CITY OF UNALASKA
UNALASKA, ALASKA

RESOLUTION 2019-12

A RESOLUTION OF THE UNALASKA CITY COUNCIL AUTHORIZING THE CITY MANAGER TO ENTER INTO AN AGREEMENT WITH RENTRICITY, INC. TO AWARD PHASE II SCOPING, 15% DESIGN, AND EQUIPMENT MANUFACTURER SELECTION FOR THE PYRAMID MICRO TURBINES PROJECT (WA17C) IN THE AMOUNT OF $50,000

WHEREAS, the Pyramid Micro Turbines Project (WA17C) is an approved component of the City of Unalaska Capital & Major Maintenance Program; and

WHEREAS, Staff publicly advertised a Request for Qualifications to perform the Design of the Project and received five (5) proposals; and

WHEREAS, RENTRICITY, INC., an experienced design firm, was determined, through an extensive scoring process, to be the most qualified firm to perform the work; and

WHEREAS, funding is available in the Capital Project budget (WA17C) to award this Phase II work.

NOW THEREFORE BE IT RESOLVED that the Unalaska City Council authorizes the City Manager to enter into an Agreement with Rentricity, Inc., to perform Phase II Scoping, 15% Design, and Equipment Manufacturer Selection for the Pyramid Micro Turbines Project (WA17C) for $50,000.

PASSED AND ADOPTED by a duly constituted quorum of the Unalaska City Council on March 12, 2019.

Frank Kelty
Mayor

ATTEST:

MVeeder
Marjie Veeder
City Clerk

MEMORANDUM TO COUNCIL

To:	Mayor and City Council Members
From:	Thomas Cohenour, Director, Department of Public Works
Through:	Thomas Thomas, City Manager
Date:	March 12, 2019
Re:	Resolution 2019-12, authorizing the City Manager to enter into an agreement with Rentricity Inc. to perform Phase II Scoping, 15% Design, and Equipment Manufacturer Selection for the Pyramid Micro Turbines Project WA17C in the amount of $50,000

SUMMARY: In December 2018, Staff issued a public Request for Qualifications (RFQ) for design of the Pyramid Micro Turbines Project WA17C; five proposals were received. Resolution 2019-12 will award the Phase II Scoping, 15% Design, and Equipment Manufacturer Selection to Rentricity, Inc. (Rentricity) for $50,000.

PREVIOUS COUNCIL ACTION: Council funded this project via the FY2017 CMMP and Resolution 2016-23, adopted it. Other recent Council action regarding the Pyramid Water Treatment Plant includes Resolution 2014-25 which authorized construction of the Pyramid Water Treatment Plant.

BACKGROUND: This project will install hydroelectric Micro Turbines in the Pyramid Water Treatment Plant in a space reserved on the plant floor for this purpose during design and construction of the plant. Because of the elevation of the Icy Creek Reservoir, the water pressure must be reduced before it can be processed. This is currently achieved by reducing the pressure through a Pressure Reducing Valve (PRV). This project proposes using two inline Micro Turbines in parallel to reduce water pressure by producing electricity instead of using a PRV. Based on real flows and average efficiency of 60%, we anticipate the Micro Turbines will generate about 342,987 kW-hr ($126,905) per year with the capability to produce 670,857 kW-hr ($248,217) per year if additional water rights are acquired. These are optimal solutions and, based on the frequency and duration of actual Pyramid Creek flows, there is not a reasonable payback for additional generation above the 670,857 kW-hr. The Micro Turbines will be brought online in FY20 but to achieve optimal capacity of 670,857 kW-hr, additional water rights will take several more years to acquire. For comparison, the Pyramid Water Treatment Plant currently requires approximately 200,000 kW-hr per year in electricity to operate; about $74,000 per year.

DISCUSSION: Approval of this resolution is the first step in preparing this project for installation. A Request for Qualifications (RFQ) for design services regarding this project was sent directly to major engineering firms in Alaska, advertised through The Plans Room and Builders Exchange of Washington, and advertised on the City website for 30 days.

Five proposals were received:

1. Electric Power Systems, Inc.
2. HDR
3. Rentricity, Inc.
4. KGS Group International Inc.
5. Coffman Engineers.

Following the pre-defined selection procedures in the RFQ, a team of City Staff scored the proposals. Interviews were held with the top 3 proposers (HDR, Rentricity, and Coffman). A second round of scoring was conducted with Rentricity receiving the highest overall score; HDR coming in a close second. Both Rentricity and HDR had outstanding proposals and concept designs but Rentricity is a firm with more direct experience installing small hydro power systems with an emphasis on constructability and commissioning.

Rentricity will subcontract Electric Power Systems, Inc., Boreal Controls, Inc., and Taku Engineering, LLC (an Alaska firm) but will perform the majority of the work in-house. Regan Engineering has years of experience with the WTP and will assist with contract administration.

Project design has been phased as follows in order to control costs and scope creep:

Phase I – Pre-Development - complete. Since 1984, 10 studies have been conducted related to hydropower in the Pyramid watershed. The City Engineer completed analysis with an optimization and validation model based on hourly 2010-2018 data. Previous work completed.

Phase II – Scoping, 15% Design, and Equipment Manufacturer Selection. <u>This Phase II work is the subject of this Resolution</u>

Phase III – Design, Permitting, Construction. Future work intended for FY20.

Phase IV – Installation and Commissioning. Future Work intended for FY20.

Tasking for Phase II is broken out as follows:

Task 1 Data review, site visit, setup project management.

Task 2 Concept design and vendor recommended micro turbine sizing, operational sequence document, and water rights permitting review.

Task 3 Controls integration, grid integration, mechanical and electrical pre-design and estimates, future expansion options, and draft turbine specification.

Task 4 Summary report with 15% plans, equipment manufacturer costs, and updated plant functional narratives.

This Resolution will award Phase II (Tasks 1-4) to Rentricity for $50,000. An FY20 CMMP nomination will come before Council which will request funding to complete Phases III and IV of the Project.

ALTERNATIVES: Council could direct Staff to negotiate with the second highest scoring respondent (HDR). However, Staff feels the Rentricity's costs are typical and fair. Each of the proposers provided billing rate tables of which Rentricity was lower than HDR.

