

Engineering, Legal, and Administrative Costs	**25.0%**
Contingency Factor (to cover typical change orders)	**5.0%**
Escalation Factor to midpoint of construction	**17.2%**

		Point Estimate
Opinion of Probable Project Cost		**$4,260,000**
Low Range Estimate (-30%)		**$2,990,000**
High Range Estimate (+50%)		**$6,390,000**

Escalation

Annual Rate of Inflation		2%
Mid-Point of Construction		June 1, 2027
Escalation from Date of Estimate to Mid-Point of Construction		17.2%

The following assumptions and references were used to develop the opinion of probable cost

1. This opinion of probable cost is based on Association for the Advancement of Cost Engineering (AACE) Class 5 estimate guidelines, which are typically accurate on the low range of -30% and on the high range of 50%. Level of detail and cost range will be refined as the project scope is further developed.
2. All unit costs are rounded to the nearest $1,000
3. All final opinions are rounded up to the nearest $10,000
4. This opinion of probable construction cost includes a suggested 5% Owner's construction contingency, intended to cover typical construction-phase change orders, due to unanticipated field conditions and Owner revisions in project scope.
5. Opinion of probable cost based on 2019 dollars.

ARCADIS

APPENDIX A
Resumes

Erie County Water Authority

ARCADIS Design & Consultancy for natural and built assets

DANIEL J SEIDER, PE

PROJECT MANAGEMENT (PROCESS MECHANICAL)

EDUCATION
MS Civil Engineering University at Buffalo 2000
BS Civil Engineering University at Buffalo 1996

YEARS OF EXPERIENCE
Total – 24

PROFESSIONAL REGISTRATIONS
Professional Engineer – NY
Water System Operator - NY
Grade 1A-SW/GUI Filtration Plant; Grade D – Distribution System

PROFESSIONAL ASSOCIATIONS
American Water Works Association
American Public Works Association, Board of Directors for WNY Branch

Mr. Seider has broad expertise in drinking water treatment, conveyance, operations and management. Prior to his employment at Arcadis, he worked for ECWA. Initially, he was responsible for overseeing the study and design of capital improvements at ECWA before transferring to the Production Department where he managed the daily operation and maintenance of two conventional WTPs, 34 pump stations and 37 storage tanks. As a Production Department manager, he supervised between two and five departments, staffing levels between 25 and 60, with annual operating budgets of approximately $5 million to $15 million.

Project Experience

Ball Pump Station Capital Improvement Program
ECWA, Erie County, NY

Project manager for the condition assessment, hydraulic evaluation and prioritized capital improvement program for the Ball Pump Station. The project includes an inventory of all assets, condition rating, risk assessment including likelihood of failure, consequence of failure, and the development of a final risk matrix to prioritize improvements. Also included is a hydraulic evaluation of the existing pumps to develop alternatives for improving reliability, increasing energy efficiency, and operational flexibility. Recommendations will be incorporated into a 15-year Capital Improvement Program.

Pine Hill Pump Station Improvements
ECWA, Buffalo, NY

Engineering consultant manager for rehabilitation and expansion of the Pine Hill Pump Station from 7 to 21 mgd to meet current and future operating conditions as well as improve reliability and system operational flexibility. The project included the replacement of 350-hp pumps and motors, mechanical piping and valving, all new electrical equipment (VFDs, MCC and standby generator), and upgrades to building HVAC, plumbing, and architectural systems. Additionally, ECWA's distribution system model was updated, calibrated, and used to evaluate system-wide transmission main improvements.

Project Experience Continued

Ross Pump Station and Raw Water Intakes Rehabilitation
Pittsburgh Water and Sewer Authority (PWSA), Pittsburgh, PA

Project manager for condition/risk assessment and schematic design of improvements for the Raw Water Intakes and Ross Pump Station. The project included assessments and condition ratings of mechanical, structural, architectural, electrical, and instrumentation assets. Hydraulic evaluations of the raw water pumps were completed to verify existing performance and efficiency. Dive inspections were conducted of the river intakes and suction tunnels to Ross Pump Station to measure sediment accumulation and assess the condition of the existing tunnels, sluice gates, and stop logs. Several alternatives were analyzed for adding passive or mechanical screening systems to the existing intake structures or a new intake facility. Led the development of the technical report and schematic design that summarized findings and identified risk-based priorities for improvements based on physical, performance, and consequences of failure criteria. Improvements were categorized according to O&M needs, health and safety projects, vendor/minimal engineering projects, and capital improvement projects.

Aspinwall Treatment Plant Pretreatment, Chemical and Clarification Improvements
PWSA, Pittsburgh, PA

Project manager for the condition assessment, alternatives evaluation, capital improvement plan and preparation of schematic design documents for improvements to the raw water intakes, raw water pumping systems, screening, flocculation, clarification, sedimentation processes, and chemical systems at the City of Pittsburgh's 117-mgd drinking WTP. Additional work included high-level facility planning for a new high-service pump station, clearwell and UV disinfection facility. The CIP identified long-term capital projects with an estimated budget of $260 million to be completed over the next 10 to 15 years.

Comprehensive Asset Renewal and Energy (CARE) Project
Onondaga County Water Authority, Syracuse, NY

Project engineer for the hydraulic transient model development, pump replacement, SCADA, and telemetry improvements. Project includes replacement of three vertical, 1250-hp raw water pumps, three horizontal split case 1250-hp finished water pumps, and three horizontal split case 400-hp distribution system pumps. The increased pump and motor efficiencies are guaranteed to reduce electrical usage by 2,500,000-kwhs per year, resulting in an operational savings of more than $400,000 per year.

Lardner's Point Pump Station Replacement
Philadelphia Water Department, Philadelphia, PA

Technical advisor for the development of the Basis of Design Report for the replacement of an existing 200-mgd pump station. The project includes construction of a new facility adjacent to the existing pump station incorporating 10 horizontal split case pumps ranging in size from 400- to 1,500-hp, new electrical services, standby generator, 60- to 108-inch-diameter suction piping, multiple discharge lines ranging from 48- to 60-inch-diameter, and associated mechanical, architectural, structural, instrumentation, and SCADA improvements.

ARCADIS Design & Consultancy for natural and built assets

MICHAEL A CHIRICO, PE

PROJECT MANAGEMENT (ELECTRICAL)

EDUCATION

BT Electrical Engineering, State University of New York College at Buffalo 2004

YEARS OF EXPERIENCE

Total – 15 years

PROFESSIONAL REGISTRATIONS AND CERTIFICATIONS

Professional Engineer – NY
Power Systems and Electric Machines Program, Accreditation Board for Engineering and Technology Accredited
NFPA - CESCP Certified Electrical Safety Compliance Professional
LEED Accredited Professional
Confined Space Entry OSHA 29 CFR 1910.146
OSHA 29CFR 1910.331-335 and NFPA 70E - Electrical Safe Work

PROFESSIONAL ASSOCIATIONS

IEEE, Buffalo Section Chair IEEE, Senior Member since 2012; Industry Applications Society Power & Energy Society; Standards Association
NSPE Member since 2020

Mr. Chirico specializes in commercial, industrial and municipal electrical power system design and analysis. He has led projects for large commercial, utility, municipal, and industrial clients, including high-voltage substation design (up to 115 kV), utility interconnections, protective relaying, standby power generation, plant distribution, motor controls, grounding, communication, and lighting systems. He has extensive power system analysis experience with short-circuit, protective device coordination, arc flash, load flow (voltage drop), harmonic studies, grounding and economic analysis. Mr. Chirico's previous experience supporting major improvements and leading Arc Flash studies at ECWA facilities will allow the electrical work that support these projects to move forward smoothly.

Project Experience

Massachusetts Avenue Pump Station

City of Buffalo, Buffalo, NY

Project manager and lead electrical engineer for evaluation and design of a facility electrical upgrade. Work includes power system studies, equipment evaluation, and economic analysis for design of a 23kV substation, medium-voltage switchgear, 4.16kV VFDs and motor controls, protective relaying and low-voltage distribution. Power system studies include short-circuit, coordination, arc flash, demand and load flow analysis. The project is anticipated to continue into detailed design and construction services through 2022.

Various Electrical Engineering Services, NC-37

ECWA, Erie County, NY

Project manager and senior electrical engineer for a term contract related to miscellaneous electrical engineering services. Tasks have included SEL relay and RTAC configuration, short-circuit calculations, protective device coordination and arc flash hazard analysis.

Water Treatment Plant Electrical Upgrades

City of North Tonawanda, NY

Project manager and lead electrical engineer for design of power system improvements at the plant. Improvements include new 4,160V-480V transformers, 480V standby emergency generators, transfer switches and motor control centers.

Project Experience Continued

Ball Pump Station Electric Substation, NC-35
ECWA, Erie County, NY

Project manager and lead electrical engineer for design and construction of a new 115kV electrical substation. The substation consists of air insulated switches, dead-tank circuit breakers, and liquid filled transformers with on-load tap changers. Design included complete switchyard design, including layout, elevations, ground mat, single lines, and AC/DC elementary diagrams. Construction services included contract management, shop drawing review and witness testing. Work also includes short-circuit, coordination and arc flash studies along with SEL relay setting modifications and on-site commissioning assistance.

Sturgeon Point Raw Water Facility and Arc Flash Analysis, NC-34
ECWA, Erie County, NY

Provided project management, engineering planning, design, construction administration, and coordination for improvements to the existing facility. The project scope included replacement of five 400-hp VFDs, new electrical distribution, building addition, replacement of two traveling screens, new bridge crane, 30-inch pump discharge valve replacement, sluice gate rehabilitation and CFD modeling of the existing wet well. Additional services included short-circuit, protective device coordination and arc flash analysis for the entire facility from the incoming 35kV substation through the low-voltage equipment including switchgear, motor control centers, switchboards, control panels and, switches.

North Street Substation Relay and SCADA Upgrades
Village of Springville, Springville, NY

Project manager and electrical engineer for design of new SEL relay panels at the 115kV substation and village-wide SCADA upgrades for the municipal electric system. Design included revising existing AC/DC elementary schematics, new one-line diagrams and detailed relay panel wiring diagrams.

Manhattan Pump Station
City of Buffalo, Buffalo, NY

Provided electrical engineering planning, design, construction administration, commissioning assistance, and arc flash / short-circuit coordination study for a new 600A, 480Y/277V, underground electric service and completely new facility electrical distribution system. The project also included utility coordination and motor relay protection, controls and rehabilitation.

Electrical Systems Improvements, NC-26B
ECWA, Erie County, NY

Electrical system improvements at the Van de Water (VDW) Raw Water Pump Station and Ball Pump Station. Work at VDW included 500kW outdoor standby diesel generator; 4,160V electric service substations; 480V motor control centers; VFD’s; 450-hp vertical pump motors; and PLC/SCADA. Work at Ball Pump Station included design of two new 4,160V variable speed drives and motors along with design of associated modifications to the existing 4,160V distribution switchgear, motor control centers and PLC/SCADA system.

MARK LENZ, PE

PRINCIPAL-IN-CHARGE / PREVENTION THROUGH DESIGN

EDUCATION
MS Environmental Engineer Cornell University 1996
BS Environmental Engineer Cornell University 1995

YEARS OF EXPERIENCE
Total – 24 years

LICENSES & CERTIFICATIONS
Professional Engineer - NY
Certified Construction Documents Technologist (CDT)

PROFESSIONAL AFFILIATIONS
American Water Works Association

Mr. Lenz's entire 24-year career has been focused on working with municipal clients in 26 states and two provinces to plan, design and construct more than $7 billion worth of municipal drinking WTP, pump station and distribution system improvements. The majority of his experience has been in the Northeast, including supporting ECWA with major projects at SPWTP, VDWTP, Pine Hill and Ball Pump Stations.

Project Experience

Ball Pump Station Capital Improvement Program
ECWA, Erie County, NY

Principal-in-charge for the condition assessment, hydraulic evaluation and prioritized capital improvement program for the Ball Pump Station. The project includes an inventory of all assets, condition rating, risk assessment, including likelihood of failure and consequence of failure, and hydraulic evaluation of the existing pumps. Developed 15-year CIP which included alternatives for improving reliability, increasing energy efficiency and enhanced operational flexibility.

Pine Hill Pump Station Improvements
ECWA, Buffalo, NY

Principal-in-charge/project manager for rehabilitation and expansion of the Pine Hill Pump Station from 7 mgd to 21 mgd to meet current and future operating conditions as well as improve reliability and system operational flexibility. The project includes replacement of 350-hp pumps and motors, mechanical piping and valving, and all new electrical equipment (VFDs, MCC, and standby generator) and upgrades to building HVAC, plumbing, and architectural systems. Additionally, ECWA's distribution system model was updated, calibrated, and used to evaluate system-wide transmission main improvements.

Lardner's Point Pump Station Upgrade
Philadelphia Water Department, Philadelphia, PA

Technical advisor for BODR of the 210-mgd finished water pump station (including 10 horizontal split case pumps from 400 hp to 1,500 hp) which supplies drinking water to 30% of City's distribution system. The $135 million project includes extensive staging and risk analysis to meet multiple stakeholder needs.

Project Experience Continued

Van de Water Treatment Plant and Ball Pump Station Electrical Improvements
Erie County Water Authority, Buffalo, NY

Principal-in-charge for design and construction phase services to upgrade electrical facilities at the VDWTP and Ball Pump Station. Ball Pump Station design included 110kV switch and breaker assessment as well as replacement of electromechanical relays with modern SEL digital relays. Arcadis performed the power systems studies and provided the new relay settings for the substation. Arcadis interfaced with National Grid to ensure setting compliance and coordinated with National Grid to ensure the equipment met National Grid standards. Arc flash records were also updated for both sites.

Raw Water, Clear Water and Eastern Pump Replacement
Onondaga County Water Authority, Syracuse, NY

Principal-in-charge for design, engineering, and construction oversight services for hydraulic model development, pump replacement, electrical (VFD), SCADA and telemetry improvements. Project includes replacement of three vertical turbine, 1250-hp raw water pumps, three horizontal split case 1250-hp finished water pumps, and two horizontal split case 400-hp distribution system pumps. The increased pump and motor efficiencies are guaranteed to reduce electrical usage by 2,500,000-kWhs per year, resulting in an operational savings of more than $400,000 per year. The project was delivered through C&S Companies (Prime Contractor) as a $14 million design-build project.

Clearwell Bypass/Aspinwall Pump Station CIP and Facility Planning
PWSA, Pittsburgh, PA

Principal-in-charge for condition assessment, alternatives evaluation and facility planning for a clearwell bypass and improvements to the 100-mgd Aspinwall (High Service) Pump Station.

Ross Pump Station and Raw Water Intakes Rehabilitation
PWSA, Pittsburgh, PA

Principal-in-charge for the condition assessment, alternatives evaluation and facility planning for improvements for the 117-mgd Ross (Raw Water) Pump Station and upstream intakes. Project included condition assessment, development of pump testing to confirm existing conditions and pump performance and development of recommended capital improvements.

River Water Intake and Pump Station Improvements
PeroxyChem, LLC, Tonawanda, NY

Principal-in-charge for or design of a new intake and raw water (non-contact cooling water) on the Niagara River to a chemical production facility. Improvements included three 450-hp vertical turbine pumps, inline screening including air burst cleaning and frazil ice protection systems all in a new pump house. The project had extensive coordination with the land owner of the future pump station, PeroxyChem, LLC electrical utility and authorities having jurisdiction, including the Town of Tonawanda, New York State Environmental Conservation (DEC), Army Corps. of Engineers, New York State Department of State and the Office of Homeland Security (OHS), and the United States Coast Guard.

BRIAN DUANE, PE

TECHNICAL ADVISOR / QA/QC

EDUCATION
BS Mechanical Engineering, Georgia Institute of Technology 1981

YEARS OF EXPERIENCE
Total – 38
With Arcadis – 3

PROFESSIONAL REGISTRATIONS
Professional Engineer – FL, GA, TX, NY

PROFESSIONAL ASSOCIATIONS
American Society of Mechanical Engineers
Georgia Association of Water Professionals
Water Environment Federation

Mr. Duane's experience includes the design of over 50 wastewater and water pumping facilities with capacities up to 740 mgd. He is a technical expert in hydraulics, pumping systems and the design of mechanical process systems, and he routinely assists with start-up and troubleshooting of mechanical systems. Throughout his career, he has partnered with clients to provide cost-effective solutions that are functional, practical, maintainable and constructible. He offers exceptional value to clients based on his proven track record of practical design; history of successful project execution and completion; and understanding of the client's needs during the construction, start-up and post-construction project phases.

Project Experience

Freud and Conner Creek Pump Station
GLWA (formerly DWSD), Detroit, MI

Evaluation and preliminary design of improvements to the following pump stations:

- Conner Creek Pump Station – The pump station is fed by two 14-foot-diameter sewers. The sanitary station was constructed in 1955 and includes four sanitary pumps with a firm capacity of 144 mgd. The stormwater pump station has eight 2300-hp, 200-rpm pumps with a firm capacity of 3,500 cfs. Both pump stations have serious suction hydraulic issues and the stormwater vacuum priming system is ineffective.
- Freud Stormwater Pump Station – Circular pump station constructed in 1954 with eight, 3000-hp, 225-rpm pumps with a firm capacity of 3,150 cfs. Flow enters the station through six 10-foot-diameter inlets. The dewatering pumps serve as sanitary pumps with a firm capacity of 13 mgd. The vertical mixed flow stormwater pumps have significant air entrainment issues that reduces capacity and reliability.

Raw Wastewater Influent Pump Station #2 Improvements
Blue Plains WWTP, DC Water, Washington, DC

Final QC review during design and technical advisor during the construction phase. The initial project phase included rehabilitation of the 657-mgd pump station to install additional pumps. Subsequent

Project Experience Continued

phases included modifications of the existing pumps and suction piping to address capacity drift issues with the existing pumps.

Elm Fork WTP Pump Station 1
Dallas Water Utilities, Dallas, TX

Technical advisor for 160-mgd high-service pump station (four 40-mgd horizontal split case pumps with 3000-hp motors) and 160-mgd raw water pump station. Project included scale hydraulic modeling of suction piping at Clemson Engineering Hydraulics.

WTP High-Service Pump Station
City of Hollywood, FL

Design engineer for preliminary design and technical advisor for the final design of 57.6-mgd firm capacity pump station that includes six 8,000-gpm, 400-hp horizontal split case pumps with VFDs. Project includes scale hydraulic modeling of clear wells at Clemson Engineering Hydraulics to verify suction intake conditions.

Quarles WTP
Cobb-Marietta Water Authority, GA

Design manager for preliminary design and evaluation of vertical turbines in cans versus horizontal split case pumps for 100-mgd high-service pump station consisting of five, 20-mgd pumps with 1500-hp motors and VFDs.