FINANCIAL IMPLICATIONS: Moving forward with this work will encumber $50,000 of the Project's present budget leaving a balance of $0. A forthcoming FY20 CMMP nomination will request funding in order to progress into Phase III and IV.

LEGAL: Not Applicable

STAFF RECOMMENDATION: Staff recommends Council adopt Resolution 2019-12 and award Phase II to Rentricity for $50,000.

PROPOSED MOTION: I move to approve Resolution 2019-12.

CITY MANAGER COMMENTS: I recommend Council approve Resolution 2019-12.

ATTACHMENTS:

Attachment 1: Consultant Agreement

Attachment 2: Request for Qualifications (RFQ)

Attachment 3: Interview Responses with Scoring Sheet Summary

Attachment 4: Statements of Qualifications (SOQs) 5 Each:

4A: Rentricity
4B: HDR
4C: Coffman
4D: EPS
4E: KGS

Resolution 2019-12
Attachments 1 - 4

Pyramid Micro Turbine
Award Documention

Attachment 1

CITY OF UNALASKA

RENTRICITY INC.

Consultant Agreement

Pyramid Water Treatment Plant Inline MicroTurbines Desig~~n~~

FILE NO. 17401

Prepared By:

City of Unalaska
P.O. Box 610
Unalaska, Alaska 99685
907.581.1260

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AGREEMENT FOR CONSULTING
AND RELATED SERVICES

THIS AGREEMENT is entered into this **__**th day of March**, 2019** by and between **Rentricity Inc.,** (hereinafter called "Consultant"), and the **CITY OF UNALASKA** (hereinafter called "City").

WITNESSETH THAT:

WHEREAS City desires to engage Consultant to render consulting and related services for the performance of the **Pyramid Water Treatment Plant Inline MicroTurbines Design**, and

WHEREAS Consultant represents that it has the experience and ability to perform such services; and

WHEREAS the parties hereto desire to enter into a basic agreement setting forth the terms under which Consultant will, as requested, perform such work;

NOW THEREFORE the parties hereto do mutually agree as follows:

1. Employment of Consultant

Consultant agrees to provide professional services in accordance with the provisions of this Agreement. A written description of the work to be performed, schedule and compensation is set out in **Exhibits A-C** of this Agreement.

2. Performance

Consultant agrees to perform the work described in **Exhibit A- Scope of Services**; however, the Consultant is not authorized to perform any work or incur any expense which would cause the amount for which he is entitled to be paid under this Agreement to exceed the amount set forth in **Exhibit C – Fee Schedule** without the prior written approval of the City. Invoices will be issued monthly. The total amount of each invoice will be based on the work, labor and costs summarized in the spreadsheet shown in Exhibit C. All services shall be rendered in accordance with the schedule set forth in **Exhibit B – Contract Schedule**.

The work shall include but not be limited to the following: furnishing all equipment, transportation, per diem, travel, and supplies to perform all scopes of work that are authorized under the State of Alaska's Professional Engineering License, in connection with the **Pyramid Water Treatment Plant Inline MicroTurbines Design**.

3. Fee

After receipt of a periodic billing for said services, the City agrees to pay Consultant as compensation for the services under this Agreement such sums of money as set forth in **Exhibit C** of this Agreement. The amount payable to the Consultant shall not exceed the amount specified in **Exhibit C**.

4. Payments

City agrees to make monthly payments to Consultant as services are performed and costs are incurred, provided Consultant submits a proper invoice for each payment, in such form accompanied by such evidence in support thereof as may be reasonably required by the City. City may, at its option, withhold last payment until all defined deliverables are accepted as outlined in Exhibit A. All invoices are otherwise due and payable within thirty (30) days of receipt by City. City shall pay Consultant for the services identified in **Exhibit A** the **Time and Expense Not to Exceed Total Fee of $50,000**. The Not to Exceed Total Fee is based on the distribution of the Not to Exceed Total Fee between tasks set forth in **Exhibit A.** The portion of the Not to Exceed Total Fee billed and paid for Consultant's services shall be equal to the proportion of services actually completed for each task set forth in **Exhibit A** during the billing period to the fee total specified for that task.

5. Personnel

Consultant agrees to furnish all personnel necessary for expeditious and satisfactory performance of this Agreement, each to be competent, experienced, and well qualified for the work assigned. No person objected to by the City shall be employed by Consultant for work hereunder.

6. Independent Contractor Status

In performing under this Agreement, Consultant acts as an independent contractor and shall have responsibility for and control over the details and means for performing the consulting services required hereunder.

7. Indemnification

Consultant shall defend and save harmless City or any employee, officer, insurer, or elected official thereof from and against losses, damages, liabilities, expenses, claims, and demands but only to the extent arising out of any negligent act or negligent omission of Consultant while performing under the terms of this contract.

City shall defend and save harmless Consultant or any employee, officer, or insurer thereof from and against losses, damages, liabilities, expenses, claims, and demands but only to the extent arising out of any negligent act or negligent omission of City while performing under the terms of this contract.

8. Assignment

Consultant shall not assign this Agreement or any of the monies due or to become due hereunder without the prior written consent of City.

9. Subcontracting

Consultant may not subcontract its performance under this Agreement without prior written consent of City. Any subcontractor must agree to be bound by terms of this Agreement.

10. Designation of Representatives

The Parties agree, for the purposes of this Agreement, the City shall be represented by and may act only through the Deputy Director of Public Utilities or such other person as he may designate in writing. Consultant shall advise City in writing of the name of its representative in charge of the administration of this Agreement, who shall have authority to act for and bind Consultant in connection with this Agreement.

11. Termination

Either party shall have the right to terminate this Agreement in whole or in part at any time and for reasonable cause, by delivery of thirty (30) days written notice, specifying the extent and effective date thereof. After receipt of such notice, Consultant shall stop work hereunder to the extent and on the date specified in such notice, terminate all subcontracts and other commitments to the extent they relate to the work terminated, and deliver to City all designs, computations, drawings, specifications and other material and information prepared or developed hereunder in connection with the work terminated.

In the event of any termination pursuant to this clause, Consultant shall be entitled to be paid as provided herein for direct labor hours expended and reimbursable costs incurred prior to the termination pursuant to Section 3 hereof, and for such direct labor hours and reimbursable costs as may be expended or incurred thereafter with City's approval in concluding the work terminated, it being understood that Consultant shall not be entitled to any anticipated profit on services not performed. Except as provided in this clause, any such termination shall not alter or affect the rights or obligations of the parties under this Agreement.

12. Ownership and Use of Documents

Work products produced under this Agreement, except items which have pre-existing copyrights, are the property of the City. Payments to the Consultant for services hereunder include full compensation for all work products produced by the Consultant and its Subcontractors and the City shall have royalty free nonexclusive and irrevocable right to reproduce, publish, or otherwise use, and to authorize others to use, such work products.

Should the City elect to reuse work products provided under this Agreement for other than the original project and/or purpose, the City will indemnify the Consultant and its Subcontractors against any responsibilities or liabilities arising from such reuse. Additionally, any reuse of design drawings or specifications provided under this Agreement must be limited to conceptual or preliminary use for adaptation and the original Consultant or Subcontractor's signature, professional seals and dates removed. Such reuse of drawings and specifications, which require professional seals and dates removed, will be signed, sealed and dated by the professional who is in direct supervisory control and responsible for all adaptation.

12a. Opinions of Probable Costs

Opinions of probable cost prepared by Rentricity are based on professional judgment and experience as a designer/consultant. Rentricity has no control over market forces, competitive bids, construction practices, etc., and therefore cannot provide assurance that competitive bids/prices will not show some variation from our judgments and assessments. Any alterations in the price estimates provided herein shall be reviewed and approved by Unalaska before incurring additional costs, expenses and fees.

13. Insurance

A. During the term of the contract, the Contractor shall obtain and maintain in force the insurance coverage specified in these requirements. Such coverage shall be with an insurance company rated "Excellent" or "Superior" by A. M. Best Company, or a company specifically approved by the City.

B. The contractor shall carry and maintain throughout the life of this contract, at its own expense, insurance not less than the amounts and coverage herein specified, and the City of Unalaska, its employees and agents shall be named as additional insured under the insurance coverage so specified and where allowed, with respect to the performance of the work. There shall be no right of subrogation against the City or its agents performing work in connection with the work, and this waiver of subrogation shall be endorsed upon the policies. Insurance shall be placed with companies acceptable to the City of Unalaska; and these policies providing coverage thereunder shall contain provisions that no cancellation or material changes in the policy relative to this project shall become effective except upon *30* days prior *written* notice thereof to the City of Unalaska.

C. Prior to commencement of the work, the contractor shall furnish certificates to the City of Unalaska, in duplicate, evidencing that the Insurance policy provisions required hereunder are in force. Acceptance by the City of Unalaska of deficient evidence does not constitute a waiver of contract requirements.

D. The contractor shall furnish the City of Unalaska with certified copies of policies upon request. The minimum coverages and limits required are as follows:

1. Workers' Compensation insurance in accordance with the statutory coverages required by the State of Alaska and Employers Liability insurance with limits not less than $1,000,000 and, where applicable, insurance in compliance with any other statutory obligations, whether State or Federal, pertaining to the compensation of injured employees assigned to the work, including but not limited to Voluntary Compensation, Federal Longshoremen and Harbor Workers Act, Maritime and the Outer Continental Shelf's Land Act.

2. Commercial General Liability with limits not less than $1,000,000 per Occurrence and $2,000,000 Aggregate for Bodily Injury and Property Damage, including coverage for Premises and Operations Liability, Products and Completed Operations Liability, Contractual Liability, Broad Form Property Damage Liability and Personal Injury Liability.

3. Commercial Automobile Liability on all owned, non-owned, hired and rented vehicles with limits of liability of not less than $1,000,000 Combined Single Limit for Bodily Injury and Property Damage per each accident or loss.

4. Umbrella/Excess Liability insurance coverage of not less than $1,000,000 per occurrence and annual aggregate providing coverage in excess of General Liability, Auto Liability, and Employers Liability.

5. If work involves use of aircraft, Aircraft Liability insurance covering all owned and non-owned aircraft with a per occurrence limit of not less that $1,000,000.

6. If work involves use of watercraft, Protection and Indemnity insurance with limits not less than $1,000,000 per occurrence.

7. Professional Liability insurance with limits of not less than $1,000,000 per claim and $1,000,000 aggregate, subject to a maximum deductible $10,000 per claim. The City of Unalaska has the right to negotiate increase of deductibles subject to acceptable financial information of the policyholder.

E. Any deductibles or self-insured retentions must be declared to and approved by the City. At the option of the City, either the insurer shall reduce or eliminate such deductibles or self-insured retentions as respects the City, its officers, officials, employees and volunteers; or the contractor shall provide a financial guarantee satisfactory to the City guaranteeing payment of losses and related investigations, claim administration and defense expense.

F. All insurance policies as described above are required to be written on an "occurrence" basis. In the event occurrence coverage is not available, the contractor agrees to maintain "claims made" coverage for a minimum of two years after project completion.

G. If the contractor employs subcontractors to perform any work hereunder, the contractor agrees to require such subcontractors to obtain, carry, maintain, and keep in force during the time in which they are engaged in performing any work hereunder, policies of insurance which comply with the requirements as set forth in this section and to furnish copies thereof to the City of Unalaska. This requirement is applicable to subcontractors of any tier.

14. Claims Recovery

Claims by City resulting from Consultant's failure to comply with the terms of and specifications of this contract and/or default hereunder may be recovered by City by withholding the amount of such claims from compensation otherwise due Consultant for work performed or to be performed. City shall notify Consultant of any such failure, default or damage therefrom as soon as practicable and no later than 10 days after discovery of such event by written notice. Nothing provided herein shall be deemed as constituting an exclusive remedy on behalf of City, nor a waiver of any other rights hereunder at law or in equity. Design changes required as a result of failure to comply with the applicable standard of care shall be performed by the Consultant without additional compensation.

15. Performance Standard

Services performed under this Agreement will be performed with reasonable care or the ordinary skill of the profession practicing in the same or similar location and under similar circumstances and shall comply with all applicable codes and standards.