Effluent Pump Station Rehabilitation – South Shore WWTP
Milwaukee Metropolitan Sanitation District, WI

Technical advisor for replacement and upgrade of five 85-mgd axial flow, vertical lineshaft propeller pumps with right angle drives, 300-hp motors and VFDs. Project included scale hydraulic modeling of the intake sumps at Clemson Engineering Hydraulics to verify suction intake conditions per HI 9.8.

Lift Station 101 Evaluation
Citizens Energy Group, Indianapolis, IN

Technical advisor for the investigation and evaluation of poorly performing dry-pit submersible pumps that had a useful life of less than three years and were never able to achieve design pumping rates. Hydraulic evaluation of field-tested pumping rates to establish/confirm the force main “C” factor.

Friar’s Branch Pump Station
City of Chattanooga, TN

Technical advisor during construction upgrade of 48.4-mgd pump station to 72 mgd. Scale hydraulic modeling of the wet well and subsequent modifications to bring wet well into compliance with HI 9.8 requirements.

ARCADIS Design & Consultancy for natural and built assets

RICHARD METZGER, PE

TECHNICAL ADVISOR / QA/QC

EDUCATION
BS Civil Engineering Technology
Rochester Institute of Technology
1981
AAS Civil Engineering Technology
Monroe Community College 1978

YEARS OF EXPERIENCE
Total – 41 years

LICENSES & CERTIFICATIONS
Professional Engineer - NY
Water Treatment Plant Operator
1A - NY

PROFESSIONAL AFFILIATIONS
American Water Works Association
American Society of Civil Engineers

Mr. Metzger's water supply engineering and management experience comes from working directly for a regional water supplier and as a consultant. His expertise includes studies, planning, design, construction contract administration, and operations management**.** His operations experience includes thirty years as the Monroe County Water Authority's (MCWA) Executive Engineer.

Project Experience

Eastside Water Supply Project
MCWA, Rochester, NY

Project officer for this $150 million project that included a new 8-foot diameter intake tunnel tapping Lake Ontario, 50-mgd direct filtration treatment plant, two 50-mgd pumping stations, and 13 miles of 60 and 48" transmission mains. Tasks included environmental compliance and permitting, public relations efforts, property acquisition, grant administration, design, construction, commissioning, and ultimately the long-term operation and maintenance of these facilities.

Shoremont West 1 Plant Upgrades
MCWA, Rochester, NY

Project officer for study and design phases for process improvements for the Shoremont WTP's West 1 section (50-mgd) originally constructed in 1971. The multi-phase program of improvements includes retrofit of the existing upflow clarifiers to serve as coagulation contact basins, filter upgrades, chemical system modifications, and building code safety compliance renovations.

Shoremont East Plant Upgrades
MCWA, Rochester, NY

Project officer for study and design phases for process improvements for the Shoremont WTP's East section (60 mgd) originally constructed in 1961. The multi-phase program of improvements includes retrofit of the existing upflow clarifiers to serve as coagulation contact basins, filter upgrades, addition of clearwell baffling, control system modernization CO_2 system addition and other chemical system modifications.

Project Experience Continued

MCWA Capital Improvement Programs
MCWA, Rochester, NY

Project officer for 30 years of MCWA's ongoing capital improvements and renewal and replacement programs, including studies, budgeting, planning, design, construction contract administration, and operations management. Projects have encompassed all aspects of three surface water treatment plants (5, 50 and 140 mgd), 0.2-mgd ground water plant, 40 pump stations, 50 storage facilities and over 3,200 miles of water mains.

Filtration and Backwash Optimization
City of Canandaigua, NY

Principal engineer for NYSERDA funded process evaluation to maximize the quantity of finished water production for the City's 6-mgd conventional WTP and reduce the year-round quantity of water wasted in inefficient filter runs and filter backwashing. Implemented improvements included backwash turbidimeter, particle size analysers and SCADA upgrades.

Water Treatment Plant Expansion
City of Watertown, NY

Project engineer for process evaluations, regulatory approvals, design, and contract administration of the renovation of the City's turn-of-the-century conventional plant (15 mgd), integrating new and old facilities. The new facility constructed includes intake structures, chemical feed and rapid mix facilities, filters, backwash settling tank, chlorination and corrosion control feeds, intermediate process and finished water pumping, laboratory and administrative area renovations, and a new water department garage and maintenance building

Water Treatment Plant
Mohawk Valley Water Authority, Utica, NY

Project engineer for pilot and feasibility studies to meet NYS DOH approval for the full-scale design of the Utica Board of Water Supply's new 32 mgd plant. Evaluated alternative pre-oxidants, preliminary treatment options, filtration medias, and corrosion control processes. Led the evaluation and design of plant, which uses pre-oxidation, absorption clarification (roughing filters), high-rate filtration, and natural freeze/dry for waste disposal. Two hydroelectric turbines (225kW and 150kW) were incorporated into the new water treatment plant project.

Water Treatment Plants
City of Pittsfield, MA

Project engineer for design and construction review of two new water treatment plants (25 and 12.5 mgd) for the City, using dissolved air flotation and shallow bed filtration processes. These plants were the first full-scale application of the Krofta "sand-flotation" process in the U.S. Also included was a 225kW energy recovery hydroelectric power plant on one plant's raw water supply.

FREDDY BETANCOURT, PE

LARGE-DIAMETER PIPING LEAD

EDUCATION
MS Engineering University of New Orleans 2001
BS Civil Engineering, Universidad Rafael Urdaneta (VZLA) 1999

YEARS OF EXPERIENCE
Total – 19 years

LICENSES & CERTIFICATIONS
Professional Engineer - FL
Envision Sustainability Professional
LEED Accredited Professional

Mr. Betancourt has more than 19 years of experience as an engineer focusing on municipal wastewater collection, transmission, distribution, and treatment. He has participated in more than 12 local design-build projects in the Tampa Bay area under the Utility Capital Improvements Projects (UCAP) program for the City of Tampa. In addition, he has provided design and construction services of two major sanitary lift stations and two large-capacity stormwater lift stations for the City of Tampa. He also serves as one of Arcadis National Discipline leader for Arcadis with extensive experience in large diameter pipeline construction, having worked with pipelines up to 120 inches in diameter.

Project Experience

Baxter WTP Clear Well Basin Replacement
PWD, Philadelphia, PA

Basins 1 and 2. Operations and start-up planning support for phasing, shutdowns and disinfection in advance of 4th quarter 2020 start-up of two new 5-MG basins, new 72”/96” flow control valves, junction chambers, and ~4,000 feet of 120” steel piping.

Basins 3 and 4. Planning documentation and facilitation of monthly Core Review Committee meetings (including stakeholders from Planning, Treatment, Conveyance, Load Control and Pumping, BLS, Construction Unit and Design Branch) in support of Capital Planning Group for two new basins with 10-MG storage. Planning effort includes siting alternatives, theory of operation, construction sequencing, planning for ~500K CY of soil management, risk review and approach to decommissioning existing CWB.

Mr. Betancourt served during QA/QC during construction assisting the project team with questions and RFIs associated with the 120” diameter steel pipe.

SEWPCP Sludge Main at Schuylkill River Crossing
PWD, Philadelphia, PA

Technical advisor and QA/QC for replacement of two-sludge force mains that convey primary and waste-activated sludge between the Southeast Water Pollution Control Plant (SEWPCP) and the Southwest Water Pollution Control Plant (SWWPCP), located on opposite sides of the

Project Experience Continued

Schuylkill River. The proposed 1,245 ft long 34-inch HDPE force main casing pipe will be installed using horizontal directional drilling (HDD) techniques to locate the casing pipe approximately 25 feet below the river bottom. The two new 10-inch high density polyethylene (HDPE) carrier pipes will be installed inside a 34-inch diameter HDPE casing pipe.

Cypress Creek WTP Yard Piping Improvements
TBW, Wesley Chapel, FL

Project manager and engineer of record during design for the Cypress Creek WTP Yard Piping Improvements for Tampa Bay Water. The project included the following major components: abandonment in-place or removal of existing underground PCCP pipe, and Venturi meter; demolition or filling in of three existing vaults associated with the chemical injection and meter locations; installation of approximately 215-ft of above-ground 60 to 72-inch welded steel pipe from the existing cross point to the existing 84-inch split to 42-inch ductile iron pipe; a new above-ground 60 to 72-inch Venturi meter; a 36-inch above-ground access hatch on the piping; chemical injection ports for sodium hydroxide, ammonia hydroxide or ammonia sulfate, sodium hypochlorite, and dedicated sampling taps. The changes were made to improve the chloramination process inside the WTP and to meet 4-log removal for disinfection within the limits of the plant and prior to its first downstream connection.

South Central Water Transmission Main
Hillsborough County, FL

Participated in the design, permitting and services during construction for a $16.9 million project that consisted of 22,900 feet of 30- through 42-inch-diameter water transmission main delivering potable water from the proposed water treatment plant to the existing county water distribution system near the intersection of Windhorst Road and Parsons Avenue. The project included a microtunnel installation under I-75.

12-Street Street Force Main Replacement
City of Tampa, FL

Participated in planning, design, public involvement, and construction services for the installation of 24,045 feet of 24-, 42- and 48-inch-diameter sanitary force main. The existing pipeline was designed in the late 1970s and was constructed using prestressed concrete cylinder pipe (PCCP) that contained defective class IV prestressing wire. Previously assisted in other phases of the project, which consisted of providing planning, design, public involvement and construction services for 42- and 48-inch-diameter force main. The replacement project also involved a tunneled crossing of the Hillsborough River, interconnections to existing tributary force mains, and the design of a new discharge structure at the terminus of the 26th Street intercepting sewer.

Belcher Road Water Transmission Main Replacement
Pinellas County, FL

For a side-by-side replacement of a failing Class IV wire PCCP, participated in the design and permitting of 15,000 feet of 42-inch-diameter water transmission main along a new alignment in the existing route.

ARCADIS Design & Consultancy for natural and built assets

TIM SHAFER

CONSTRUCTION LEAD / COST ESTIMATING / MOPO PLANNING / O&M MANUAL / SOPS / TRAINING

EDUCATION
AAS Drafting-Surveying, Erie Community College South 1988

YEARS OF EXPERIENCE
Total – 24 years

PROFESSIONAL REGISTRATIONS
AutoCAD Certified
Certified AutoCAD Software Specialist
Certified Construction Documents Technologist

PROFESSIONAL ASSOCIATIONS
Confined Space Entry Ergonomics
Hazardous Waste Operations Site Supervisor
Unexploded Ordinance (UXO) remediation site training

Mr. Shafer's experience encompasses both design and construction of a variety of facilities, including water treatment facilities, pumping stations, waterlines and water storage tanks — encompassing initial project planning, detailed design, construction administration and resident project representative. He has coordinated design work for all disciplines on a variety of projects. Mr. Shafer has overseen more than $100 million in construction projects over the past 11 years.

Project Experience

Van de Water Treatment Plant Coagulation Basins Upgrades MP-76
ECWA, Buffalo, NY

Senior designer, construction administration and resident project representative for the $8-million VDWTP Coagulation Basins Upgrades project. The VDWTP is a conventional WTP which includes raw water pumping and screening, in-line flash mix, walking beam flocculation, tube settler sedimentation, and conventional mixed media filtration. The improvements are focused on the flash mix, flocculation, and sedimentation basins, lime system, chemical systems, and include new mechanical equipment, and associated structural, electrical, and instrumentation improvements for the 49.5-mgd facility. The improvements were completed over a three-year period.

Sturgeon Point Treatment Plant GHD-6C Residuals Pump Station Improvements
ECWA, Buffalo, NY

Resident project representative for installation of new solids pumps, piping, lights and HVAC improvements in the wastewater treatment building. New decant structures, lagoon influent piping, wash water piping, dispensation pads and electrical service to all four lagoons. New residuals pump station building addition with electrical room, chemical room and mechanical room. Demolition and replacement of the existing residuals pump station pumps, piping, HVAC and electrical systems. Replacement of the equalization basin mixers and improved access with new grating and walkways.

Project Experience Continued

Pine Hill Pump Station Improvements MP-77B
ECWA, Buffalo, NY

Design quality leader, construction administration and resident project representative for improvements to the Pine Hill Pump Station. The project includes complete demolition of the interior pumps, piping, electrical, HVAC, plumbing and partial demolition of the exterior suction and discharge piping. Installation of new 350-hp pumps, piping venture meter and appurtenances, HVAC equipment including fans, louvers and heaters. The entire electrical system, including a standby generator and various architectural and structural improvements.

Sturgeon Point Treatment Plant GHD-6A Wastewater Treatment Facility Improvements
ECWA, Buffalo, NY

Resident project representative for upgrades to the wastewater treatment building at the SPWP. The improvements included installation of a flow distribution structure and polymer feed system, replacement in-kind of the thickener /clarifier residuals collection mechanisms, replacement of the solids pumps, removal and replacement of the tube settlers, sandblast and repaint the thickener/clarifier tanks, modify the structural components of the thickener/clarifiers to provide a covered walking surface, and electrical and instrumentation upgrades.

Hoosick Falls/Petersburgh Point of Entry Treatment System (POET) Oversight and Site Management
New York State Department of Environmental Conservation (NYSDEC), Hoosick Falls, NY

O&M coordinator and on-site representative managing critical yet complex projects with the objective of installing, monitoring and maintaining point of entry treatment systems (POETS) to address environmental contamination in the groundwater within the Towns of Hoosick Falls, Petersburgh, New Windsor and Newburgh. Duties included managing and scheduling the POETS evaluation team and POET installation team, granulated activated carbon (GAC) tank preparation management and POETS repair team management. Communication with local officials, department staff, NYSDOH, remedial contractors and the effected homeowners. The successfully implemented remedial effort resulted in over 900 POET installations in homes/business during 2016 and 2017.

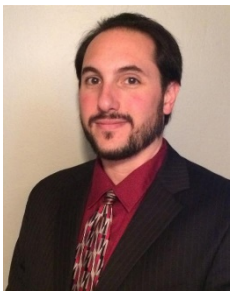
Lanpher Reservoir and Transmission System Improvements
Pittsburgh Water and Sewer Authority, Pittsburgh, PA

Design quality leader for improvements to the 150-MG reservoir headworks, including the installation of venturi meters, isolation valves and a concrete vault on parallel 60-inch-diameter riveted steel piping, 36-inch-diameter bypass piping, and a new sodium hypochlorite system within a new chemical storage building to improve chlorine residuals within the distribution system. This work will be completed while maintaining the reservoir ‘in-service’ except for short durations during critical interconnections.

ARCADIS Design & Consultancy for natural and built assets

JASON J WILLIAMS, PE

PROCESS MECHANICAL / PUMPS



EDUCATION
MS Environmental Engineer SUNY College at Buffalo 2003
BS Civil Engineering SUNY College at Buffalo 2001

YEARS OF EXPERIENCE
Total – 17 years
With Arcadis – 15.5

LICENSES & CERTIFICATIONS
Professional Engineer – NY, OH, PA
Certified Construction Contract Administrator (CCCA)
Certified Construction Documents Technologist (CDT)

PROFESSIONAL ASSOCATIONS
New York Water Environment Association (NYWEA)
Water Environment Federation (WEF)

Mr. Williams' environmental consulting experience encompasses wastewater treatment and conveyance, pumping and blower system design and construction, and sludge management, including design and construction of pumping, polymer conditioning, sludge thickening and dewatering, and conveyance systems. He is experienced in facilities planning, preparation of design reports, bidding/contract documents, and construction cost estimates, construction administration services, and development of operations and maintenance manuals.

Project Experience

River Water Intake and Pump Station Improvements
PeroxyChem, LLC, Tonawanda, NY

Associate project manager, design quality leader and pumping system process/mechanical project discipline leader for design and construction of an approximate $6 million project for a new pump station to convey water from the Niagara River to a chemical production facility for non-contact cooling water services. Improvements included three 450-hp vertical turbine centrifugal pumps, inline screening and air burst cleaning systems, architectural and structural work for a new pump house, civil/site work, marine work, instrumentation/controls, and electrical improvements. The work involved extensive coordination between various stakeholders, including the land owner of the future pump station, PeroxyChem, electrical utility, authorities having jurisdiction, including the New York State Environmental Conservation (DEC), Army Corps. of Engineers, New York State Department of State and the Office of Homeland Security (OHS), and the United States Coast Guard.

Elma Pump Station Improvements, Contract No. 47
Erie County Department of Environment and Planning, Elma, NY

Associate project manager, design quality leader and process/mechanical project discipline leader for design and construction of a $480,000 project to expand the existing 0.6-mgd Elma Pump Station. Improvements included addition of one 50-horsepower progressing cavity-style pump, architectural and structural improvements to increase the footprint of the pump house, civil/site work, and instrumentation/controls and electrical improvements. The work involved extensive coordination between various stakeholders, including the

Project Experience Continued

owner, Steuben Foods (the main discharger to the pump station), electrical utility, and two prime construction contractors, and included preliminary and final design, including preparation of construction documents and opinion of probable construction cost estimates, and contract administration services. Despite numerous challenges, the project was completed approximately $16,000 under budget.

Erie WWTP Pumping System and Structural Improvements
Erie Sewer Authority, Erie, PA

Associate project manager and process/mechanical project discipline leader for design and construction of a $2.4 million project to replace nine of the 12 return activated sludge pumps for a 68-mgd WWTP. Other improvements included replacement of the two final effluent water automatic backwash strainers, replacement of four final settling tank sludge well sluice gates, structural improvements to various concrete tunnels, channels, and tanks, and electrical improvements. During construction, a change order was requested by the client for replacement of the two final effluent wash water pumps and other related improvements. The work involved extensive coordination between various specialty groups, including regulatory agencies and a third-party construction inspection consultant, and included preliminary and final design, construction documents, opinion of probable construction cost estimates, and contract administration services. Construction involved two prime construction contracts and was completed $60,000 under its contracted amount.

Erie WWTP ORF Pumping System Improvements
Erie Sewer Authority, Erie, PA

Project manager and process/mechanical project discipline leader for design and construction of a $200 thousand project to provide pumping system improvements to the 6-million gallon overflow retention facility (ORF) for a 68-mgd WWTP. Improvements included replacement of the two ORF solids pumps and VFDs, three ORF recovery pump VFDs, mechanical/piping improvements, electrical improvements, and instrumentation and controls improvements. The work included a feasibility evaluation, preliminary and final design, construction document development, opinion of probable construction cost estimates, and contract administration services. Construction involved two prime construction contracts.