16. Compliance with Applicable Laws

Consultant shall in the performance of this Agreement comply with all applicable federal, state, and local laws, ordinances, orders, rules, and regulations applicable to its performance hereunder, including without limitation, all such legal provisions pertaining to social security, income tax withholding, medical aid, industrial insurance, workers' compensation, and other employee benefit laws. Consultant also agrees to comply with all contract provisions pertaining to grant or other funding assistance which City may choose to utilize to perform work under this Agreement. The Consultant and all subcontractors must comply with state laws related to local hire and prevailing wages.

17. Records and Audit

Consultant agrees to maintain sufficient and accurate records and books of account, including detailed time records, showing all direct labor hours expended and all reimbursable costs incurred and the same shall be subject to inspection and audit by City at all reasonable times. All such records and books of account pertaining to any work performed hereunder shall be retained for a period of not less than six (6) years from the date of completion of the improvements to which the consulting services of this Agreement relate.

17a. Confidentiality

Except as required by applicable law and regulation, both parties to this Agreement undertake to keep confidential and not to disclose to any third party or to use itself, any Confidential Business Information (CBI).

Both parties to this Agreement undertake to disclose CBI of the other party only to those of its officers, employees, agents and contractors to whom and to the extent to which disclosure is necessary for the purposes contemplated under this Agreement, and/or as is required by law. The above obligations of confidentiality and non-use shall not apply to information or material:

a. which is known prior to receipt by the receiving party, as evidenced by documents in the possession of the receiving party at the time of disclosure;

b. which, after receipt, is disclosed to the receiving party by a third party having the legal right to do so;

c. which is available to the public at the time of receipt; or

d. which becomes available to the public after receipt through no fault of the receiving party.

This clause shall survive the termination of this Agreement.

18. Reporting of Progress and Inspection

Consultant agrees to keep City informed as to progress of the work under this Agreement by providing monthly written progress reports, and shall permit City to have reasonable access to the work performed or being performed, for the purpose of any inspection City may desire to undertake.

19. Form of City Approval

Except as otherwise provided in this Agreement, City's requests and approvals, and Consultant’s cost estimates and descriptions of work to be performed, may be made orally where necessary, provided that the oral communication is confirmed immediately thereafter in writing.

20. Duration of Agreement

This agreement is effective for a period of three (3) years from the date first shown above. The agreement may be extended by the mutual written agreement of City and Consultant.

21. Inspections by City

The City has the right, but not the duty, to inspect, in the manner and at reasonable times it considers appropriate during the period of this Agreement, all facilities and activities of the Consultant as may be engaged in the performance of this Agreement.

22. Endorsements on Documents

Endorsements and professional seals, if applicable, must be included on all final plans, specifications, estimates, and reports prepared by the Consultant. Preliminary copies of such documents submitted for review must have seals affixed without endorsement (signature).

23. Notices

Any official notice that either party hereto desires to give the other shall be delivered through the United States mail by certified mail, return receipt requested, with postage thereon fully prepaid and addressed as follows:

To City:

Tom Cohenour, DPW Director
City of Unalaska
Box 610
Unalaska, Alaska 99685

To Consultant:

Frank Zammataro, CEO
Rentricity Inc.
PO Box 1021
Planetarium Station
New York, NY 10024

The addresses hereinabove specified may be changed by either party by giving written notice thereof to the other party pursuant to this paragraph.

24. Venue/Applicable Law

The venue of any legal action between the parties arising as a result of this Agreement shall be laid in the Third Judicial District of the Superior Court of the State of Alaska and this contract shall be interpreted in accordance with the laws of the State of Alaska.

25. Attorney's Fees

In the event either party institutes any suit or action to enforce its right hereunder, the prevailing party shall be entitled to recover from the other party its reasonable attorney's fees and costs in such suit or action and on any appeal therefrom.

26. Waiver

No failure on the part of City to enforce any covenant or provisions herein contained, nor any waiver of any right hereunder by City, unless in writing and signed by the parties sought to be bound, shall discharge or invalidate such covenants or provisions or affect the right of City to enforce the same or any other provision in the event of any subsequent breach or default.

27. Binding Effect

The terms, conditions and covenants contained in this Agreement shall apply to, inure to the benefit of, and bind the parties and their respective successors.

28. Entire Agreement/Modification

This agreement, including **Exhibits A-C**, and the Consultant’s Statement of Qualifications dated **January 17, 2019** constitutes the entire Agreement between the parties with respect to the subject matter hereof, and all prior negotiations and understandings are superseded and replaced by this Agreement and shall be of no further force and effect. No modification of this Agreement shall be of any force or effect unless reduced to writing, signed by both parties and expressly made a part of this Agreement.

In witness whereof, the parties hereto have executed, or caused to be executed by their duly authorized officials, this Agreement in duplicate on the respective date indicated below.

CONSULTANT:RENTRICITY INC.

By:___________________________________
Frank Zammataro, Its CEO

State of New Jersey)
) ss.
)

The foregoing instrument was acknowledged before me on the ____ day of ___________, 2019, by ____________________________, the _______________________________ of __________________, a _________ Corporation, on behalf of the corporation.

____
Notary Public, State of New Jersey
My Commission Expires ________________

CITY OF UNALASKA, ALASKA

By:_________________________________
Thomas Thomas, City Manager

State of Alaska)
) ss.
Third Judicial District)

The foregoing instrument was acknowledged before me on the ____ day of ___________, 2019, by Thomas Thomas, City Manager for the City of Unalaska, a First Class Alaska Municipal Corporation, on behalf of the City of Unalaska.

____
Notary Public, State of Alaska
My Commission Expires _______________

CITY OF UNALASKA

EXHIBIT “A”
SCOPE OF SERVICES

The Consultant will work with the City to complete the **Pyramid Water Treatment Plant Inline MicroTurbines Design**

In general accordance with the narrative work plan in the Rentricity Statement of Qualifications dated **January 17, 2019** and the and Article 2.1 of the Request for Qualifications (RFQ) issued by Unalaska on November 30, 2018.

The following shall constitute Rentricity’s scope of work for this agreement unless all parties mutually agree to a change in writing.

1. Enumeration and evaluation of any permits or authorizations required to utilize an excess of raw water over normal fresh water demand for the express purpose of generating additional power. The agencies and entities listed on p.2.9 will be included in the assessment. The requirements, timing and fees will be identified as well as an assessment of the risk/level of difficulty will be noted. A summary will be prepared covering these factors which will provide a basis for decision making by Unalaska to pursue or abandon efforts to gain approvals for usage of the excess raw water.
2. Prepare a Functional Design Document for the project which defines all of the overarching objectives and criteria for energy recovery at the Pyramid WTF
3. Prepare a technical evaluation documenting a full assessment of turbine generator options for both the current and future flow scenarios. These scenarios are fully modeled for the supply through the water processing/treatment and delivery to Unalaska in the detailed spreadsheets in the reference list of documentation associated with the RFQ. This detailed model utilizes SCADA data from 2010 and includes assumptions for an overlay of excess usage up to 7000 gpm. The evaluation will consider up to three alternative turbine generator designs for such factors as range of use, output, size and ease of deployment in the existing WTF, cost, location of fabrication and service facilities.
4. Develop a complete set of mechanical design schematics covering all potential changes to backfit the in-pipe hydropower options into the WTF. These schematics will consider and evaluate as necessary following elements:
    a. Relocation of the existing PRVs
    b. Utilization of modulating flow control valves where the PRVs are currently located for granular control of CT Tank level.
    c. Potential for over-pressurization or other transients and steps to mitigate same.
    d. Piping/valve/turbine arrangement configurations and limitations within the confines of the existing WTF mechanical/hydraulic profile.
    e. Impact of regulatory and permitting requirements
5. Develop a complete set of electrical design schematics covering all potential changes associated with power generation, distribution, control and monitoring. These schematics and supporting documentation will consider and evaluate as necessary the following elements:

    a. System remote and local control requirements.
    b. Location of the main electrical control panels
    c. Protective relaying requirements
    d. Interconnection to existing plant switchgear, back-feed through primary grid circuits, metering and anti-islanding requirements and possible tie-in to the existing microgrid.
    e. Coordination with the electric utility to confirm assessment of and mitigation of transients and perturbations
    f. Interface with existing SCADA, form/type of data transfer in both directions, requirements for displays
6. Schedule and Capital Cost Estimates – prepare first indicative capital cost summary for the current and future flow scenarios covering the following:
    a. Budget for each turbine generator system estimate from a minimum of three suppliers.
    b. Final Design engineering
    c. Additional mechanical system specialty control, relief and manual valves, incremental piping and supports,
    d. Additional electrical equipment and components to complement the specialty panels estimated by the suppliers
    e. Mechanical and electrical installation estimates
    f. Estimated permitting costs
    g. Schedule to complete including key assumptions and conditions.

CITY OF UNALASKA

Pyramid Water Treatment Plant Inline MicroTurbines Design

EXHIBIT "B"

CONTRACT SCHEDULE

Completion date is on or about four months following issuance of a purchase order for this work.

Timeline: Phase II – Pre-design Scoping - 4 months (16 weeks)

2.5 weeks:

- Review Phase I (Feasibility Study) materials and historical materials and documentation

- Draft Project Functional Specification Document
- Site visit and kickoff meeting (two people, two days inclusive of video conference)
- Edit project schedule, deliverables, and communication plan; e.g. type/frequency of update sessions and action Items

3.5 weeks:

- Conceptual design, equipment & vendor recommendations with sizing of turbine(s)
- Projection of annual power production based on historical data and selected current turbine options/performance curves
- Draft Operational and Sequence of Events Document
- Initial review & assessment of requirements for permitting of water rights for generation

3 weeks:

- Recommendations for equipment siting within WTP, inclusive of control panel and intertie to the WTP switchgear and power grid
- Preliminary mechanical and electrical design, inclusive of construction cost estimates
- Recommendations for future (optional) expansion to accommodate untreated water flow

- Draft turbine generator specification

2 weeks:

- 10% level project review by City, followed by video/web conference call

2 weeks:

- Preparation and submittal of summary report, inclusive of 15% design plans
- Review of requisite permits and recommendations, with conference calls as needed
- Update Functional Specification document & Operational/Sequence Events document.

3 weeks:

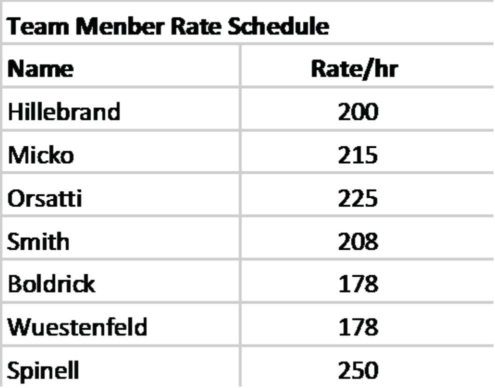
- 15% level project review by City, followed by video/web conference call
- Revisions to 15% level project review documentation and recommendations for Phase III (all materials to be submitted as PDF files and four bound hardcopies

CITY OF UNALASKA

EXHIBIT “C”

FEE SCHEDULE

Fee will not exceed $50,000. All fees will be based upon the rate schedule previously included in Rentricity’s Statement of Qualifications.



Team Menber Rate Schedule

Name	Rate/hr
Hillebrand	200
Micko	215
Orsatti	225
Smith	208
Boldrick	178
Wuestenfeld	178
Spinell	250

In addition, Rentricity will use two forms (shown below) to report Team member activities and travel related expenses on a monthly basis:

Rentricity Inc. ____________________ Prepared by: ____________

Department ____________________ Date ____________

Time Period	Consultant	Task Description	Hours	Rate	Other	Total
						$ -
						$ -
						$ -
						$ -
						$ -
						$ -
						$ -
						$ -
						$ -
						$ -
						$ -
						$ -
						$ -
						$ -
						$ -
			$ -	$ -	$ -	
					Subtotal	$ -
					Advances	
					Total	$ -

APPROVED: ____________________

NOTES: ____________________

CONSULTANT INFORMATION:

Name ____________________ Position ____________________ SSN ____________________

Department ____________________ Manager ____________________ Employee ID ____________________

Date	Account		Hotel	Transport	Fuel	Meals	Phone	Entertainment	Misc.	Total
										$ -
										$ -
										$ -
										$ -
										$ -
										$ -
										$ -
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									Subtotal	$ -
									Advances	
									Total	$ -