Erie WWTP Solids Handling Improvements
Erie Sewer Authority, Erie, PA

Associate project manager and process/mechanical project discipline leader for design and construction of an $8.8 million project to replace a 68-mgd WWTP's belt filter press sludge dewatering system with high-solids centrifuges, and to upgrade existing 35-year-old multiple-hearth sludge incinerators. Other improvements included new grinders, piping systems, solids conveyance systems, hoisting systems, incinerator wet electrostatic precipitator (WESP) modifications, ash handling systems, structural improvements, and instrumentation and controls upgrades. During construction, change orders were requested by the client for additional improvements, including new centrifuge access platforms, high-pressure air compressor and dryer system improvements, polymer system improvements, replacement of the two belt conveyor weight scales, replacement of the two incinerator in-situ oxygen analyzers, replacement of the incinerator continuous emissions monitoring system (CEMS), and other improvements.

ARCADIS Design & Consultancy for natural and built assets

MARNIE BELL, PE, ENV SP

DESIGN CRITERIA / REGULATORY REQUIREMENTS

EDUCATION
MS Civil and Environmental Engineering Massachusetts Institute of Technology 2000
BS Environmental Engineering Massachusetts Institute of Technology 2000

YEARS OF EXPERIENCE
Total – 20 years

LICENSES & CERTIFICATIONS
Professional Engineer – NY
Envision Sustainability Professional
Certified Construction Documents Technologist (CDT)

PROFESSIONAL AFFILIATIONS
American Water Works Association

Ms. Bell has broad expertise with potable water treatment, including regulatory assessment and conceptual and detailed final design and construction administration. She has completed master planning and regulatory compliance assessments for utilities ranging in size from 1- to 2,000-mgd. Ms. Bell has completed water quality evaluations and treatment optimization studies for utilities throughout the U.S.

Project Experience

Water Quality Laboratory
ECWA, Tonawanda, NY

Technical leader for an assessment of ECWA's water quality laboratories, including the Donald Kane Water Quality Laboratory, Sturgeon Point Treatment Plant Process Laboratory, and Van De Water Treatment Plant Process Laboratory. Laboratory documents were reviewed, and operations and activities were observed to determine compliance with the National Environmental Laboratory Accreditation Conference NELAC standards and New York State's Environmental Laboratory Approval Program ELAP. Additionally, an overall assessment of laboratory operations related to best practices was conducted. Findings and recommendations that may improve performance were submitted in a written report.

Van de Water Treatment Plant Capital Improvements Plan
ECWA, Tonawanda, NY

Technical advisor for a Comprehensive Plant Evaluation (CPE) and development of 20-year CIP for the Van de Water Treatment Plant. The project evaluated alternative process trains and treatment techniques to address long-term demands, current and proposed regulations, and current equipment deficiencies. The final deliverable included a $60-million CIP for the next 20-years

Van de Water Treatment Plant Coagulation Basin Upgrades
ECWA, Tonawanda, NY

Designed upgrades to the existing 49.5-mgd conventional treatment plant, including replacement of walking-beam flocculators with vertical, turbine-style flocculators, replacement of baffles in flocculation compartments,

Project Experience Continued

replacement of existing tube settlers and chain and flight equipment, installation of new surface wash pumps and chlorine injector pumps, installation of new liquid lime storage and feed equipment, and installation of a new coagulation day tank and filter aid feed equipment.

Pre-Oxidation and Disinfection Study
ECWA, Tonawanda, NY

Project manager for an evaluation of ECWA's pre-oxidation and primary and disinfection approach at its two WTPs. For the pre-oxidation study, potassium permanganate and seasonal chlorine application has a proven track record for pre-oxidation and zebra mussel control. However, potassium permanganate can be labor intensive and messy. Therefore, alternate pre-oxidants were screened, and sodium permanganate and chlorine dioxide are being further evaluated. Conceptual designs, building layouts, capital and operation cost opinions were developed and benchmarked against the existing potassium permanganate system. In light of emerging contaminants and potential security regulations, alternate approaches to primary and secondary and disinfection were also being evaluated. A roadmap was developed that will inform and assist ECWA with evaluating and selecting an alternative should a future condition require modifications to current disinfection practices.

Collins Park WTP General Plan – HAB Extended Alternatives Evaluation
City of Toledo, OH

Evaluated powdered activated carbon (PAC) and granular activated carbon (GAC) to serve as additional treatment barriers to address harmful algal blooms. The project includes an evaluation of advanced treatment processes, including ozone and GAC and optimization/upgrades of existing treatment processes to optimize HAB removal and replace aging infrastructure.

WTP Facility Assessment
Metropolitan Water Board (MWB), Oswego, NY

Led process mechanical assessment of MWB's 54-mgd WTP, which supports a population of nearly 500,000 people. There is no back-up supply for this system and thus the WTP must continue to operate reliably so as not to jeopardize the primary water supply. The process mechanical assessment evaluated the performance and physical conditions of the various treatment systems at the WTP, the expected useful life of structures and equipment, the ability of the existing processes to meet current and proposed regulatory requirements, and the criticality of each system relative to providing potable water. Process mechanical improvements were identified that would reliably produce high quality water that meets all regulatory requirements while minimizing maintenance requirements and improving energy efficiency and operational flexibility.

Glen Cove Pump Station Evaluation
Nassau County Department of Public Works, Nassau County, NY

Project manager for an asset condition assessment of 16 pumping stations in the Glen Cove service area. Each pumping station will be evaluated relative to condition, performance, and criticality. Near-, short-and long-term capital improvements will be identified and incorporated into the County's 20-year capital improvement plan.

REBECCA SLABAUGH, PE, ENV SP

DESIGN CRITERIA / REGULATORY REQUIREMENTS

EDUCATION
MS Environmental Engineer
Virginia Polytechnic Institute and State University 2007
BS Civil Engineering Purdue University-Main Campus 2005

YEARS OF EXPERIENCE
Total – 14 years

LICENSES & CERTIFICATIONS
Professional Engineer - IN
Envision Sustainability Professional - ISI
Construction Documents Technologist - Construction Specifications Institute

Ms. Slabaugh serves as the Drinking Water Treatment Practice Leader at Arcadis. She brings over 13 years of experience engineering and managing drinking water quality, treatment and distribution system projects, including process selection and optimization, corrosion control treatment, regulatory compliance, water quality monitoring, and cost estimating. She has completed preliminary and detailed process designs for ground and surface WTPs ranging in size from <5 mgd to 1,300 mgd and has experience with both conventional and advanced treatment processes.

Project Experience

Filter Optimization
City of Bloomington Utilities, Bloomington, IN

Project manager for ongoing study to reduce algae breakthrough in filters. Project includes evaluation of existing treatment processes, filter optimization testing, jar testing, operator training and identification of recommendations to optimize the existing treatment processes.

Filter Evaluation
Fort Wayne City Utilities, Fort Wayne, IN

Project manager for ongoing study to assess filterability challenges and identify potential improvements to filter design and operations, including filter media composition, depth and size. Work includes review of water quality and operational data, filter testing results, filter media specifications.

Feasibility Study for Maximizing Surface Water Treatment Capabilities
LADWP, Los Angeles, CA

Project manager on Phase I study to evaluate various alternatives for enhanced coagulation at the Los Angeles Aqueduct Filtration Plant and along the Los Angeles Aqueduct for improved control/removal of turbidity, total organic carbon and DBPs.

Optimal Corrosion Control Treatment Study
Erie County Water Authority, Buffalo, NY

As corrosion expert evaluated current and alternative corrosion control treatment practices at two WTPs. Work included desktop evaluation,

Project Experience Continued

detailed alternatives analysis, harvesting and scale analysis of lead service lines, and development of a demonstration study of the recommended corrosion control treatment.

Kokomo WTP Improvements
Indiana-American Water Company, Kokomo, IN

Process QA/QC for a design-build project at the 8-mgd Kokomo WTP. Project includes design, permitting and construction of a new UV disinfection system (for *Cryptosporidium* inactivation), a new bulk sodium hypochlorite storage and feed system (to replace the chlorine gas system), and a new liquid lime storage and feed system.

Collins Park WTP 20-Year Master Plan & Needs Assessment
City of Toledo, OH

Project engineer for water master plan project designed to provide a comprehensive needs assessment to improve treatment plant performance and operations and develop a 20-Year Capital Improvements Plan (CIP) program.

Queens Groundwater Rehabilitation
New York City Department of Environmental Protection (NYCDEP), NY

Assisted in the evaluation and design of treatment processes for iron, manganese, volatile organic compounds (VOCs), nitrate and perchlorate from groundwater for over 30 well stations. Selected processes at each station included sequestration, oxidation followed by pressure filtration, GAC, air stripping, ion exchange and chemical finishing (i.e., caustic, phosphoric acid, sodium hypochlorite, and hydrofluorosilic acid).

Tunnel 3 Stage 2 Design Services During Construction
New York City DEP Bureau of Water Supply, New York, NY

Lead engineer in the design of a temporary treatment systems for activation of a 24-foot-diameter water main in lower Manhattan. Treatment included flocculation/settling; chemical systems for pH adjustment, chlorination, dechlorination and coagulant and polymer addition; spill containment; chemical procurement; sampling and monitoring; and treatment operations.

WTP Corrosion Control Treatment Update and Simultaneous Compliance Assessment
City of Bay City, MI

Project engineer for a comprehensive evaluation of corrosion control treatment, softening/coagulation practices and related simultaneous compliance issues at the Bay City Municipal WTP. Project work included evaluation of existing water quality conditions and operations/process control data, modeling various treatment process alternatives, and identifying treatment modifications required to re-establish optimum corrosion control treatment, while maintaining compliance with other critical regulatory requirements and utility specific water quality goals.

ARCADIS Design & Consultancy for natural and built assets

MATTHEW CZORA, PE

PROCESS MECHANICAL / PUMPS

EDUCATION

BS Civil Engineering Technology
Rochester Institute of Technology
2011

YEARS OF EXPERIENCE

Total – 10 years

PROFESSIONAL REGISTRATION

Professional Engineer, PA
SWPPP Certified Inspector (NYS) - April 2012, SWT# 45T-042012-11
Certified Construction Documents Technologist (CDT)

PROFESSIONAL AFFILITATIONS

American Public Works Association
American Society of Civil Engineers, Associate Member
Water Environment Federation

Mr. Czora has engineering experience in the design and construction management for municipal water and wastewater projects, including project management, design of water and wastewater treatment facilities and collection systems and pumping systems, preparation of design drawings and technical specifications for construction contracts, and scheduling and administration of construction contracts with multiple prime contracts.

Project Experience

24-in/30-in Canal Crossing South of Ayrault Road

Monroe County Water Authority, NY

The project included installation of a 200-ft span steel pipe bridge over the Erie Canal supporting a 24-in welded steel pipe for the transmission of potable water. Responsibilities included design, preparation of design drawing and contract specifications, bid phase, construction administration, project management, and resident project representative services.

Cobbs Hill Reservoir Structural and Mechanical Improvements

City of Rochester Bureau of Water, NY

Design of a $2.5-million rehabilitation project at Cobb Hill Reservoir, which included design of a new fountain control valve, modifications to the existing submerged inlet conduit, structural repair to Upper Gate House portico floor, and concrete repairs to the Reservoir floor. Responsibilities included design, cost estimating and bid phase services.

Queens Groundwater Rehabilitation Project

NYCDEP, NY

The project scope included design of process residual management, treatment and disposal at each of the 43 different groundwater stations drawing water from the Brooklyn-Queens aquifer system station. Responsibilities included preparation of 30% design drawings and specifications.

Project Experience Continued

Riverdale Pump Stations Improvements
Monroe County DES, NY

The project included improvements to six wastewater pump stations, which encompassed pump upgrades, wet well modifications and electrical upgrades. Responsibilities included project management, construction administration and resident project representative services, including review of payment applications, change orders and submittals.

Electrical Safety Program
Monroe County DES, NY

The project consisted of an evaluation of the County's properties aimed at developing a comprehensive electrical safety program that focused on employee safety and complied with both current OSHA regulations and NFPA 70 requirements for arc flash hazards. Responsibilities included site inspections, field data collection, electrical system modeling and preparation of electrical equipment condition assessments.

Pump Station 9E and 10E Improvements
Ontario County Department of Public Works, NY

The project included the design of improvements to two wastewater pump stations, which encompassed pump upgrades, wet well modifications and electrical upgrades. Responsibilities included project management, design, preparation of design drawings and technical specifications, cost estimating, bid phase services, and construction administration services, including review of payment applications, change orders and submittals.

Central Gates Pump Station Improvements
Monroe County DES, NY

Design of a $2.5-million improvement project at the Central Gates Pump Station. The project included a replacement of the existing pumps, electrical upgrades, architectural modifications, new sewage grinder, heating and ventilation modifications, and replacement of piping and valves. Responsibilities included bid phase services, resident project representative services and construction administration services, including submittal review, request for information, payment applications and change orders.

Northwest Quadrant WWTP Secondary Clarifier Improvements
Monroe County DES, NY

The project included a $9-million expansion project at the Northwest Quadrant WWTP. Improvements included a new secondary clarifier, pump station and distribution structure. Responsibilities included bid phase services and construction administration services—submittal review, request for information, payment applications and change orders.

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JOHN SALVAGNO, EIT

PROCESS MECHANICAL / PUMPS

EDUCATION

MEng Engineering Management
Cornell University 2017
BS Environmental Engineering
Cornell University 2016

YEARS OF EXPERIENCE

Total – 3

PROFESSIONAL REGISTRATIONS

Engineering in Training (EIT)
Construction Documents Technologist (CDT)

PROFESSIONAL ASSOCIATIONS

New York Water Environment Association – WNY Young Professionals Co-Chair

Mr. Salvagno has worked across the planning, design and construction phases of multiple water and wastewater projects as a water specialist at Arcadis. He has supported senior staff during the project life cycle through the development of design calculations, financial feasibility studies and construction administration. In May 2017, he earned a Master of Engineering degree in Engineering Management from Cornell University. In May 2016, he received his BS in environmental engineering from Cornell University with a focus in water infrastructure.

Project Experience

Routing Study for Delivered Water Transmission Main, Van de Water Treatment Plant to Ball Pump Station

ECWA, Erie County, NY

Task manager responsible for project requests for information as well as coordination and analysis of received GIS and as-built information. Project support included AACE Class 4 cost estimating, geodatabase management and report writing to describe cost and non-cost criteria of potential routing alternatives. Project deliverable is a routing study that provides recommendations for water transmission main construction through developed neighborhoods of varying land use classifications.

Corrosion Control Treatment Study

ECWA, Erie County, NY

Provided project engineering support for an evaluation of existing ECWA corrosion control practices and to provide an updated corrosion control desktop study to address current water quality. Work used several databases, including geospatial and historic sampling data using ArcGIS Pro, Power Business Intelligence and Rothberg, Tamburini and Winsor modeling. Assisted in the development of the final report, which included an overview of regulatory and academic information, current corrosion control practices and recommended best practices for optimal corrosion control treatment.

Project Experience Continued

Aspinwall WTP Process/Facilities Assessment
Pittsburgh Water & Sewer Authority, Pittsburgh, PA

Assisted in the preparation of a basis of design report highlighting proposed capital improvements resulting from a facility wide assessment. Report identified the risk profiles and associated costs with improvements to the existing facility. Evaluation included treatment performance, health and safety considerations, and AACE Class 3 cost estimation.

Phase II Evaluations
Metropolitan Water Board, Syracuse, NY

Prepared hydraulic calculations and provided construction administration support for the selection and commissioning of ongoing improvements to several pump stations. Reviewed administrative submittals from the general contractor, drafted construction progress meeting minutes and provided design support for proposed improvements to evaluate potential energy savings.

Industrial Parkway Pump Station
Erie County Dept. of Environmental Planning, Buffalo, NY

Providing engineering support for an evaluation of the existing 21-mgd pump station. Activities include hydraulic calculations, alternative process-mechanical improvements design support and report development. Recommendations of the final report will support future capital planning decisions.

Oxygen Generation System Replacement Feasibility Study
Town of Tonawanda, NY

Analysis considered operational and capital costs associated with design alternatives. Coordinated with vendors and project managers to evaluate implementation of proposed alternatives. Provided a life-cycle cost estimate and capital improvement recommendations. Drafted a final report, including recommendations for site specific and technical considerations for implementation.

Raincheck 2.0
Buffalo Sewer Authority, Buffalo, NY

Project engineer supporting the spatial analysis of green infrastructure feasibility across the City of Buffalo. Work included the use of ArcGIS Pro, Python, and Power Business Intelligence to accurately collect, analyse and provide feedback on several thousand properties of interest. Project deliverable included objected oriented programming to produce over 400 data sheets of spatial and site surveyed information to better inform green infrastructure implementation.

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HANNAH ROCKWELL, EIT

BURIED PIPING

EDUCATION
BS Environmental Engineering
University of Michigan 2015

YEARS OF EXPERIENCE
Total – 4.5

PROFESSIONAL REGISTRATIONS
Engineering in Training (EIT)
Construction Documents Technologist (CDT)

PROFESSIONAL ASSOCIATIONS
American Society of Civil Engineers, Associate Member
American Water Works Association, Member
New York Water Environment Association, Member
Genesee Valley Chapter NYWEA, Board Member

Ms. Rockwell specializes in water, wastewater and green stormwater infrastructure system design and construction. She has experience in providing planning, design, funding application, bid phase, construction administration and resident project representative services.

Project Experience

Risk and Resiliency Assessment
Buffalo Water Board, Buffalo, NY

Performed an All-Hazards Risk and Resilience Assessment to comply with AWIA. Evaluated Buffalo Water system's physical and cyber assets using AWWA J100-10 Standard RRA Methodology using a collaborative workshop-based approach to promote knowledge sharing. When completed, the project will result in an estimated overall risk and resilience profile for Buffalo Water, in addition to meeting the AWIA requirements ahead of the March deadline. Responsibilities included identification and evaluation of threats unique to the area (severe flooding/winds, ice jams, harmful algae blooms, etc.), site visits for risk and vulnerability assessment, development of threat-asset pairs for further evaluation, identification of applicable consequences for each threat-asset pair, and preparation of materials summarizing the results of the workshops and overall project.

Riverdale Pump Stations Improvements
Monroe County, NY

Project included improvements to six wastewater pump stations, which encompassed pump upgrades, wet well modifications, and electrical upgrades. Responsibilities included construction administration and resident project representative services, including review of payment applications, change orders, and submittals.

Pump Station 9E, 10E, and 1W Improvements
Ontario County, NY

Project included the design of improvements to three wastewater pump stations which encompassed pump upgrades, wet well modifications, and electrical upgrades. Responsibilities included project design, cost estimating, bid phase services, and construction administration services including review of payment applications, change orders, and submittals.

Project Experience Continued

Thornell Pump Station Chlorination/Dechlorination
Monroe County Water Authority, NY

The project consisted of a condition assessment, evaluation and conceptual design of improvements to the chlorination and dechlorination facilities at the MCWA Thornell Pump Station. Condition assessment and evaluation included review of electrical and I&C systems, chlorination and dechlorination systems, structural components, and HVAC systems. Responsibilities included cost estimates, manufacturer coordination and preparation of an evaluation report.

Frank E. Van Lare WRRF CEPT Improvements
Monroe County DES, Irondequoit, NY

The project included evaluating the applicability and effectiveness of chemically enhanced primary treatment (CEPT) to improve primary effluent quality at FEV and reduce permit exceedances during wet weather events. The project included the evaluation of ferric chloride and polymer addition for CEPT, including an extensive lab scale testing plan for numerous chemical doses and combination. Design of the system included review of hourly flow/wet weather data, operational data, and the design of a ferric chloride storage and feed system. Responsibilities included review of other facilities using CEPT, designing testing plans for and performing multiple rounds of jar testing to determine appropriate chemical dosing rates, jar testing results evaluation, preparation of a Basis of Design Report for review by the NYSDEC, and design and bidding efforts.

NYS Consolidated Funding Application Grant Assistance
Monroe County DES, NY

The project included the preparation of consolidated funding applications for the Water Quality Improvements Program (WQIP), Engineering Planning Grant (EPG) Program, the NYS Water Infrastructure Improvement Act (WIIA), and the NYS Intermunicipal Water Infrastructure Grants Program (IMG) for MCDES' Secondary System Improvements Program. The total cost of the projects submitted for consideration is greater than $40 million, and applications to date have resulted in the award of subsidized SRF funding and $5 million in grant awards. Responsibilities included review of available project information and grant application requirements, coordination with the client, long-term funding/grant planning, and preparation of multiple grant applications in a short time frame.

Frank E. Van Lare (FEV) WRRF Aeration System
Monroe County DES, Irondequoit, NY

The project included investigating the performance challenges of the existing secondary treatment system at FEV and identifying potential remedies and actions to improve the performance of the secondary treatment system. The project included regulatory review and stakeholder meetings, full-scale, plant-wide demonstration testing, design of a pilot test unit for biological performance testing, investigations on CEPT, investigations on recycle wastewater treatment, preparation of a SPDES permit application, and evaluation of waste activated sludge pumping and piping capacities.

GREG MOORE, PE

ELECTRICAL

EDUCATION
BS Electrical University of Bridgeport 1989

YEARS OF EXPERIENCE
Total – 26
With Arcadis – 22

PROFESSIONAL REGISTRATIONS
Professional Engineer – CT, LA, NH, MA, MD, MO, NY, PA, RI

Mr. Moore specializes in electrical engineering. His work has involved various aspects of design of large and small municipal and industrial wastewater treatment, process, and pharmaceutical facilities, including but not limited to, the design of power distribution, including medium voltage, generator, utility and generator paralleling, lighting, grounding, control schematics and wiring interconnections. In addition, Mr. Moore develops the Division 16/26 Electrical Specifications for projects. He also has performed construction administration on many projects, overseeing the installation of electrical work. In addition, he has performed electrical inspections of installed electrical work on various projects and pre-design inspections of various facilities evaluating their electrical capability. In addition, he has performed energy audits for existing facilities, designed fire alarm detection, and alarming systems and security systems.

Project Experience

Van De Water WTP, Electrical Improvements and Design
ECWA, Buffalo, NY

Upgrades included demolition and installation of a new 35-KV metal clad switchgear substation, transformers and appurtenances. Due to the proximity to a larger National Grid Substation, National Grid requested that Arcadis perform a grounding grid analysis to ensure safe step and touch potentials during faults. Arcadis mobilized a field team to take ground resistance measurements using the Wenner method as well as complete ground grid analysis. The project included the following upgrades:

- Demolish existing 23 kV reclosers.
- Provide new 38-KV switchgears.
- Replace existing supply transformers accessories.
- Modify existing switchgear.
- Repair switchgear enclosure.
- Modify site access to new electrical equipment.
- General construction.

Wet Weather Expansion
Metropolitan District Hartford, CT

Provided the electrical design of a new wet weather facility with an approximate electrical load of 9MVA. In addition to providing the design

Project Experience Continued

of lighting, grounding, interconnection, lightning protection, power utilization, power distribution systems and all other electrical aspects (short-circuit analysis, voltage drop calculations, etc.), three 2.5-MW, 4.16-KV generators were be provided and synchronized to provide standby power to the facility. In addition, the generators will be connected to the main switchgear of the facility requiring and interface with Connecticut Light and Power and will parallel under exercise mode.

WWTP Improvements
Gloversvillle-Johnstown, NY

Provided the electrical design of paralleling two 480-V generators with the plant's 13.2-KV utility service. Design involved providing new 13.2-KV switchgear, a 480-V generator paralleling gear and all synchronizing controls to allow them to run in parallel. The generators were provided with process digester gas as the fuel source, thereby, reducing the utility bill by over 80%.

Water Pollution Upgrade and Expansion
Arlington County, VA

Responsible for design of lighting, grounding, interconnection, lightning protection, power utilization, power distribution systems and all other electrical aspects (short-circuit analysis, voltage drop calculations, etc.). The design included providing a three 4.16-KV, 2.5-MW generators and paralleled to provide standby power to the entire plant. The generators were synchronized and fed to a 4.16-KV switchgear which in turned tied into the plants main 34.5-KV switchgear via transformers.

Upgrading of Northeast Water Pollution Control Plant
Philadelphia Water Department, Philadelphia, PA

Responsible for all aspects of electrical work from design to rehabilitation of the existing aeration system. Work included multiple site visits to determine existing condition. Providing new I/O panels for each tank, adding new instruments, and tying the existing instruments into the system. Modified the blower controls for the new process. Developed all electrical specifications and provided construction administration and field inspections.

Phase II Biological Nutrient Removal (BNR) Upgrade
The Metropolitan District, Hartford, CT

Responsible for design of lighting, grounding, interconnection, lightning protection, power utilization, power distribution systems and all other electrical aspects (short-circuit analysis, voltage drop calculations, etc.). The design also included the replacement of an existing 4.16-KV switchgear and the installation of three 4.16-KV blowers. The replacement of the switchgear and blower’s required detailed staging to ensure the plant remained operational and air was available to the aeration tanks at all times.

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RYAN KOWALSKI, PE

I&C / AUTOMATION / SECURITY

EDUCATION
BS Electrical Hofstra University
1995

YEARS OF EXPERIENCE
Total – 19

PROFESSIONAL REGISTRATIONS
Professional Engineer – CT, NY, VA

Mr. Kowalski is a professional engineer for project management, design and construction supervision of SCADA, instrumentation and automation systems for wastewater and water treatment systems. As part of design delivery, he has been the Engineer of Record and led discipline design teams for projects spanning small municipal water and wastewater systems to installations for large, urban treatment plants treating over 100 mgd. His focus is on process control automation evaluation and design, telemetry and network design, configuration, evaluation of instrument systems, system start-up, commissioning, and training of operators on automation systems. At the 2015 AWWA Annual Conference and Exposition (ACE) in Anaheim CA, Mr. Kowalski presented “Getting Two Billion Gallons through the Gates! Lessons Learned in Startup, Commissioning and SCADA Management at the World’s Largest UV Disinfection Facility” providing an overview of the SCADA commissioning for the facility.

Project Experience

Van de Water Treatment Plant and Ball Pump Station Electrical Improvements MP-77A
ECWA, Buffalo, NY

Lead I&C SCADA engineer. Interconnected both new and replaced switchgear to ECWA SCADA. Work included coordinating signal interfaces and architecture for configuration of Schweitzer relays.

Van de Water Treatment Plant Coagulation Basins Upgrades MP-76
ECWA, Buffalo, NY

Lead I&C/SCADA engineer for the $8 million project. The improvements included I&C improvements to flash mix, flocculation and sedimentation basins, lime system, chemical systems and new mechanical equipment for the 49.5-mgd facility. SCADA improvements included three new flocculator PLC panels with VFD interconnection, new flocculator room PLC panel, new turbidity sampling system, PLC improvements to sludge drawdown and telescoping valve control, a new coagulation filter feed PLC panel, revisions to the fiber optic network on site, new operator interfaces, development of scope and allowance items for ECWA systems integrator, and inclusion of ECWA standards within all I&C specifications.

Project Experience Continued

Sturgeon Point WTP GHD-6B HVAC Upgrades
ECWA, Buffalo, NY

Lead SCADA/I&C engineer for HVAC upgrades at the Sturgeon Point WTP. The project included upgrades to the VFD cabinet ventilation system in the delivered water pump station, VFD room, chlorine room, Quonset Hut and flocculation building, including provisions for new SCADA PLC panels, extension of fiber optic network, development of scope and allowance items for ECWA systems integrator.

Pine Hill Pump Station Improvements MP-77B
ECWA, Buffalo, NY

SCADA/I&C engineer for improvements to the Pine Hill Pump Station. The project included complete demolition of the interior pumps and installation of new 350-hp pumps, installation of new flow metering and appurtenances, a new electrical system, including a standby generator and transfer switch, and interfacing all to existing ECWA RTU.

Larnder's Point Pump Station Upgrade
Philadelphia Water Department, Philadelphia, PA

Principal for preliminary design development for the upgrade project. LPPS is a finished water pump station, with capacity to 210 mgd, that pumps treated drinking water to the City of Philadelphia's (City) distribution system. It normally conveys approximately 30% of the drinking water consumed by the City each day. Facilities and mains associated with the station are among the oldest in the system, some dating back to before 1900.

Samuel S. Baxter WTP Planning and Design for Clear Well Basin (CWB) Expansion – New Clear Well Basins 3 and 4
Philadelphia Water Department, Philadelphia, PA

Principal facilitator for monthly core team meetings with stakeholders for the Baxter 34 project. Project includes planning for two additional clear well basins (10-MG storage) at the Baxter WTP, which has peak night-time flows over 200 mgd. Effort includes evaluation of constructability, siting alternatives and theory of operation. Project scope includes construction of clear well basins 3 and 4, interconnecting piping, valving and isolation stop log chambers, and site restoration. Project has complex sequencing and staging, including almost 500,000 CY of soil movement and soil stockpile removal, as well as decommissioning and demolition of the existing CWB, and disinfection and interconnect of large-diameter piping (120 inches). Core stakeholders include PWD staff from planning unit, treatment, conveyance (load control and pumping), BLS, construction unit and design branch.

Raw Water Intake and Potomac Raw Water PS
Loudoun Water, Leesburg, VA

Lead instrumentation engineer for design of 40-mgd raw water intake on the Potomac River (250-ft-tunnel, 125-ft-deep shaft, raw water PS, approximately a quarter of a mile of 42-inch raw water transmission main, and associated site upgrades). Design includes air burst system and reverse flush system for intake cleaning, four new 900-HP 4160V VFDs for pumping, chemical feed systems, level monitoring and water quality systems.

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ALEXANDER MISIASZEK, PE

I&C / AUTOMATION / SECURITY

EDUCATION
MBA Business Administration
Management Boston University
2011
BS Electrical Engineering
University of New Hampshire
2002

YEARS OF EXPERIENCE
Total – 17 years

LICENSES & CERTIFICATIONS
Professional Engineer – CT, MA, ME, NH

PROFESSIONAL ASSOCIATIONS
International Society of Automation

Mr. Misiaszek is a Massachusetts professional control systems engineer with 15 years of relevant experience in system integration, SCADA, and instrumentation and controls (I&C) design. He is proficient in PLC/HMI/OIT programming and LAN Ethernet configuration and has a thorough working knowledge of ISA 101, Human-Machine Interface Standard and high-performance graphics.

Project Experience

Exeter Wastewater Treatment Facility Upgrade
Town of Exeter, Exeter, NH

Designed a new I&C system for upgrades, including conversion of the facility from a lagoon to a Bardenpho system. The project also includes a new main pump station, force mains, headworks, septage, plant water system, dewatering centrifuges and UV disinfection. The design included networked analyzers, site-wide industrial Wi-Fi, fiber optic ethernet, cellular boosters, licensed radio and SCADA system upgrades.

Bernier Road Well and Pump Station
Sanford Water District, Sanford, ME

Performed design and start-up of a new water treatment well to add capacity to the Sanford Water District. The design included pumping to flow/system pressure requirements, chemical treatment, building alarms, radio communications and SCADA integration.

Headworks Screening Upgrade
City of Nashua, NH

Performed I&C design for new influent screens and wash presses, including new automation for the plant influent to minimize the potential for flooding of the lower screening area/pump station wet well.

Iron Removal Plant SCADA Installation
Veolia North America, Sturbridge, MA

Designed and built a complete turnkey SCADA system, including control panel, communications panel and SCADA computer. Set up, tested and commissioned the new system. Coordinated with filter, UV, construction and engineering representatives. Provided consulting, training and

Project Experience Continued

customer-focused support to promote a successful transition to a complete working system with operators.

Iron Removal Plant SCADA Installation
Manchaug Water District, Manchaug, MA

Designed and built a new SCADA system, including SCADA computer and programming for the main control panel PLC. Set up, tested and commissioned through coordination with filter, aeration, instrumentation vendor, construction and engineering representatives. Provided consulting, training and customer-focused support to enable a smooth start-up.

Lower Lift Pump Station Upgrade
City of Rochester, NH

Designed new raw water pumps control system, instruments, control panel and fiber optic integration to SCADA.

Madison Street Pump Station
North Berwick Sanitary District, North Berwick, ME

Provided a I&C system evaluation for the pump station followed by documents for a design/build operation with a third-party electrician/system integrator firm.

Marshall Pump Station SCADA Upgrade
Town of Georgetown, MA

Upgraded SCADA and PLC to add the upgraded station to existing systems at an iron removal plant and main water office SCADA computers.

SCADA / PLC Assessment
City of Rochester, NH

Performed an evaluation/assessment and provided recommendations for improvements for the city water sites' control panels.

South Acton Water Treatment Plant
Acton Water District, Acton, MA

Project engineer responsible for construction administration and review of drawings and documents.

Water Treatment Plant Improvements
Town of Bellingham, Bellingham, Massachusetts

Project engineer responsible for construction administration and review of drawings and documents.

ARCADIS Design & Consultancy for natural and built assets

VINCENT VITALE, PE, LEED AP

BUILDING MECHANICAL

EDUCATION
BS Mechanical Engineer
Manhattan College 1988

YEARS OF EXPERIENCE
Total – 31

PROFESSIONAL REGISTRATIONS
Professional Engineer – MA, NJ, NC, NY, PA, Puerto Rico, RI, VA
U.S. Green Building Council - LEED AP BD+C

PROFESSIONAL ASSOCIATIONS
American Society of Heating, Refrigerating and Air-Conditioning Engineers

Mr. Vitale specializes in the design and engineering of heating, ventilating and air conditioning systems for commercial and industrial applications. He has participated as a team member on value engineering projects related to HVAC system cost saving measures. He is experienced in the design of systems using steam, hot water, chilled water, refrigerant, electricity, gas and fuel oil. Mr. Vitale is responsible for boiler and chiller systems designs, built-up and packaged central station air handling systems, including constant and variable volume, heat recovery systems, industrial ventilation, cooling towers, exhaust and dust collection systems, HEPA filtration systems, laboratory HVAC systems, computer room AC systems, clean room air systems, and associated direct digital control systems. He is also experienced in the design of odor control systems, including carbon adsorbers, wet scrubbers, fiber glass reinforced plastic (FRP) fans and duct systems, FRP covers, associated chemical systems, and controls.

Project Experience

Deer Island Treatment Facility (DITP)

Massachusetts Water Resource Authority (MWRA), Boston, MA

The DITP was constructed in the early 1990's and treats 1.3 billion gallons per day peak flow from 43 greater Boston communities. HVAC controls and equipment have reached their useful life or have deteriorated and require evaluation and replacement. As project manager and lead HVAC design engineer for the building automation system and HVAC unit replacement contract, responsible for a design report and follow-up detailed design. Tasks included identifying replacement options, life-cycle cost analysis, construction cost and construction scheduling associated with control systems in 25 buildings and HVAC equipment upgrades in 15 buildings. The four-story administration/laboratory building, which included 39,000 SF of laboratory within the 92,000 SF four story building included two 35,500-cfm air handling units, 96 fan coil units, three 260-ton chillers, four primary chilled water pumps, two secondary chilled water pumps, four condensing water pumps, two cooling towers and 26 chemical fume hoods. As part of the evaluation we included replacement options for converting 26 auxiliary air fume hoods to low flow high performance hoods and retrofitted the 71,000-cfm outside air system with air

Project Experience Continued

conditioning using a hybrid DX and passive desiccant system. The existing system had tempered air in the winter but no air conditioning in the summer.

Pine Hill Pump Station Improvements
ECWA, Buffalo NY

Responsible for the HVAC design upgrades for the rehabilitation of the Pine Hill Pump Station. The project includes ventilation, heating and control system upgrades to support new pumps and VFDs.

Sturgeon Point WTP GHD 6B HVAC Upgrades
ECWA, Buffalo NY

Responsible for the HVAC design upgrades at the Sturgeon Point WTP. The project includes air conditioning of the electric room associated with the pumps in the delivered water pump station, ductwork modifications, rooftop air conditioning units and control system. The project also included fans, louvers and control systems in the chlorine room, quonset Hut, and flocculation building.

WPCF Wet Weather Expansion Project
Hartford MDC, Hartford CT

Responsible for the HVAC design of a new influent pumping station and headworks facility at an existing WPCF. Responsibilities included the design of a central hot water heating plant consisting of modular high efficiency condensing boilers and associated hydronic heating distribution system. Design of an outdoor hot water heated radiant slab heating system to prevent slab freezing during cold weather wash down and snow melting. Design of 100% outside air heating and ventilating systems and associated supply air distribution systems. Design of air conditioning systems for electric and control rooms. Design of PLC-based HVAC control systems and integration with the plant wide fiber optic HVAC control system.

Hanover Park WWTP
MWRD, Hanover Park, IL

As the project's mechanical design advisor, responsible for evaluating dual fuel fired boiler plant system design for an existing facility. Dual fuel boilers blend digester gas with natural gas for plant wide hot water heating systems serving comfort heating for buildings and sludge heaters for the treatment process.

Central Plant Additions
Williamsport Sanitary Authority, Williamsport, PA

Responsible for the HVAC systems design of eight new buildings, including headworks building, denitrification filter building, operations center, secondary clarifier building, methanol building, chlorine contact tank building, chemical builiding, blower building and upgrades to the existing solids handling building. Systems included hot water condensing boilers, custom air handling systems, DX refrigeration systems, high plume exhaust fans, laboratory HVAC systems and plant wide direct digital control systems for global monitoring and control.