APPROVED: ______________________________

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NOTES: ______________________________

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Attachment 2

RFQ

Request for Qualifications

Pyramid Water Treatment Plant Inline MicroTurbines Design

DPU Project No. 17401

Prepared by:

City of Unalaska
Department of Public Works

PO Box 610
Unalaska, Alaska 99685

November 30, 2018

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LIST OF ATTACHMENTS

Attachment A	References
Attachment B	DRAFT Consulting Services Agreement
Attachment C	Evaluation Score Sheet

LIST OF ACRONYMS

ADEC	Alaska Department of Environmental Conservation
ADNR	Alaska Department of Natural Resources
ASFM	Alaska State Fire Marshal
BEP	Best Efficiency Point
CAD	Computer Aided Drafting
CFS	Cubic Feet per Second
CMMP	Capital and Major Maintenance Plan
CT	Contact Time
EPS	Electrical Power Systems
FERC	Federal Energy Regulatory Commission
FFE	Fixed Floor Elevation
GPM	Gallons per Minute
GPRV	Generating Pressure Reducing Valve
KWH	Kilo-Watt-Hour
kVA	Kilo-Volt-Ampere
MG	Million Gallons
MLW	Mean Low Water
MGD	Million Gallons per Day
MPPT	Maximum Power Point Tracking
PDF	Portable Document Format
PRV	Pressure Reducing Valve
PSI	Pounds per Square Inch (gauge)
RFP	Request for Proposals
RFQ	Request for Qualifications
SCADA	Supervisory Control and Data Acquisition
UV	Ultra Violet
WTP	Water Treatment Plant

1.0 INTRODUCTION

This is a RFQ by the City of Unalaska Department of Public Works for engineering services for preliminary design of the installation of inline MicroTurbine power generation (or GPRVs) at the City of Unalaska Pyramid WTP. All questions about this RFQ are to be directed to the City Engineer.

City of Unalaska - Department of Public Works
Robert Lund, P.E. City Engineer
rlund@ci.unalaska.ak.us
P.O. Box 610
Unalaska, AK 99685
Phone 907-581-1260 x8106

Interpretations or clarifications considered necessary by the City of Unalaska in response to such questions will be issued by Addenda. Addenda will be emailed to all registered potential Respondents and also posted on the City of Unalaska website:

http://www.ci.unalaska.ak.us/rfps

To be added to the registration list published on the City of Unalaska website send an email to:

lgregory@ci.unalaska.ak.us

1.1 PROJECT BACKGROUND

The City of Unalaska has about 4,500 permanent residents and supports the largest seafood industry in the U.S. in terms of volume. During various seafood processing seasons, the total population may swell to more than 8,000 due to an influx of transient employees hired to work for the seafood processors. In order to meet water system demand, the City of Unalaska relies on three groundwater wells in the Unalaska Valley and an unfiltered surface water treatment plant herein referred to as the Pyramid WTP or the WTP in the Pyramid Valley. Water system demand ranges from about 1.5 MGD to 8 MGD closely following the seafood processing seasons. Seafood processing seasons vary but do not typically exhibit high water demand in May or November-December.

The Pyramid Valley watershed is located in Unalaska, Alaska on Unalaska Island in the Aleutian Archipelago and drains approximately 4.9 square miles of mountainous tundra growing atop deposits of volcanic ash underlain with shallow glacial till and friable bedrock. It is accessible by an unpaved gravel road, Pyramid Road, controlled and maintained by the City of Unalaska. The uppermost sub-watershed is the Icy Creek Valley. Icy Creek Valley is a 0.24-square mile drainage discharging into a 17-acre alpine lake, Icy Lake, situated at 727-feet MLW in a glaciated trough with about a 57 MG storage capacity of which ½ is accessible for use by the City of Unalaska's Water Utility. The level of Icy Lake was historically raised by a 6-feet high sheet pile dam with discharge controlled through a remotely operated valve on a 24-inch pipe which extends about 1,200-feet downstream before discharging into Icy Creek. Overflow and controlled discharge are routed 2,600-feet overland through Icy Creek across an alluvial valley to a man-made lake, Icy Creek Reservoir, at 517.8-feet MLW with an impoundment of 9.6 MG. Icy Creek Reservoir gathers an additional 3-square miles of drainage along the way.

Icy Creek Reservoir is impounded by a 28-feet tall and 280-feet long sheet pile dam. Water from Icy Creek Reservoir spills over the crest of the dam back into Icy Creek. The highest recorded flow measurement was 367 CFS on December 9, 2011, but the spillway is also often dry as water released from Icy Lake is prioritized for municipal use. 2,100-feet downstream of Icy Creek Reservoir, Icy Creek confluences with the East Fork of Pyramid Creek and becomes Pyramid Creek, which discharges into Captain's Bay about 6,668-feet further downstream.

Prior to the Icy Creek Reservoir spillway, raw water can be diverted 6,200-feet through an automated valve on a 24-inch ductile iron pipe to a tee just below the Pyramid WTP at 252-feet MLW. From the tee, water can either continue uphill 320-feet to the Pyramid WTP inlet at 298.5-feet FFE MLW or, by opening a manual butterfly valve at the tee, it can be discharged into an air gap manhole where it breaks head and is conveyed down a steep 24-inch penstock to Pyramid Creek, discharging at 185.2-feet MLW. The discharge penstock is rated at 12,000 GPM and has energy dissipaters at the discharge point. Normally, raw water continues 320-feet uphill to the Pyramid WTP and after entrance is reduced to 16-inch stainless steel pipe. The Pyramid WTP is a 6,250 GPM maximum, 2,500 GPM average and 280 GPM minimum facility. At least 500 GPM is typical for stable operation of the various processes and sensors.