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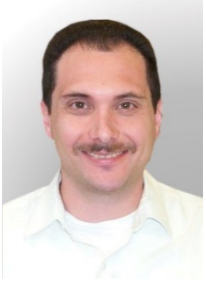
PAUL DICORSO, PE

STRUCTURAL



EDUCATION
MS Structural Engineering
University at Buffalo 1989
BS Civil Engineering University at
Buffalo 1986
BPS Architecture University at
Buffalo 1984

YEARS OF EXPERIENCE
Total – 32

PROFESSIONAL REGISTRATIONS
Professional Engineer – NY, PA

PROFESSIONAL ASSOCIATIONS
American Institute of Steel
Construction

Mr. DiCorso is experienced in the design of a vast array of steel, concrete, aluminium and timber structures for municipal water and wastewater facilities, highway bridges, heavy industrial and steel making facilities, and industrial and commercial buildings. As senior project engineer on numerous structural engineering projects throughout the U.S. His structural designs are enhanced by professional studies and experience in architecture for various types of buildings.

Project Experience

Sturgeon Point WTP Coagulation Basin Upgrades
ECWA, Evans, NY

Lead project structural engineer for a $21-million project to upgrade a 90-mgd WTP. The improvements consisted of modifying underground flocculation basins to facilitate the replacement of existing flocculator mechanisms with new vertical turbine-style flocculators. Responsibilities included the structural modification of the underground open top tanks to support a new floor and the design of new influent and effluent channels at the ends of the basins. All structures were designed to the stringent requirements of the ACI 350 code for environmental structures and for the seismic sloshing effect of the liquid in accordance with ACI 350.3 seismic standard for water retaining structures.

Smith at Eagle Real Time Control Structure
Buffalo Sewer Authority, Buffalo, NY

Lead structural engineer responsible for the design of an underground control structure, approximately 45 by 30 feet in plan, and 22 feet deep below grade. Acting as an inline flow storage facility, it contained sluice gates and weirs to control the flow. The structural system consisted of reinforced concrete moment frames, walls and mat foundation. It was designed in conformance with the stringent requirements of ACI 350 for environmental liquid retaining structures. Located below Smith Street, the structure was designed for AASHTO truck traffic loading.

Ley Creek Pump Station Upgrade
Onondaga County, NY

Structural engineer of record for improvements to the dry well area of the pump station and an exterior flood barrier system. The interior improvements consisted of a 250-sq. ft. steel framed mezzanine to

Project Experience Continued

service 30-inch diameter knife gate valves. The exterior flood barrier consisted of 2-foot-high reinforced concrete walls and gates with removable stoplogs that partially protect the building and adjacent electrical substation from flood waters. Responsibilities included all aspects of detailed structural design, preparing division three and five specifications, coordinating drafting and developing details, construction cost estimating, and associated shop drawing and submittal review.

Pump Station Engineering Term Services

Monroe County, NY

Structural engineer in providing various engineering services on an as-needed basis for the County's wastewater treatment facilities, including evaluations, load rating, preliminary and final design, cost estimating, and construction phase services.

Oak Orchard WWTP Disinfection Improvements and Lagoon Rehabilitation

Onondaga County, NY

Project discipline leader for structural design of several structures related to the Oak Orchard Wastewater Treatment Plant Disinfection Improvements and Lagoon Rehabilitation projects. The dechlorination tank was a reinforced concrete open top tank with four chambers with various sluice gates, weirs and a parshal flume. The structure was approximately 50 by 27 feet in plan, and 12 feet deep below grade. It used 34-hp piles driven to bedrock. It was designed in conformance with the stringent requirements of ACI 350 for environmental liquid retaining structures, and with the seismic requirements of ACI 350.3. The tank was constructed in two phases since the flow from an adjacent chlorine contact tank needed to be maintained until the new tank was ready to receive the flow. The project also involved the design of an 80 ft walkway above an existing chlorine contact tank consisting of aluminium framing and bar grating. The chemical transfer station consisted of a reinforced concrete slab to support tanker trucks while they unloaded chemical. The structure was approximately 60 by 21 feet in plan with a 30 foot by 4 foot by 4 foot deep pit covered in FRP grating to retain spillage. The structure was supported on 27-hp piles driven to bedrock. The lagoon effluent platform consisted of a reinforced concrete platform constructed over a 72-inch diameter outfall pipe on the bank of a lagoon. The structure included a concrete stairway down to a lower level for taking samples at the water surface.

Stewart Standpipe Roof Replacement

City of Syracuse Department of Water, Syracuse, NY

Situated at the top of a hill in Thorndon Park overlooking the city of Syracuse, the Elon P. Stewart Standpipe is a 2-MG potable water reservoir serving the surrounding area. Constructed in 1925, the steel ribbed concrete dome had experienced a gradual deterioration over the years, and a recent inspection had determined that complete removal and replacement was warranted. As lead project structural engineer and engineer of record, responsibilities included inspection, and all aspects of the structural analysis and design involved in demolishing the existing dome and replacing it with a lightweight aluminium geodesic dome.

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WILLIAM BARHORST, PE

HYDRAULIC ANALYSES

EDUCATION

MBA Business Administration
Wright State University 2006
MS Civil Engineering University of Dayton 1999
BS Civil Engineering San Diego State University 1992

YEARS OF EXPERIENCE

Total – 27 years

PROFESSIONAL REGISTRATIONS

Professional Engineer – KY, OH, WV
Construction Documents Technologist - OH
Board Certified Environmental Engineer – OH

PROFESSIONAL ASSOCIATIONS

American Water Works Association

Mr. Barhorst has experience in design and hydraulic analysis for water and wastewater treatment facilities incorporating various open-channel, pressure flow and unit processes. He has hydraulic modeling experience in various analysis programs for modeling water distribution systems, raw water delivery systems and transient pressure analysis, including model calibration to match real-world conditions.

Project Experience

Collins Park WTP Basins 7 and 8 Redundant Capacity Improvements

City of Toledo, OH

Hydraulic engineer for the design of Basins 7 and 8 at the 120-mgd Collins Park WTP expansion to 160-mgd hydraulic capacity. Each 20-mgd basin includes flocculation, sedimentation and recarbonation stages. A new filter building complex will add 10 filters for a total of 40. Additional gate and channel provisions will facilitate connection to the future ozone contactor facilities.

Collins Park WTP Ozone Improvements

City of Toledo, OH

Hydraulic engineer for the inclusion of ozone into plant processes. Evaluated multiple scenarios for gravity flow through ozone contactors and pumped flow and impact on plant hydraulic profile and existing processes.

Collins Park WTP Basin 1 - 6 Improvements

City of Toledo, OH

Hydraulic engineer for plant renovations of Basins 1 - 6 by incorporating flow splitting and measurement, submerged orifice troughs and provisions for future ozone flow paths.

Clearwater Pump Station Surge Analysis

Metropolitan Water Board, Onondaga County, NY

Hydraulic transient surge analysis of 50-mgd Clearwater Pump Station and 26.5 mile, 54-inch transmission main to determine improvements necessary to resolve transient surge pressures during pump starting, shutdown, and emergency stop conditions.

Project Experience Continued

Raw Water Improvements
City of Oregon, OH

Upgrade to the existing low service pumping station from 16 to 24-mgd that delivers raw water from Lake Erie to the WTP. Project includes three new pumps and evaluation of surge potential on the existing 36-inch raw water main. Design of approximately four miles of 24-inch HDPE raw water main from the Oregon WTP to the future Oregon Clean Energy Facility including air release and blowoff connections. Conducted hydraulic and surge analysis for pumping requirements along raw water main.

Elm Fork Pump Station No. 1 Transient Analysis
Dallas Water Utilities, Dallas, TX

Hydraulic transient surge analysis of new Elm Fork Pump Station No. 1 supplying 200-mgd to surrounding communities. Transient analysis was conducted as part of design to ensure that excessive high or low pressures were mitigated with the appropriate surge protection devices as the pump station during a power failure.

Low Service Pumping and Raw Water Mains
City of Toledo, OH

Hydraulic transient pressure analysis at the 180-mgd low service pump station for selection of surge control devices, such as surge anticipation valves, air release, and vacuum breaking valves. Analysis included evaluation of existing nine-mile, 78-inch-diameter raw water main to prevent negative pressures from deforming the pipeline during a loss of power while pumping.

Low Service Pump Station System Curve and Surge Analysis
City of Toledo, OH

Process engineer for analysis of the pump operation at a 200-mgd low service pump station. Historically the low service pump station pumping operations contained an operational pumping “void” from 68 to 82 mgd. Used Bentley Hammer to perform surge analysis and parallel 72- and 60-inch raw water mains to the Collins Park WTP.

Alum Creek Pump Rehabilitation Design
City of Columbus, OH

Assistant project manager and process engineer for design for replacement of eddy current drives on two 35-mgd, 1,250-hp raw water pumps as well as design for replacement of pump station electrical, ventilation and other auxiliary systems.

Kirtland Pump Station Hydraulic Analysis
City of Cleveland, OH

Principal engineer for the Kirtland Raw Water Pumping Station hydraulic capacity analyses. The 200-mgd raw water pump station takes suction from Lake Erie through a five-mile, 108 - inch-diameter tunnel and delivers 130 mgd to the Baldwin WTP through approximately 15 miles of 48- through 60-inch-diameter raw water system piping.

MICHAEL HIGGINS, PE, CPESC

SITE/CIVIL

EDUCATION

MS Environmental Resource and Forest Engineering State University College of Environmental Science & Forestry 2005

BS Environmental Resource and Forest Engineering State University College of Environmental Science & Forestry 2001

AA Environmental Technologies Paul Smiths College 1998

YEARS OF EXPERIENCE

Total – 16

LICENSES & CERTIFICATIONS

Professional Engineer – NY, OH, PA, VT, MD

Certified Professional Erosion and Sediment Control (CPESC) – U.S.

Mr. Higgins has more than 16 years of experience as a project manager specializing in civil design and stormwater design, permitting and compliance, industrial stormwater management, and erosion and sediment control. He oversees all aspects of his environmental and water-related projects, from scoping through implementation. Mr. Higgins has extensive experience working with agency representatives, clients, contractors and suppliers to facilitate project completion. Under his guidance, his teams routinely develop design drawings, reports/memos, proposals, and permits for a variety of water, environmental and industrial projects. In addition, Mr. Higgins also has extensive field experience, including environmental monitoring for transmission line construction; construction supervision; and boundary and topographic surveying.

Project Experience

Wastewater Treatment Facility Site Design and Permitting

Confidential Client, Peach Glen, PA

Led a team responsible for the site design (including earthwork and stormwater management system designs) for a food production-related wastewater treatment facility. Served as the liaison between the mechanical designers, the client and the regulators during design and permitting activities. The team developed an erosion and sediment control and post-construction stormwater management plan in support of the construction and operation of the industrial wastewater treatment facility. The plans were submitted for coverage under the Pennsylvania Individual NPDES permit for Stormwater Discharges Associated with Construction Activities. Site design activities included considerations for aquatic resources, temporary and permanent access roads, soil disposition, stormwater management features and storm sewer conveyance systems.

Baxter Clear Well Basin Design

Philadelphia Water Department (PWD), Philadelphia, PA

Provided earthwork, erosion and sediment control, and stormwater management design and permitting support for the design of the City of Philadelphia's Baxter Clear Well Water Basin. The project consisted of a new 10-MG clear well basin, soil disposition area, a valve gate house for

Project Experience Continued

flow control, and approximately 4,000 feet of large-diameter pipe. The new facilities replace the existing clear well basin and provide a higher level of redundancy in the facilities between the WTP and the downstream pump stations, which can provide approximately 260 mgd of potable water to the City. The civil design incorporates a comprehensive stormwater management system, including a four-acre green roof, permeable pavers and subsurface infiltration.

Evaporation Pond Design
Confidential Client, Rock Springs, WY

Led a team responsible for the design of a 60-acre evaporation pond system at a uranium mine reclamation site. Evaporation pond design included a 60-mil high-density polyethylene double liner system, leak detection system, conveyance piping system, and a Probable Maximum Flood study to determine the extent of the adjacent flood plain to evaluate potential pond siting impacts. In addition, the design included a 280,000 cubic yard earthwork analysis to achieve a cut/fill balance, site restoration specifications, and health and safety-related facilities design. The design was prepared in accordance with client and agency regulations, including dam design guidelines.

Commercial Property Stormwater Management System
Confidential Client, Rome, GA

Provided engineering design support for a project involving the installation of over 1,500 LF of 18- to 60-inch high-density polyethylene stormwater culvert piping and pre-cast concrete manholes traversing several commercial properties. This project involved soil removal as deep as 20 feet below the ground surface to remove polychlorinated biphenyl (PCB)l-containing soils and allow for the installation of the stormwater pipe and manholes. Shoring measures were used to provide soil stabilization along an active road and railway during soil excavation.

Eastern Parcel Soil Remediation
Hastings-on-Hudson, NY

Lead design engineer for the design, permitting, and construction of a 7.5-acre soil cover. This project included development of a Final Remedial Design Report that documented the construction requirements for the import of approximately 30,000 cubic yards via barge, construction of the soil cover, and restoration of the site. Led the permit/regulatory approval activities, coordination with New York State Department of Environmental Conservation staff, and construction management/oversight for Arcadis.

Point Breeze Vacant Lot/Street Greening
PWD, Philadelphia, PA

Led the design of a green stormwater infrastructure system (rain garden) to reduce the potential for flooding and overtopping of a residential street. Performed stormwater calculations for the system to meet PWD standards, including watershed delineations, and conducted a site visit to verify existing conditions. Prepared drawing submissions to PWD. The project is part of the City of Philadelphia's "Green City, Clean Waters" initiative.

ARCADIS Design & Consultancy for natural and built assets

PAUL KEITZ

HAZARDOUS MATERIALS

EDUCATION
BS Mechanical Engineering 1990

YEARS OF EXPERIENCE
Total – 29 years
With Arcadis – 17 years

PROFESSIONAL REGISTRATIONS
Asbestos Inspector – RI
Asbestos Management/Planner – RI
Asbestos Project Designer – RI

Mr. Keitz is a degreed mechanical engineer with 29 years combined experience in industrial hygiene, mold remediation, HVAC design, mold assessments, indoor air quality investigations, construction and asbestos management. His work experience has included projects in large power plants, hospitals, colleges and universities, industrial manufacturing facilities, schools, corporate office buildings and commercial real estate.

Industrial Hygiene Project Experience

Kidney Dialysis Facilities Throughout the U.S.
Conducted mold assessments, assemble project specifications and provide independent third-party oversight of numerous mold remediation projects.

Federal Location, NY
Developed standard operating procedures for equipment and containment construction used hexavalent chromium paint application to aircraft, including equipment maintenance, personnel protective equipment uses and storage, enclosure systems during paint application and general housekeeping procedures.

Multiple Client Locations
Survey and cost estimates for silica dust sampling during cement operations, sanding and grinding activities and during general construction activities.

Private Client Naugatuck, CT
Provided industrial hygiene services at two research and development facilities in accordance with OSHA required sampling methodologies. Sampling included respirable particulate, noise dosimetry, methylene chloride, total particulate and other analytes.

Commercial Office Renovation, New York, NY
Solicited contractors for mold remediation project in a 51-story commercial office building that sustained water damage due to broken valves and provided remediation oversight. Assisted in the design of a total HVAC refit of 25 floors of a 51-story commercial office building.

Project Experience Continued

Construction Management Project Experience

Jahn Foundry, Springfield, MA
Provided Construction oversight for the reconstruction of a metal casting production foundry on behalf of Kemper Insurance Company.

Kodak, Rochester, NY
Assisted in the design of various chemical-processing applications.

Xerox Corporation, Rochester, NY
Design of various dust collection systems within the manufacturing facilities and implementation of the dust collection system.

Asbestos Project Experience

Multiple Client Locations
Survey and cost estimates for asbestos materials sampling, cost estimates for asbestos abatement and building demolition activities and project management.

Moses Brown School, Providence, RI
Verification of asbestos survey, design, abatement plan, and abatement management for removal of asbestos prior to renovations. Conducted tri-annual AHERA re-inspection and updated management plan.

New York State Electric and Gas (NYSEG), NY
Survey, cost estimates, design, and site supervision over the contractor during abatement from start to finish.

Providence College, Providence, RI
Cost estimates design, abatement plan, contract management, and abatement management for the removal of friable asbestos on campus.

Union Hospital, Elkton, MD
Assisted the hospital with contractor selection, preliminary costs and schedules.

Veterans Administration Hospitals, NY
Survey, cost estimates, design, abatement plan, and site supervision over the contractor during abatement from start to finish.

Veterans Administration Hospitals, Buffalo and Albany, NY
Involved in all aspects of construction management for the installation of two new chiller plants.

MATT YONKIN, PE, BCEE, CEM

ENERGY INCENTIVES

EDUCATION
MS Management Rensselaer Polytechnic Institute 2004
BS Civil Engineering Union College 1994

YEARS OF EXPERIENCE
Total – 25
With Arcadis – 22

PROFESSIONAL REGISTRATIONS
Professional Engineer – NY
Board Certified Environmental Engineer
Certified Energy Manager – US

PROFESSIONAL ASSOCIATIONS
American Academy for Environmental Engineering
Association of Energy Engineers
Water Environment Federation

For more than 25 years, Mr. Yonkin's career has focused on energy efficiency, process optimization and water resources solutions for municipal and industrial clients. Areas of expertise include demand side energy efficiency measures; renewable generation using biogas, hydroelectric, and photovoltaic; water reuse and conservation; waste heat and wastewater heat recovery; co-digestion and solids handling; and other process optimization and cost saving measures. He applies his depth and breadth of expertise to produce sustainable bottom line energy and operational savings using both conventional and non-conventional project delivery and financing models.

Project Experience

Flexible Technical Assistance Program
NYSERDA, Statewide NY

Project manager or technical lead on over two dozen energy efficiency studies within the municipal and industrial sectors. All studies were cost-shared up to 50% by NYSERDA. Energy conservation measures that have been evaluated include pumping systems, aeration systems, solids handling processes, disinfection systems, media and membrane filtration systems, hydroelectric generation, biogas-fired electricity generation, HVAC systems, lighting improvements, geoexchange, photovoltaic electricity generation, and other demand reduction measures.

Integrated Energy and State of Good Repair Plan
NYPA / NYCDEP, NY

Technical advisor and lead for the development of a planning and implementation strategy document for NYCDEP to support city-wide sustainability goals. Reviewing previous energy studies; completing on-site energy audits; identifying near-, mid- and long-term opportunities for energy efficiency improvement; determining energy and cost savings; estimating implementation costs; reviewing capital improvement plans and planned operational and regulatory changes; and developing a strategic approach for implementation that includes integration of energy improvement measures as incremental expansions of work already needed, rather than standalone projects.

Project Experience Continued

High-Level Assessment of Feasibility of Anaerobic Digestion
The Metropolitan District, Hartford, CT

Technical lead for a fast-tracked assessment of the technical and financial feasibility of integrating anaerobic digesters into the current solids management strategy to capitalize on recently promulgated organics management regulations in Connecticut. Scenarios that were evaluated included management of current solids streams as well as import of additional feedstocks (organics and additional sludge) with beneficial recovery of biogas for displacement of natural gas use for incinerators, generation of electricity for on-site use, or production of renewable biogas for direct inject into the natural gas grid. While viable, the economics were not sufficiently compelling under current conditions to warrant further development currently.

Energy Efficiency and Resource Recovery Development
City of Atlanta / Schneider Electric, Atlanta, GA

Technical advisor and lead for the investment grade energy audit and conceptual design and pricing of significant energy efficiency and renewable generation upgrades at two water pollution control plants and two drinking water treatment plants under a proposed energy performance contract. Areas considered include influent and filter pumping; digester mixing and heating improvements; digester gas recovery and use, including cogeneration, compressed natural gas fuelling, and sludge drying; centralized solids processing; building system and lighting improvements; solids thickening and dewatering improvements; blower replacement; and aeration system upgrade and automation.

Public Private Comparator of Biogas Recovery Options
City of Columbus Wastewater Treatment Plant, Columbus, OH

Technical advisor for a public private comparator evaluation assessing the feasibility of cleaning digester gas to pipeline quality. Included development of a preliminary gas clean-up train design, estimated construction cost and estimated operations and maintenance costs over the life-cycle of the equipment. An evaluation of the Renewable Energy Credit and Renewable Identification Number markets was completed and a detailed technical and financial evaluation was completed to quantify risk and uncertainty.

Portfolio Wide Energy Management Program
Toho Water Authority, Kissimmee, FL

Technical advisor on a comprehensive energy management program that included detailed energy audits of four water reclamation facilities ranging in size from 3 to 12 mgd. Specific activities include baseline development, benchmarking, on-site energy audits, identification and detailed evaluation of energy conservation and renewable generation measures, evaluation of project delivery models and identification of potential funding sources and incentives. Developed key performance indicators to facilitate ongoing assessment of energy performance, developed worksheets and tools to assist with self-implementation, and provided detailed training to support future activities.

MATTHEW A WELSHANS

REVIT 3D MODELING / CADD

EDUCATION
AS Drafting Erie Community College 2004

YEARS OF EXPERIENCE
Total – 20 years

PROFESSIONAL REGISTRATIONS
Certificate of Completion: Pre-Engineering
Certificate of Completion: CADD I & II

HEALTH AND SAFETY TRAINING
Ergonomics

PROFESSIONAL TRAINING
Civil 3D Training - 2007
MEP Training – 2007
Revit MEP Training-2014

SPECIAL RECOGNITION
National Deans list 2000-2001 Phi Theta Kappa member 2000-present
National Deans List 2002-2003

Mr. Welshans has extensive design/drafting experience encompassing both design and drafting of numerous civil and mechanical design/drafting as well as production of design drawings for wastewater, water, solid waste, and industrial facilities. He also has extensive experience managing and coordinating design requirements between multiple disciplines, multiple offices, and design firms. Mr. Welshans has also been involved with several 3D projects, using AutoCAD MEP, Civil 3D, and Revit.

Project Experience

Sturgeon Point WTP Process Design Upgrades
ECWA, Buffalo, NY

As CADD designer, developed design drawings and overall coordination of the drawing set between multiple disciplines for design and bidding services for the process improvements at the 90-mgd Sturgeon Point Treatment Plant. Improvements included replacement of existing flash mixers, retrofit of the existing flocculation basins with new vertical turbine flocculators and new baffle curtains, replacement in-kind of existing tube settlers and demolition of existing chain-and-flight sludge collection and installation of Parkson Super Scraper sludge collection equipment. The project also includes chemical, piping, electrical, structural, and instrumentation improvements.

Van de Water Treatment Plant Coagulation Basin Upgrades
ECWA, Buffalo, NY

As CADD coordinator and designer, developed design drawings and overall coordination of the drawing set between multiple disciplines for design and bidding services for the upgrades to the existing 49.5-mgd conventional treatment plant, including replacement of walking beam flocculators with vertical, turbine-style flocculators, replacement of baffles in flocculation compartments, replacement of existing tube settlers and chain and flight equipment, installation of new surface wash pumps and chlorine injector pumps, installation of new liquid lime storage and feed equipment, and installation of a new coagulation day tank and filter aid equipment.

Project Experience Continued

Pine Hill Pump Station Improvements
ECWA, Buffalo, NY

As CADD coordinator and designer, developed design drawings for the rehabilitation and expansion of the Pine Hill Pump Station. The project includes replacement of pumps/VFDs, piping, and electrical equipment, installation of a new Venturi flow meter, installation of new emergency generator, and upgrades to building HVAC, plumbing, and architectural systems. Additionally, ECWA's distribution system model was updated, calibrated, and used to evaluate system-wide transmission main improvements and update future flow projections. Based on the revised flow projections, the pump station will be expanded to a firm capacity of 14 mgd to meet current and future operating conditions as well as improve reliability and system operational flexibility.

Highland Reservoir and Liner Improvements
City of Rochester, Dept. of Environmental Services, Rochester, NY

As CADD coordinator and designer, developed design drawings and overall coordination of the drawing set for the improvements at the City of Rochester's 26-MG Highland Reservoir. As part of the City's overall LT2ESWTR and dam safety compliance approach, the City desired to line the reservoir and later install UV disinfection. The project included an early evaluation of alternative lining materials, which resulted in the selection of a 45-mil Hypalon lining. Other improvements that are part of the project include a new inlet design to improve circulation in the reservoir, addition of an emergency overflow, and replacement of the existing bird wires.

Eastern Reservoir 30-MG Tank Construction Phase Services
Onondaga County Water Authority, Syracuse, NY

As CADD coordinator and designer, developed design drawings and overall coordination of the drawing set for the $14.3-million Eastern Reservoir 30-MG tank project. The project consisted of excavation of more than 120,000-cy of material from the site to allow for construction of the new 30-MG tank directly adjacent to the active and in-service open reservoir. The tank was an AWWA D110, Type I cast-in-place prestressed concrete tank completed by DYK. The project also included mechanical piping, telemetry, electrical, site security, fencing, paving and stormwater improvements.

Western Reservoir 20-MG Tank Construction Phase Services
Onondaga County Water Authority, Syracuse, NY

As CADD coordinator and designer, developed design drawings and overall coordination of the drawing set for the $10.4-million Western Reservoir 20-MG tank project. The project consisted of placement of more than 40,000-cy of structural fill to raise the elevation of the tank floor 10-ft above the previous reservoir bottom. The tank was an AWWA D110, Type III precast prestressed concrete tank completed by Natgun. The project also included mechanical piping, telemetry, electrical, site security, fencing, paving and stormwater improvements. All improvements were constructed adjacent to the in-service 48-MG open reservoir. At the conclusion of the project, the existing embankment will be decommissioned from the NYS Dam Inventory.

CRAIG DEWYER

REVIT 3D MODELING / CADD

EDUCATION
AAS Civil Engineering Technology

YEARS OF EXPERIENCE
Total – 31

PROFESSIONAL REGISTRATIONS
Certified Computer Technician (CompTIA A+)
Microsoft Certified Professional

HEALTH AND SAFETY TRAINING
Ergonomics
OSHA 10 Hour Construction Safety
OSHA 40 Hour Hazwoper
Electrical Safety – IACET
Hazmat #1
Confined Space Entry, Attendant, Supervisor
CPR / AED / First Aid Trained

Mr. DeWyer has more than 15 years of experience as a resident project representative providing construction and health & safety oversight as the owner's sole representative on site. The projects have included demolition, excavation, buried utility installation, general building construction, mechanical and process equipment, hydraulic structures, I&C/SCADA improvements, and electrical upgrades, including medium-voltage substation replacement. As the primary construction administrator for multiple contracts, his organization, management and communication skills facilitate timely completion of daily and weekly reports, progress payment applications, and resolution of RFI/RFCs, change orders, and field directives.

Project Experience

Bird Island WWTP Low Pressure Air Blower System Improvements
Buffalo Sewer Authority, Buffalo, NY

Resident project representative for construction of a $5.7-million project to replace a system of four 3,000- and 5,000-hp single-stage centrifugal blowers at a 180-mgd WWTP with a system of five new 700-hp high-efficiency integrally-geared single-stage centrifugal ("turbo") blowers. Other improvements included mechanical/piping improvements, structural improvements, instrumentation and controls improvements, and electrical improvements that included two new secondary unit substations consisting of transformers and duplex medium-voltage switches, 480-VAC switchgear, and other improvements.

Pine Hill Pump Station Improvements
ECWA, Buffalo, NY

Resident project representative responsible for construction oversight and H&S compliance by multiple entities during the $3-million rehabilitation and expansion of the Pine Hill Pump Station from 7 to 21 mgd. The project includes replacement of 350-hp pumps and motors, mechanical piping and valving, and all new electrical equipment (transformer, VFDs, MCC, and standby generator) and upgrades to building HVAC, plumbing, and architectural systems. The project also included water main improvements in the public right-of-way which required appropriate traffic controls protection and deep (>15-feet) excavation shoring. Solely responsible for all H&S activities, including HASP and JSA development,

Project Experience Continued

regular safety briefings, H&S audits/assessments, and development of lessons learned/safety shares. During the design phase, participated in Prevention through Design (PtD) workshops to develop safer ways to construct and operate the facility. Responsible for daily and weekly construction/safety reports, all submittals, payment applications and change orders.

VDWTP and Ball Pump Station Electrical Improvements
ECWA, Tonawanda and Amherst, NY

As resident inspector, provided daily construction oversight and ensured conformance with all contract documents, OSHA requirements and owner/project H&S procedures. Improvements at Ball Pump Station and VDWTP included modifications to existing switchgear, including safety improvements to relays and test switches, demolition of existing 23KV reclosers, new 38KV switchgears, and modification of site access to new electrical equipment. Responsible for site-specific Health and Safety Plan (HASP) and Job Safety Analyses (JSAs) for coordination of all work and compliance with all regulations and requirements of utility provider and owner. Discussed Lockout/Tagout responsibilities with contractor for further safety precaution. Coordinated and oversaw Arc Flash study to ensure all major electrical equipment on-site was properly labeled. Provided daily H&S briefing (i.e. toolbox meeting) for contractor and sub-contractors on hazards of proposed activities, required training and PPE, and risk mitigation strategies. The $2-million project had no recordable injuries.

SPWTP – Wastewater Treatment Facility Improvements
ECWA, Buffalo, NY

Resident inspector for the $5-million wastewater treatment facility improvements project. Provided construction and H&S oversight for construction of improved clarifiers, sludge pumps, chemical systems and new mechanical equipment, along with the associated structural, electrical and instrumentation improvements for the treatment facility. Developed HASP and JSAs for the project and conducted daily H&S meetings with contractor reminding them about the specific dangers associated with various work activities. The work included substantial amounts of confined space and work at height; on a number of occasions review of submittals and discussion at toolbox meetings allowed contractor to proceed with the work in a safer manner than originally proposed.

VDWTP Coagulation Basin Upgrades
ECWA, Tonawanda, NY

Resident project representative for the $8-million project. The VDWTP is a conventional WTP, which includes raw water pumping and screening, in-line flash mix, walking beam flocculation, tube settler sedimentation and conventional mixed media filtration. The improvements are focused on the flash mix, flocculation, and sedimentation basins, lime system, chemical systems, and include new mechanical equipment, and associated structural, electrical, and instrumentation improvements for the 49.5-mgd facility.

KATIE A KASPEREK

REVIT 3D MODELING / CADD

EDUCATION

AS Computer-Aided Design Drafting ITT Technical Institute 2006

YEARS OF EXPERIENCE

Total – 13 years

Ms. Kasperek is experienced in providing Civil 3D, 3D modeling, electrical and instrumentation design support for water resources and environmental design projects. She is adept at managing and coordinating design requirements among disciplines, offices and other firms.

Project Experience

Chemical Storage and Delivery System Improvements

City of Buffalo, NY

Primary designer for general, demolition and mechanical sheets. Chemical system improvements include first and second floor, and low lift pump station corrosion control and coagulant storage and feed upgrades, including new tanks, pumps, equipment and piping.

Brookfield Water Reclamation Facility Improvements

Trumbull County, OH

CADD coordinator and civil/mechanical designer for the water reclamation facility's improvements. Rehabilitations include grit tank, sludge transfer station, chlorine building, preliminary treatment building, aeration facility, digester facility, secondary control building, operations building and secondary clarifiers. Additions include an influent pump station, equalization basin and UV facility.

Meadowbrook-Limestone WWTP Sludge Pump Replacements

Onondaga County Dept. Water Environment Protection, NY

Designer in charge of electrical modifications and upgrades. Includes one-line diagrams, schematics and riser diagrams.

Meadowbrook-Limestone WWTP Backup Sludge Holding Tank Conversion

Onondaga County Dept. Water Environment Protection, NY

Designer for general, demolition and mechanical sheet layouts. Depicted demolition and replacement/additions of gates, piping, valves and equipment related to facilitating the backup sludge holding tank to meet new flow demands.

Project Experience Continued

Hamlin Water Reclamation Facility Phase I
Orange County, FL

Primary civil 3D designer for the new WRF site layout. Laid out storm drain piping, stormwater ponds, profiles, new surfaces and contours. Worked with all disciplines to make sure all site features were implemented properly. Worked closely with the CADD coordinator and assisted with all general sheet and drawing index items.

Various Facility Upgrades
Pittsburgh Water and Sewer Authority, PA

Designer for various facility upgrades. For Aspinwall Water Treatment Plant, assisted in the design of sodium hypochlorite improvements, plant water upgrades, clarifier repairs and PAC system improvements. For Lanpher Reservoir, assisted in the design of the gate house, hypochlorite building and site improvements.

County-Wide Pump Station SCADA Phase II
Hillsborough County Public Utilities Dept, Tampa, FL

Primary CADD drafter for setup of a 300+ pump station project, including using sheet set for staging of the project per region. Additional responsibilities include placement of electrical equipment and conduit, which varies per pump station.

Downtown Community Redevelopment Area A Stormwater Treatment Improvements
City of Tavares, FL

Primary civil 3D CADD drafter for stormwater modifications with plans and profiles, storm drain and inlet additions, streetscape, and striping plans for the effected roadways. Primary Civil 3D CADD drafter responsible for water and wastewater pipeline upgrades, lift station designs and the water main extensions.

Richland Creek Water Supply Project Design
Paulding County, Dallas, GA

CADD drafter for chemical building and residuals handling process 3D design. Also assisted with GAC area, DAF area, and structural and electrical discipline 3D design.

Southeast Regional WTP Ozone Design
Seminole County, Sanford, FL

Instrumentation drafter for design of a 19.4-mgd water treatment plant, including the ozone and side-stream injection system, liquid oxygen (LOX) system, ozone destruct system, dissipation structure, sodium hypochlorite system, fluoride system, high-service pumping and electrical generators. The ozone system includes the nitrogen boost system and closed- and, and open-loop cooling water systems. The side-stream injection system includes the ozone chemical injection, side-stream pumps, degasification, and ozone injectors into the main flow stream.

ARCADIS Design & Consultancy for natural and built assets

JAMES RALEIGH, PE

COST ESTIMATING / MOPO PLANNING

EDUCATION
BS Physics State University of New York at Oneonta 1975
MS Civil Engineering State University of New York at Buffalo 1978

YEARS OF EXPERIENCE
Total – 34 years

LICENSES & CERTIFICATIONS
Professional Engineer
Certified Construction Contract Administrator
Certified Construction Documents Technologist

Mr. Raleigh's experience encompasses design, construction administration and resident engineering for water and wastewater treatment, hazardous waste remediation, and solid waste management facilities. He has evaluated and designed biological and chemical treatment systems, pump stations and pipelines, and solid and hazardous waste management facilities. His experience also includes extensive planning and design for facility construction and site remediation including landfills and water and wastewater treatment plants.

Project Experience

Bird Island WWTP Various Upgrades
Buffalo Sewer Authority, NY

Supervised design of fine bubble aeration system conversion, incinerator breeching, air pollution monitoring system and final effluent pumping system. Also served as resident engineer and/or project manager for construction phase of plant-wide SCADA system, air pollution system monitoring system, flow metering system, RAS-WAS pump replacement, and fine bubble system conversion projects. Evaluated cost and operational considerations for anaerobic digester steel and fiberglass systems and field layout of new digester heating and mixing systems.

WWTP Construction
Village of Gowanda, NY

Resident engineer for construction of 2.5-mgd biotower treatment facility and one mile of gravity interceptor sewer to serve village and Collins Correctional Facility. The WWTP includes primary and secondary clarifiers, biotowers, and sludge press and anaerobic digesters. Dried sludge is composted onsite.

Bird Island WWTP Grit Removal Facility
Buffalo Sewer Authority, NY

Supervised design and served as resident engineer during construction of the 600-mgd Bird Island WWTP grit removal facility. The $20-million construction project included 30-ft-deep pile-supported foundations constructed 15 feet below existing groundwater adjacent to the Niagara River.

Project Experience Continued

91st Ave WWTP Improvements
City of Phoenix, AZ

Office engineer responsible for review of shop drawings, change order requests, and preparing supplemental sketches and responses in response to field problems resulting from contractor being removed from the project by the owner. Redesigned most of the pipe supports for the entire project, which included miles of exposed piping systems for air, wastewater and chemical feed systems.

Wastewater Treatment Lagoons
Confidential Client, Western Region, NY

Supervised production of plans, specifications and permits for construction of 50,000-gpd industrial wastewater treatment lagoons.

Sludge Wastewater Treatment Facility and Sewer Rehabilitation
Village of Franklinville, NY

Served as resident engineer for construction of 0.75-mgd activated sludge wastewater treatment facility and sewer rehabilitation contracts.

Squaw Island Incinerator Demolition
City of Buffalo, NY

Design and construction management for demolition and soils cover system for Squaw Island municipal incinerator demolition.

Wastewater Lagoon
Lyons Falls Pulp & Paper, Lyons Falls, NY

Designed and provided bid phase and shop drawing approval services for a 20-MG wastewater lagoon with 40-mil HDPE liner.

Wastewater Lagoon and Pumping Station
Niagara County Water District, NY

Designed and served as resident inspector/construction manager for construction of a 3.5-MG earthen lagoon and recirculation pumping station for alum sludge disposal at a 20-mgd water filtration plant.

MICHAEL T. MARINO, P.E.