Inside the Pyramid WTP, the raw water continues through a 34.5-feet section of straight pipe which crosses a 16-feet wide by 34-feet long floor space dedicated for a future MicroTurbine. After the straight pipe, the line branches again. One branch conveys discharge water back downhill 320-feet to the air gap manhole through an automated valve on a 16-inch pipe. This discharge water line is used to automatically clear turbidity from the raw water line whenever necessary to maintain UV transmittance requirements. The other branch continues as raw water through two parallel basket strainers. At the outlets of the basket strainers, the line reconnects and then is expanded back to 24-inch and split through two parallel UV reactors. Recombined with a reduction to 16-inch, it is then chlorinated, continues through a flowmeter, and then is split again through two parallel PRVs which drops pressure 30 PSI to operate quickly enough to adjust for rapidly varying flows.

After the PRVs, the treated water line leaves the building and continues underground 211.5-feet (including riser) through a 16-inch line to the 2.6 MG CT Tank with discharge into the CT Tank at 293.5-feet FFE through a 35.5-feet tall perforated riser. The CT Tank head is normally maintained at 329-feet MLW.

All pipes are Class 52 ductile iron outdoors and 304L SCH40S stainless steel indoors.

The discharge of Pyramid Creek to Captains Bay is an anadromous reach. However; pink and Coho salmon cannot run over a waterfall located about 1,200-feet downstream of the Pyramid WTP discharge. The waters upstream of this waterfall are populated by freshwater resident Dolly Varden up into Icy Creek Reservoir to a waterfall located about midway to Icy Lake.

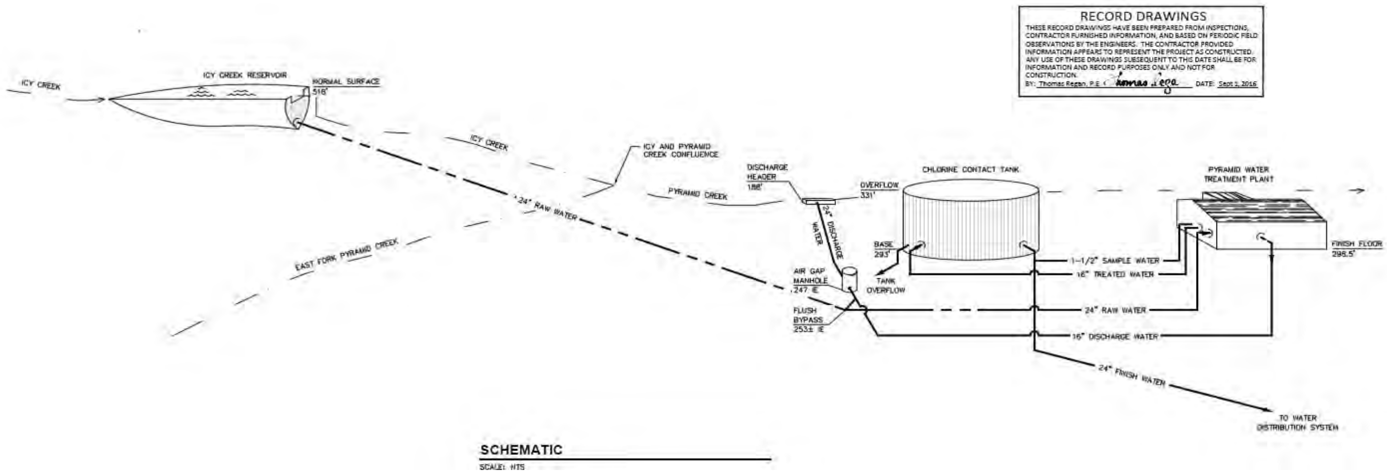


Figure 1. Icy Creek Reservoir to the Pyramid WTP.

2.0 SCOPE OF SERVICES

The requested services are as outlined below. The City of Unalaska considers historical work Phase I and intends to award this Project as Phase II Pre-Design Scoping and Supplier Procurement followed by Phase III Schematic Design then Phase IV Construction and Commissioning.

Phase II has a budget of $50,000.

- Scoping Study
- Competitive selection of qualified GPRV manufacturers
- 15% plans and cost estimate

Phase II-III of the Project is expected to be complete before June 30, 2020.

2.1 PHASE II – PRE-DESIGN SCOPING

The scoping study will bridge the Project from feasibility analysis into schematic design and construction. The scoping study provides an evaluation of the existing facility and available information to select inline MicroTurbines (GPRVs) best suited to facility needs. A GPRV system dedicated to energy recovery on existing infrastructure requires considering some constraints not experienced in the case of conventional hydropower infrastructure. Specifically, this scoping study will address energy recovery in a drinking water treatment plant, where the primary function of the infrastructure is to deliver water to consumers. The primary function must be preserved at all times and the inclusion of GPRVs planned accordingly.

The scoping study is the planning activity and documentation required to achieve a successful outcome for this Project. It follows initial planning and precedes the schematic design and construction stages. The scoping study is the “business plan” for the Project and identifies the goals to for how the Project will function to serve operations and obtain the full support and embracement by the City of Unalaska and the community. The scoping study will communicate essential Project objectives with factual data, such as cost estimates and preliminary schematics, before the full design process commences or other decisions are made.

This Project supports the future installation of inline MicroTurbines on existing pipelines in or in the vicinity of the Pyramid WTP. Historically, a great deal of study has been put into hydroelectric generation on the Pyramid system in many configurations, but this Project is specifically for inline MicroTurbines (GPRVs) using existing infrastructure to the extent practical. Based on previous work by others and information presented to the

City Council during the CMMP process, a location for inline MicroTurbines has already been identified.

DPW evaluated the available studies and different siting scenarios using a hydraulic model which estimates benefits based on hourly flow data from 2010-2012. We feel the model is conservative and on that basis, an acceptable best cost benefit would be the following:

a) A single GPRV; or should payback and floor space allow two parallel GPRVs with partially overlapping operating ranges, operating in a lead lag mode then lead + lag mode, inside the Pyramid WTP on the 16-inch straight pipe previously dedicated for this purpose. Power generation is limited to treated water capacity to 6,250 GPM, at first, but in the future untreated water may be diverted as discharge water up to a total of both GPRVs flow capacity, as future operating conditions and permits, ADNR Water Rights in particular, allow.

The City of Unalaska wants the successful Respondent to consider or evaluate relevant requirements, even if an in depth evaluation is reserved for a later phase, including:

- This Project has been studied previously, Phase II is not intended to be another feasibility study; instead it is intended to bridge previous feasibility studies into schematic design and construction through a Scoping Study, 15% plans and identification of qualified GPRV manufacturers. Later in Phase II our goal is a lean design process in partnership with a qualified manufacturer to bring the right GPRVs online in late Winter 2019 through Spring 2020 following full design/construction funding in early Summer 2019 if approved by City Council.