Principal Engineer / QA QC Reviews
mmarino@nussclarke.com ‖ 716-827-8000 x257

Education:
State University of New York at Buffalo
BS Civil Engineering - 1996

Registration/Licenses:
Professional Engineer (P.E.)
2001 – New York (078995)
2015 – PA (084169)

Certifications:
Sandia RAM-W

Years Experience:
5 – Nussbaumer & Clarke, Inc.
24 – Total

Technical Societies:
American Water Works Association (Past Chair, National Management & Leadership Division; Co-Chair, AWWA/WEF 2008 Utility Management Conference Planning Committee; Former Trustee, AWWA Technical and Education Council; Member, PVC Pipe & Fittings Standards Committee)
New York Section American Water Works Association (Past-Chair, Board of Governors; Chair, Section Awards Committee; Member, Program Committee)
Western New York Waterworks Conference (Secretary, Board of Governors; Co-Chair, Education Committee)

Discipline Specialties:
Municipal Engineering
Potable Water
Wastewater
Stormwater
Capital Planning

PROFESSIONAL HISTORY:
As Chief Executive Officer, Mr. Marino oversees Nussbaumer's municipal engineering department projects in an executive/administrative capacity. He has more than 24 years' experience in the evaluation, design and construction of a wide variety of municipal infrastructure projects in New York and Pennsylvania, and is actively involved in several industry organizations including the American Water Works Association (AWWA) at both the national and state level. He is a past chair of New York Section AWWA and recipient of the AWWA's George Warren Fuller Award for distinguished service to the water supply field.

EXPERIENCE:

- **City of Buffalo, NY – Colonel Ward High Service Pump Improvements -** Project Manager (Individual Experience) responsible for the design for two new high service pumps for the City's Division of Water. New smaller pumps were designed to meet decreasing demands, save on power consumption, and avoid over pressurizing the distribution system. Plans included two new 800 HP 20 mgd vertical centrifugal pumps, which required extensive floor modifications to install a new 48-inch suction header pipe, new flow control rotovalves, several motorized butterfly valves, new discharge piping, and SCADA control upgrades. The project also included upgrades to the existing 50 mgd high service pumps to improve the priming system, discharge check valve, and automate the pump changeover procedures. Due to the success of the project, plans for additional energy savings measures have been prepared including the installation of an additional 800 HP pump, HVAC and lighting improvements, and system-wide SCADA integration.
- **City of Buffalo, NY - Water Treatment Plant Filter, Gallery Rehabilitation -** Project Manager (Individual Experience) during the construction of $20 million in improvements including: civil/structural rehabilitation; mechanical/piping upgrades; HVAC system addition; electrical modifications; and asbestos remediation. This project was financed via a NYS Environmental Facilities Corporation (EFC) Drinking Water State Resolving Fund (DWSRF) loan.
- **City of Buffalo, NY - Colonel Ward Chlorination System Replacement -** Project Manager (Individual Experience) responsible for the design of replacement chlorine equipment at the City's 160 mgd Water Treatment Plant. The project includes a new emergency system to shutdown the 1-ton cylinders, new automatic changeover system, evaporators, automatic gas feeders, educators, replacement piping and valves, instrumentation and SCADA control upgrades.

MICHAEL T. MARINO, P.E.
Principal Engineer / QA QC Reviews
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- **City of Buffalo, NY - 60-inch Watermain Joint Sealing** - Project Manager (Individual Experience) for design of repairs to one of the City's primary transmission mains. It was determined that due to advanced age, many joints within the transmission main began to leak. Based upon video inspection, it was determined that there were approximately 100 joints to be mechanically sealed over a 1,000-linear foot stretch from the water treatment plant and crossing railroad tracks and Interstate-190. The design included installation on internal joint seals and replacement three electric actuators on the City's primary transmission mains.
- **Town of Tonawanda, Water Treatment Plant Pump Station Heating Upgrades** – Project Manager for engineering report and analysis of the Water Treatment Plant regarding the condition and performance of the existing steam heat system for the Pumping Station. The report considered different options for future heating systems with performance, operation and maintenance data. A comparison of alternatives including cost estimates for repair or replacement of the pumping station heating system, potential incentive programs for new systems, life cycle costs and operation and maintenance requirements was considered. Prepared a recommendation regarding improvements to the Pumping Station heating system based on findings. The new system included replacement of all existing unit heaters in the pump station with gas unit heaters, including all new gas lines. Nussbaumer provided general services during construction including construction review of quotes received, recommended award, and provided periodic inspection of the work during installation of the new heating system.
- **Town of Aurora, NY- Water District 18 -** (Individual Experience) Project Manager for design work associated with a $12.9 million comprehensive project to provide a water transmission and distribution system to the southern portion of the Town of Aurora. The system included two water storage tanks, three booster pump stations, and approximately 180,000 linear feet of new watermains. The design included detailed plans and specifications for the proposed facilities. The project also included developing a WaterCAD model of the proposed system along with a detailed design report. Administrative issues include the formation of new water districts for the system as well as providing funding assistance through USDA Rural Development.
- **Town of Aurora, NY - Mill Road Pump Station -** (Individual Experience) Project Manager for the design of a concrete masonry unit (CMU) block building pump station on Mill Road in the Town of Aurora. Mr. Marino directed the design team for preparation of plans and specifications including engineering calculations, process and instrumentation diagram, quantities, material specifications, as well as designing details for interconnections to the existing system and other necessary appurtenances. He also coordinated applications for municipal, environmental, and regulatory review and permits. The design and technical material specifications were completed in accordance with AWWA and Ten States Standards.
- **Town of Eden, NY - Violet Parkway Pump Station** - (Individual Experience) Project Manager responsible for hydraulic analysis and project design for a water booster pump station drawing from an existing tank. Project includes coordination of agency reviews and approvals.

GARY MUFFOLETTO, P.E.

Senior Corporate Associate
gmuffoletto@nussclarke.com ‖ 716-827-8000 x214

Education:
State University of New York at Buffalo
BS Civil Engineering - 1985

Registration/Licenses:
Professional Engineer (P.E.) - New York (086708)

Years Experience:
28 – Nussbaumer & Clarke, Inc.
35 – Total

Technical Societies:
American Water Works Association – National and NY Section
Western New York Water Works Conference
Water Environment Federation – National and NY Section

Discipline Specialties:
Municipal Engineering
Potable Water
Wastewater

PROFESSIONAL HISTORY:
As Vice President of Engineering, Mr. Muffoletto oversees Nussbaumer's engineering department projects in an executive/administrative capacity. In addition, he continues to serve as Project Manager for select Civil Engineering Projects.

EXPERIENCE:

- **Erie County Water Authority, Waterline Replacement, Amherst and Cheektowaga (Contract NC-39)** – QA/QC for evaluation and design of approximately 7,000 L.F. of 8-inch diameter waterline and appurtenances to replace existing aging facilities at multiple locations in the Towns of Amherst and Cheektowaga.
- **Erie County Water Authority, Water System Improvements** – Evaluation, design and construction of approximately 9,000 l.f. of 8" diameter waterline and appurtenances to replace existing aging facilities in the Towns of Cheektowaga and Clarence.
- **City of Buffalo, Manhattan Pump Station Improvements** – Evaluation, design and construction of improvements to 3 existing 5 mgd canned, vertical turbine pumps and related 100 Hp vertical electric induction motors. The water booster pumps were rebuilt to improve operation/ performance, monitoring and control. Each rebuild included conversion to mechanical split seal, new RTDs to monitor operating temperatures, vibration sensors, new pump control valves with electro-hydraulic actuators to replace existing discharge check valves, prime and finish painting. The project also included complete replacement of electrical switchgear and MCC line-up, and instrumentation and control equipment upgrades to facilitate remote operation via the SCADA/Telemetry system; safety and aesthetic upgrades, improvements to mechanical systems, and building envelope and roofing system improvements.
- **City of Buffalo, Update Water Records** - General consulting services related to the City's Computerized Maintenance and Management System (Innovyze/InfoNet). Work includes assisting City staff with the assembly of archived information pertaining to completed capital improvements and distribution changes, and the status of pipes and valves in the water system, and using the information to update the database in InfoNet. The work also includes performing a QA/QC review of the existing database in InfoNet.
- **City of Buffalo, Water Modeling and Related Services** – General consulting services related to system storage, booster and high service pump stations. Work includes assisting Buffalo Water Board and Division of Water with matters related to Tonawanda Water Supply Study, Kensington Standpipe Replacement Project, High Service Area Pressure Zone Creation Study, and Hydraulic Water Model Project (all pipes WaterCAD Model of the City's transmission and distribution system).

GARY MUFFOLETTO, P.E.

Senior Corporate Associate

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- **City of Buffalo, Rehabilitation of No. 4 Pump and Motor at Massachusetts Avenue Pump Station** – Evaluation, design and construction of improvements to an existing 30mgd vertical end suction delivered water pump and 1,500 Hp vertical synchronous electric motor at the Pump Station. The pump rehabilitation consisted of the disassembly, cleaning, inspection, measurement, and reconditioning or replacement of all components. The motor rehabilitation consisted of new stator coils and rotor windings, and change over to brushless excitation system with automatic power factor correction.
- **State University Construction Fund Project No. 28423, Reconstruct Pump House, SUNY at Buffalo, South Campus** – Evaluation, design and construction of replacement pump house to provide domestic water service and fire protection on the South Campus.
- **City of Buffalo, Rehabilitation of Pumping Equipment at Ward Filter Plant** – Evaluation, design and construction of improvements to 5 existing horizontal split case raw water pumps (10 mgd, 35 mgd, 45 mgd, and 2 at 75 mgd), 2 existing horizontal split case filter wash water pumps (8.5 mgd), and related horizontal electric induction motors (75 Hp, 2 at 150 Hp, 2 at 200 Hp, and 2 at 350 Hp). The raw water and wash water pumping equipment was rebuilt, as needed, to improve operation/performance, monitoring and control. Each rebuild included conversion to mechanical split seals, 12 new RTDs to monitor operating temperatures, prime and finish painting. A sixth existing low lift pump and motor was replaced with a new, smaller unit and a VFD to allow the City to more closely match their water production needs. The project also included related electrical (switchgear and MCC line-up), instrumentation and control equipment upgrades to facilitate automated operation via SCADA system; safety upgrades, and aesthetic upgrades.
- **Village of Akron, DBP Compliance Plan for Existing Water Facilities** – General consulting services related to reducing trihalomethane and haloacetic acid levels in public water system. Work included assisting Village in evaluating additional operation and maintenance practices, and developing Disinfection Byproducts Compliance Plan for their submittal to the Erie County Health Department.
- **City of Buffalo, New No. 3 Pump and Motor at Mass Station –** Evaluation, design and construction of an 18 mgd vertical end suction delivered water pump and 800 Hp vertical brushless synchronous electric motor to replace an existing 50 mgd vertical end suction delivered water pump and 2,500 Hp vertical synchronous electric motor at the Massachusetts Avenue Pump Station. The project included removal and storage of existing equipment and appurtenances, demolition of existing pump supports, construction of new pump supports, new pump suction/discharge piping and appurtenances, field modifications to existing power distribution switchgear (medium voltage), automatic power factor correction, installation, start-up, testing, and operation of new equipment and appurtenances.
- **City of Buffalo, Rehabilitation of No. 2 Pump and Motor at Mass Station** – Evaluation, design and construction of improvements to an existing 30 mgd vertical end suction delivered water pump and 1,500 Hp vertical synchronous electric motor at the Massachusetts Avenue Pump Station. The pump rehabilitation consisted of the disassembly, cleaning, inspection, measurement, and reconditioning or replacement of all components. The motor rehabilitation consisted of new stator coils and rotor windings, and change over to brushless excitation system with automatic power factor correction.
- **City of Buffalo, Division of Water -** General consulting services related to water system evaluation using WaterCAD Hydraulic Model. Work included assisting Division of Water with matters relating to proposed redevelopment projects, inter-municipal water supply connections, emergency and bulk supply to adjacent water purveyors, modifications and improvements to principal pumping stations, and rehabilitation of principal transmission mains.
- **Chautauqua Utility District, Water Treatment Plant Improvements** – Design and construction of modifications to raw water pump station and water filtration plant, resulting in no changes to exterior walls or height of buildings, primarily consisting of pump, process and piping improvements to increase permitted capacity from 0.75 MGD to 1.5 MGD and meet finished water quality requirements. The project included enhanced coagulation (mechanical rapid mixing), enhanced flocculation (three-stage, tapered mechanical), enhanced settling (plates and mechanical sludge collection), dual-media filtration (underdrain, silica sand, anthracite coal, troughs and surface wash), liquid aluminum sulfate and liquid potassium carbonate feed systems, related appurtenances and accessories. Nussbaumer & Clarke, Inc. received a Platinum Engineering Excellence Award from the ACEC of New York for the project and design.

KARL W. ROHDE, P.E.

Associate / Structural Engineer
krohde@nussclarke.com ‖ 716-827-8000 x217

Education:
State University of New York at Buffalo
BS Civil Engineering - 2003

Registration/Licenses:
Professional Engineer (P.E.)
2010 – New York (087823)

Certifications:
NYSERDA – Energy Efficiency Services Commercial & Industrial Incentive 2012
Certified NYSDOT Bridge Inspection Workshop – 2005

Years Experience:
14 – Nussbaumer & Clarke, Inc.
17 – Total

Technical Societies:
NYSATE – NYS Association of Transportation Engineers
Chairman of the Western Region of ACEC-NY – 2015-2016
Association of Bridge Design and Construction - member

Discipline Specialties:
Structural

PROFESSIONAL HISTORY:
Mr. Rohde is a Civil/Structural Project Manager with extensive experience including design of several projects with the NYSTA and NYSDOT. He has performed as Project Manager for construction phase services. He has a broad knowledge of building and bridge design, including timber, concrete and steel structures. He also has extensive experience with building codes including the Building Code of New York State (BCNYS), Minimum Design Loads for Buildings and other Structures (ASCE-7) and AASHTO Bridge Design Specifications.

EXPERIENCE:

- **Erie County Water Authority, Sturgeon Point Raw Water Pump Station Improvements -** Project scope includes building addition on pile supported foundation, replacement of two (2) existing traveling screens, installation of overhead new bridge crane, replacement of 30-inch pump discharge valves and VFD's, Replacement of sluice gates, modifications to wet well and repair of a 48" diameter water main. Responsibilities include Construction Phase project management including: presiding over job progress meetings, preparing meeting minutes, reviewing and responding to RFI's, reviewing shop drawings, preparing change orders, reviewing payment applications, supervising construction inspection staff and review of daily observation reports.
- **Erie County Water Authority, Ball, Windom and Van De Water Emergency Generator Buildings –** Design of the three masonry bearing wall building to house emergency generators and electrical gear for the Erie County Water Authority. Responsible for structural design including coordinating with a geotechnical engineer to perform soil boring and prepare a soils report, design of continuous wall footings, masonry bearing walls and steel roof trusses. Prepared plans, specifications and estimate.
- **NYSDOT, Pump House Rehabilitation/Stormwater Pump House Replacement at Four Locations, D030519, PIN 5809.32** – Design of four stormwater pump stations in Erie and Niagara Counties. The existing pump stations range from 25 to 68 years old, and service depressed highway sections at various underpass locations. Responsible for structural design of pump station building modifications.

IAIN RAMAGE, R.A., LEED AP

Project Architect

iramage@nussclarke.com ‖ 716-827-8000 x218

Education:
State University of New York at Buffalo
M.Arch - 1991
B.P.S. Architecture – 1987
Civil/Transportation Course Work

Registration/Licenses:
Registered Architect:
1996 - New York (#025930)
2006 - Pennsylvania (#403834)

Certifications:
Leadership in Energy & Environmental Design (LEED) Accredited Professional

Years Experience:
20 – Nussbaumer & Clarke, Inc.
31 – Total

Technical Societies:
Niagara Frontier Building Officials Association
National Council of Architectural Registration Boards

Discipline Specialties:
Architecture
Civil Engineering
Transportation Engineering

PROFESSIONAL HISTORY:

Mr. Ramage is a registered architect with expertise in civil and transportation engineering. His experience includes many areas of architectural and civil project management. Mr. Ramage has obtained his LEED (Leadership in Energy & Environmental Design) accreditation for designing "green" buildings, as defined by the U.S. Green Building Council's (USGBC) Green Building Rating System. He has worked with the LEED rating system and frequently assists clients with exploring sustainable, environmentally responsible and energy efficient building strategies.

EXPERIENCE:

- **Erie County Water Authority, Contract NC-32B, Ball Pump Station, Windom Pump Station, Van De Water Treatment Plant -** Seven (7) new 20KW – 400KW Permanent Outdoor Stand Alone Enclosed Generators with Automatic Transfer Switches; Design, Construction Administration, Start-up Services.
- **Erie County Water Authority, Contract NC-32A Ball Pump Station, Windom Pump Station, Van De Water Treatment Plant** - New (2) 1000KW and (1) 800KW Generators, Automatic Transfer Switches, Generator Building to Match Existing Facility, Design, Construction Administration, Start-up Services.
- **Erie County Water Authority, Contract NC-30 Sturgeon Point Water Treatment Plant** - New 90MGD facility with (2) 2500KW stand-by generators, paralleling switchgear, and custom block and brick building to match existing buildings within the facility for housing all the generator and substation equipment, Design, Construction Administration, Start-up Services.
- **Erie County Water Authority, Contract NC-26B Van De Water Raw Water Pump Station** - New 5KV Outdoor Substation with 500KW Outdoor Stand Alone Enclosed Generator and Automatic Transfer Switch; Design, Construction Administration, Start-up Services.
- **NYSDOT, Pump House Rehabilitation/Replacement Project at Four Locations, D030519, PIN 5809.32** – Design of four stormwater pump stations in Erie and Niagara Counties. The existing pump stations range from 25 to 68 years old, and service depressed highway sections at various underpass locations. Nussbaumer was retained by the NYSDOT to provide survey, design, bidding, construction administration, and resident observation services associated with extensive remedial and reconfiguration improvements of the pump stations.
- **Stericycle, Plant Expansion, Sheridan, NY** – Design of a 13,750 square foot expansion to the west of its existing 19,800 square foot facility. Responsibilities included design services for an engineered metal building system, civil/site work, structural engineering, and interior finishes.
- **SUCF, State University of New York at Buffalo – South Campus – Pump Station (2010-2012),** SUCF Project No. 28423, UB Project No. 2008-150, New 450 KW Generator in conjunction with reconstruction of the pump house on the South Campus.

TERESA M. LIDDLE, PE

Mechanical / Plumbing Engineer

tliddle@nussclarke.com ‖ 716-827-8000 x252

Education:
State University of NY at Buffalo
BS in Mechanical Engineering - 2001

Certifications:
Professional Engineer (P.E.)
2018 – New York (099646)

Years Experience:
9 – Nussbaumer & Clarke, Inc.
19 – Total

Discipline Specialties:
Mechanical
Plumbing
Electrical
Proficient in:
AutoCAD
Energy Calculations
NYSERDA and Utility rebates
LEED requirements

PROFESSIONAL HISTORY:

Ms. Liddle is an experienced MEP/FP designer. She is familiar with many HVAC systems including rooftop units, closed loop water glycol systems, radiant heating systems, terminal units, split systems and variable refrigerant flow. She also has knowledge in plumbing systems, electrical power and lighting systems and control centers. She has previously been responsible for construction project management including bid out and award of construction contracts, and coordinated work during construction on commercial projects.

EXPERIENCE:

- **Town of Tonawanda, Water Treatment Plant Pump Station Rehabilitation** – Mechanical Engineer for analysis and recommendation for replacement of all existing water source unit heaters in the pump station with gas unit heaters, including all new gas lines. Performed calculations required to finalize heating unit and gas line sizing, coordinated with the gas company for installation of a new gas service line to the pump station and prepared design drawings and specifications. Provided general services during construction and periodic inspection of the work during installation of the new heating system.
- **City of Buffalo, Marcy Casino** – Mechanical Engineer and Project Manager to replace and consolidate the HVAC system equipment at the March Casino, located in Delaware Park. All new exterior equipment designed to be located on new tiered concrete pad. Project includes adding a Building Management System, Make up Air for kitchen exhaust hood, Kitchen Heating and Cooling, and VAV zoning controls. Services included cost estimates, design documents, general services during construction and periodic inspections.
- **Village of Kenmore, Community Center** – Mechanical design to update existing perimeter steam boiler radiator system and add air conditioning and ventilation air to building. Existing boiler, radiators and piping was removed. New rooftop units, ductwork and diffusers were added throughout the building.
- *Subconsultant* **Seneca Nation of Indians, Steamburg Community Building Renovations** – Mechanical design to update existing HVAC systems equipment and add air conditioning to gym. New air handlers and modified ductwork, intake louvers and condensers were added. New rooftop units in proposed addition and upsized propane tank were also included in design.
- **SUNY Fredonia - Disney Hall - Boiler #3 Replacement (PO# 150750** - Mechanical Engineer for project to replace 2,000 MBH hot water heating boiler including modifications to existing piping and ventilation ductwork and interface with existing controls.

MICHAEL J. ENNIS, P.L.S.

Senior Corporate Associate / Land Surveying Manager
mennis@nussclarke.com ‖ 716-827-8000 237

Education:
AutoCAD Training/PCI
ArcInfo (GIS)/ESRI
Microstation Training/Data-Term
GPS Training/SUNY

Registration/Licenses:
Professional Land Surveyor (PLS)
2000 - New York State (050415)
2007 – Pennsylvania (SU075163)

Years Experience:
21 – Nussbaumer & Clarke, Inc.
33 – Total

Certification:
National Fuel Gas Line Location
First Aid and CPR Certification
EMT - Basic
(volunteer Fireman)

Technical Societies:
Niagara Frontier Land Surveyors Association – former Vice President
NFLSA – Scholarship Committee
New York State Association of Professional Land Surveyors – Education Committee

Discipline Specialties:
Surveying
Mapping
GPS
Carlson Survey 2009
Microstation
Inroads

PROFESSIONAL HISTORY:
Mr. Ennis has over 33 years of experience in both field work and boundary line determination. He is well versed in the operation of Total Stations, Data Collectors, Microstation, Land Desktop, AutoCad, Carlson and Inroads. Mr. Ennis' experience includes topographical surveys, boundary determination, wetland delineations, highway boundary determinations, hazardous waste studies, bridge and highway design and various other construction projects. He has drafted topographical, boundary, wetlands mapping, and acquisition maps. He is responsible for coordinating field and office personnel. He also reviews the projects completed by the survey department.

EXPERIENCE:
- **Erie County Water Authority Contract NC-19, Armor Drive, Town of Hamburg and Powers Road, South Abbott Road, Armor Duells Road, Town of Orchard Park** – Survey manager for the installation of 9,400 LF of 24" PCCP water transmission main. As a part of these contracts, NCI provided all the initial field topography for the creation of the base mapping in accordance with ECWA's specifications, and with special attention to areas of potential utility interference.
- **Erie County Water Authority Contract NC-28, Veteran's Park Pump Station** – Survey Manager for upgrade to an existing pump station and tank.
- **Erie County Water Authority Contract NC-27, William Street and Harris Hill Pump Stations** – Survey Manager for two pump stations.
- **Erie County Water Authority Contract NC-26, Pump Station Improvements** – Survey Manager for Pump station improvements to the Van de Water Raw Water Pump Station, Delivered Water Pump Station, Filter Wastewater Pump Station and Ball Pump Station. Services include electrical design, pump station design, survey and construction documents.
- **Town of Marilla, Water Districts No. 3 and 4** – Survey Manager for design of 102,000 l.f. of 8" and 12" PVC waterlines, including creek crossings and interconnection to existing water mains.
- **Village of Lewiston, Onondaga Street Playground** – Survey Manager for topographic survey for proposed handicap playground.
- **Gomez Sullivan Engineers, DPC, Artpark, Lewiston** – Survey Manager for topographic survey for proposed reconstruction of trail stairway.
- **Village of Attica, Market Street Retaining Wall** – Survey Manager for topographic and highway right-of-way survey for retaining wall reconstruction.
- **Village of Attica, Lower Dam Improvements** – Survey Manager for topographic survey for the proposed dam improvements.
- **City of Lockport, Kayak Launch** – Survey Manager for topographic survey for construction of a Kayak Launch at Nelson C. Goehle Public Marina.

DANIEL L. CALABRESE, NICET IV

Construction Inspector / Observer

Construction Services Group

Education:
State University of NY at Buffalo – Erie Community College, Coursework towards AAS Construction Management Engineering Technology

Registration/Licenses:
NICET Level IV

Training Courses:
OSHA Safety Course
NYSDEC / Erosion & Sediment Control Training

Years Experience:
2 – Nussbaumer & Clarke, Inc.
33 – Total

Organizations:
Member of City of Tonawanda School Board

Discipline Specialties:
Construction Inspection

PROFESSIONAL HISTORY:

Mr. Calabrese has over 33 years of experience in construction inspection management. He has performed as Construction Manager, Resident Engineer, Chief Inspector, or Office Engineer on various major construction projects. Dan has reviewed contract proposal and plans, the contractor's CPM, and means and methods to identify errors, omissions and conflicting information that could lead to potential problems.

EXPERIENCE:

- **Lewiston (V), Lewiston Landing Phase 4, Contract C1000534, Emergency Rehabilitation Upgrades (2019) –** Construction Inspector (NICET IV) for rehabilitation of the Middle, North and South Dock Areas, including new floating dock systems and design element to raise the project area an additional 24-inches.
- **Erie County Water Authority, Ball Pump Station Electric Substation, NC-35 (2019)** – Chief Inspector for construction of a new 115kV electrical substation. Substation consisted of air insulated switches, dead-tank circuit breakers, and liquid filled transformers with on-load tap changers. Work also includes short-circuit, coordination, and arc flash studies along with SEL relay setting modifications.
- **Erie County Water Authority, Water System Improvements, NC-36 (2018)** – Construction Inspector (NICET IV) for construction of approximately 9,000 l.f. of 8-inch diameter waterline and appurtenances to replace existing aging facilities.
- **New York Power Authority** (subconsultant to Gomez & Sullivan), **Motor Island Shoreline Maintenance / Berm Modifications (2018)** - Construction inspector. In 2013, the Motor Island Shoreline Restoration HIP project involved restoring approximately 1-acre of eroding shoreline at Motor Island, as well as removal of man-made structures and invasive plant species herbicide treatments. Shoreline erosion protection measures including excavation along the island shoreline to replace hardened shoreline with habitat-friendly embayments and installation of protective offshore stone berms, habitat logs, and native emergent plants. Upland and riparian planting was also conducted. This project raised selected offshore berms that were installed in 2012 and 2013 and installed additional erosion protection measures.
- **Grand Island Water Plant and Water Intake Upgrade,** Town of Grand Island Water and Sewer Dept., Town of Grand Island, N.Y. - Construction Observer for construction on Water Plant (new Increased Size Piping, Electrical and Control Devices Construction) and Water Intake (Building, Piping, Vertical Pump Installations, Electrical, Equipment and Radio Controls Construction).

JOSEPH J. NEWLAND, NICET IV

Resident Inspector / Observer

Construction Services Group

Education:

Erie Community College
AAS Civil Engineering - 1979

Certifications:

NICET Level IV #070969/ Transportation/Highway - 1989
FHWA & NYSTA / Design and Operations of Work Zone Traffic Control – 1990; 2006; 2007
NYSDEC / Erosion & Sediment Control Training, Qualified Inspector for SPDES # 3998: 4 - Hour -2016
OSHA Construction Industry Safety & Health Training – 10 Hour - 2008
ACI Concrete Field Testing Technician Grade 1- 2017
ASCE / Bridge Inspection, Evaluation and Rehabilitation - 1989

Years Experience:

22 - Nussbaumer & Clarke, Inc.
41 – Total

Discipline Specialties:

Construction Inspection

PROFESSIONAL HISTORY:

Mr. Newland has performed as Resident Engineer, Chief Inspector, or Office Engineer on various major construction projects. Joe has reviewed contract proposal and plans, the contractor's CPM, and means and methods to identify errors, omissions and conflicting information that could lead to potential problems. He has tabulated these findings and worked with the owner and the contractor to identify solutions early to avoid problems before they surface. His look ahead proactive approach has resulted in many issues being resolved at the project level, thus reducing delays and claims. He understands the importance of working with the owner's representative to maintain an accurate and open line of communication.

RECENT EXPERIENCE:

- **Erie County Water Authority, Sturgeon Point, Raw Water, NC-34** – Chief Inspector for improvements to the existing facility. Scope includes building addition, replacement of two (2) existing traveling screens, new bridge crane, 30-inch pump discharge valve replacement, and sluice gate rehabilitation.
- **NYSTA D214506, TAB 16-35 (D214510)/TAB 17-4 (D214545), Reconstruction /Rehabilitation of I-90 Pavement from MP 430.62 (Rt. 400) to MP 427.7 (Lackawanna Toll Barrier)** $4 M – Chief Inspector *EIC Christian Hulse, PE (**NCI**).*
- **Erie County Water Authority, Contract NC-26C and NC-27 -** Site Inspector on two Erie County Water Authority Projects. NC-26 Project was at Sturgeon Point Water Treatment plant that required electrical up-grades to the plants Motor Control Cabinet banks including new conduit and wire runs. Inspected all aspects of installation and testing of the new components. NC-27 Harris Hill and William Street Pump Stations included the building of two separate Water distribution line Pump Stations. The Harris Hill station was a replacement station and the William Street station was a total new location structure. Responsibilities included the inspection of all aspects of the new buildings as well as the internal Electrical and mechanical components. ***(NCI)***
- **Town of Marilla Water District No. 4** – Senior Inspector for installation of 50,000 feet of 8-inch and 12-inch water main in the Town of Marilla. The project included 24-inch and 18-inch road bores and 1 creek bore. Responsible for pressure leakage and bacteriological testing per Erie County Water Authority requirements. Recorded contract as-builds for all installed components per owners' requirements. ***(NCI)***
- **NYS Thruway Authority, Contract D213184, TAB 02-16B -** Resident Engineer /Inspector for $415,000 Bridge repair project on the South Grand Island Bridge Southbound. Project included fabrication and installation of structural steel components at approach span piers on both ends of the structure. New components were bolted to existing floor-beams which exhibiting extensive section loss. Replacement K-Frame bracing was also installed to maintain acceptable load ratings. Work was performed from below structure without lane closures. Liaison Engineer (LE) TWY, Gary Hart. ***(NCI)***

JAMES W. GRZESKIEWICZ, NICET IV

Senior Inspector

Construction Services Group

Education:

Erie Community College
AAS Construction Technology 1977
SUNY at Buffalo
Construction Management & Claims Avoidance -Night School (1998)
Construction & Excavation Safety - Night School (1999)
Timberline – Kelar Corporation
Primavera Suretrak 3.0 Project Manager – CPM Scheduling (2001)

Certifications:

NICET LEVEL IV - Highway Construction, Cert # 067374 (1987)
NETTCP – Soils and Aggregate Inspector, Cert #726 (2009)
ACI –Concrete Field Testing Technician Grade 1, Cert # 01067559 (2015)
NYSDEC, Erosion and Sediment Control, "Protecting NY's Natural Resources with Better Construction Site Management" (2017)
Troxler Electronics Laboratories – Nuclear Gauge, Cert # 11632 (2009)
U.S. Dept of Labor – OSHA 10 Hour Training, Construction Safety & Health
FHA/NYSTA/NYSDOT – Design and Operation of Work Zone Traffic Control (1991, 2003, 2014)
NYSTA – Operations and Partnering Training (March 2003)
NYSDOT – Construction Inspector Training (Sept.2002)
Timberline – Kelar Corporation Primavera, Suretrak 3.0 Project Manager – Scheduling Software
FAA - Eastern Region Laboratory Procedures, P-401 Asphalt Concrete Pavement (March 1992)

Years Experience:

11 - Nussbaumer & Clarke, Inc.
42 – Total

PROFESSIONAL HISTORY:

Construction Management - Project scheduling, budgeting and quantity controls including payment approval and record keeping. Cost proposal analysis, performance recommendations and public relations between client and contractor along with partnering and dispute resolution.

Technical Experience - Design, inspection, survey layout and quantity computations for a wide range of highway and bridge projects involving the NYSDOT, NYSTA, and various municipalities. Experience in supervision of assigned project personnel, training programs, EEO requirements, office administration, and computerized record keeping (MURK) in conjunction with the Dept. of Transportation Construction Site Manager Initiative.

RECENT EXPERIENCE:

- **ECWA, Sturgeon Point, Raw Water, NC-34** – Resident Engineer for improvements to the existing facility. Scope includes building addition, replacement of two (2) existing traveling screens, new bridge crane, 30-inch pump discharge valve replacement, and sluice gate rehabilitation.
- **Erie County Water Authority – Sturgeon Point Emergency Generation Station ($10.0M)** – Senior Inspector – Construction of a new 1 story 10,000 SF electrical building housing a 25KV power system along with a 5KV backup system powered by two (2) Caterpiller diesel generators. Work included the installation of all associated electrical and mechanical gear, control and communication systems.
- **USDA – Village of Attica Water/Sewer Improvements, Village of Attica, Genesee County ($2.0M)** –Project Engineer – Installation of 10,000 LF of 8"-12" PVC watermain and 2,400 LF of 8"-12" PVC sanitary sewer along Rte. 238 and Rte. 98 within the village proper.
- **Niagara County Water District, Transmission Raw Water Crossing** – Resident Engineer
- **City of Lockport, Intake Crib Screen Replacement** – Resident Engineer.
- **City of Lockport, WWTP Thickener Tank Drive Rehabilitation** – Resident Engineer.
- **ECDPW, FA-255-2-16 Replacement of Swift Mills Road Bridge, Town of Newstead, Erie County ($0.92M) –** Resident Engineer, this project replaced an existing thru girder structure with a prestressed box beam unit structure. The new bridge is a 92' single span, jointless structure founded on a concrete, steel H-pile supported foundation. Related work included approach slabs, sleeper slab, bridge rail, safety improvements and pavement reconstruction of a portion of Swift Mills Road on both approaches.

Andrew J. Klettke, P.E.

Project Engineer

Years Experience:
Total: 11
McMahon & Mann: 11

Education:
- MS, 2009, Civil Engineering, Tufts University
- BS, 2006, Civil Engineering, Clarkson University

Certifications
- OSHA 29 CFR 1910.120 40-Hour safety training and 8-hour refreshers
- OSHA 29 CFR 1926.1-1926.35 "10-Hour Construction Outreach," 2009
- Nuclear Density Gauge Certification, 2004

License:
Professional Engineer
- New York

Professional Affiliations:
- American Society of Civil Engineers
  - Buffalo Section Treasurer (2016 – Present)
  - Buffalo Section Director (2014-2016)

Presentations / Publications:.
- Mann, Michael J., Snow, Robert, E. and Klettke, Andrew J., "Remedial Design of an Earth Dam – 20 years Later", presented at the ASCE GeoCongress, San Diego California, March 2013.
- Klettke, Andrew J., Edgers, Lewis (2011). A Comparison of 2D and 3D Settlement Analyses of the Tower of Pisa, in *Proceedings of ASCE GeoFrontiers Advances in Geotechnical Engineering*, March 13-16, 2011, Dallas, Texas, 3776-3785.

Mr. Klettke has over ten years of experience on various projects involving civil, structural and geotechnical engineering, all with McMahon & Mann Consulting Engineering and Geology, P.C. (McMahon & Mann). His work has included involvement in as design and construction monitoring of several civil works and embankment stabilization projects. He also has experience with structural evaluations of various foundation elements and geotechnical evaluations for foundations, earth slopes, earth retention systems and landfill embankments.

SELECTED PROJECT EXPERIENCE

Richard F. Ball Pump Station and Ground Storage Reservior, Amherst, New York. The Erie County Water Authority installed a new storage tank at the Ball Pumping Station along Sweet Home Road. Mr. Kelttke reviewed the demolition plan for the existing tank and reviewed existing boring logs. He evaluated the performance of existing and new underground structures and piping subject to construction truck and crane loads.

Erie County Water Authority, Ball Pump Station Electrical Substation, Amherst, New York. The Erie County Water Authority is installing a new substation at the Ball Pump Station along Sweet Home Road. Mr. Klettke evaluated the performance of an existing underground pre-stressed concrete cylinder pipe subject to construction equipment loading.

Church Street Sewer, Buffalo, New York. Mr. Klettke reviewed the data from completed subsurface explorations and designed an excavation support system for a replacement section of sewer and a chamber along Church Street at the intersection of Lower Terrace. The shoring system consisted or soldier piles and lagging, considering the depth, section, and spacing of the piles and the size of the lagging boards.

Niagara County Clear Well Tank, Wheatfield, New York. The Niagara County Water District constructed a 2 million gallon clear well tank at its Williams Road Treatment Plant. Mr. Klettke reviewed shoring system design, caluclations and pile design for construction. He also provided monitoring for the shoring and foundation system installation.

Niagara County Water District Wastewater Lagoon No. 2, Niagara Falls, New York. McMahon & Mann developed and implemented a subsurface exploration, laboratory testing, and groundwater monitoring program for an earthen embankment with seepage issues. Mr. Klettke provided the client with design recommendations for collecting and monitoring the seepage with a downstream blanket and drainage measures. He also provided input during design and observed construction of additional clay liner materials placed to limit seepage.

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