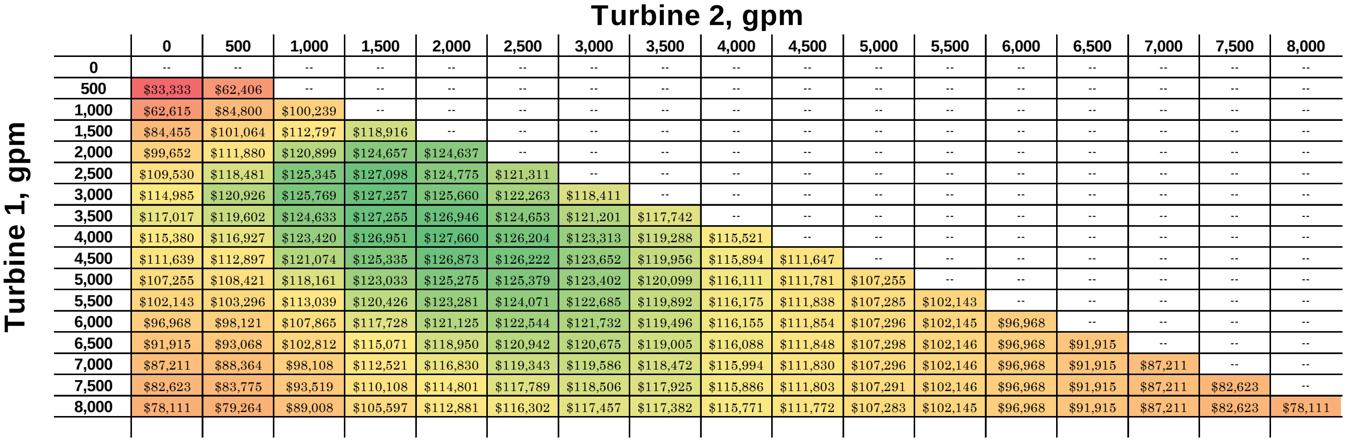
- Gather available data, assess or validate any necessary models, develop selection criteria, specifications and pre-select manufacturer partners based in North America and conduct site visits if needed. Again, this is not a feasibility study; the manufacturers will be most efficient at taking provided data, modeling it in their equipment and recommending equipment sizes based on their standard products.

- The over 6,250 GPM scenario using treated or untreated water is a future scenario that roughly doubles payback from 10.6 down to 6.4 years, but the necessary permits for the future scenario will be difficult and time consuming to acquire. Obtaining those permits is currently out of scope but could be added in the future.

- The selected equipment could be sized for the future scenario and include controls to operate it while still providing satisfactory performance in the current scenario. Two parallel GPRVs at peak flow could do a combined total of 7,000 gpm, or even less, and the future scenario would be adequately covered. We have observed through the 2010-2012 model that due to the actual flow duration frequency experienced through the WTP; the majority of the benefit isn't from passing very high but infrequent flows through the turbines. Rather the most benefit is from keeping smaller turbines fully loaded even when treated water demand is low but Icy Creek Reservoir overflow is available.

- The 2010-2012 model estimates 3,700-4,700 max gpm rating on Turbine 1 (see Figures 2 and 3) and 1,800-2,300 max gpm on Turbine 2 as optimum turbine combinations for both the current or future scenarios. The water to wheel hill efficiency curve used allows as low as 25% of BEP flows up to 125% of BEP flow (max gpm rating) with further reduction by an 80% wheel to wire factor.

  A single 4,000 gpm max turbine approaches a maximum payback in the current scenario but the future scenario optimized at 6,000 gpm.

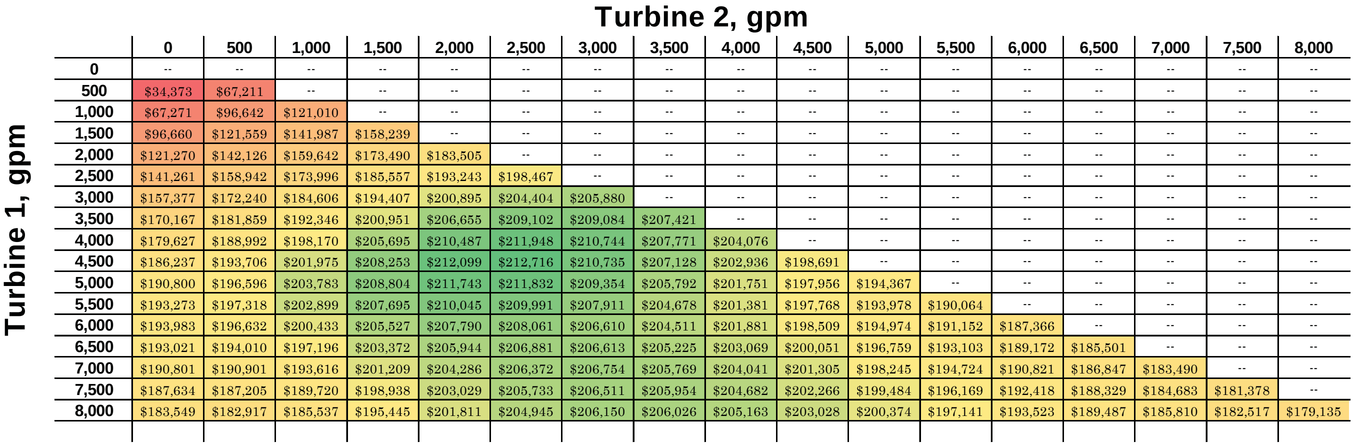


Turbine 2, gpm

Turbine 1, gpm

	0	500	1,000	1,500	2,000	2,500	3,000	3,500	4,000	4,500	5,000	5,500	6,000	6,500	7,000	7,500	8,000
0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
500	$33,333	$62,406	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,000	$62,615	$84,800	$100,239	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,500	$84,455	$101,064	$112,797	$118,916	--	--	--	--	--	--	--	--	--	--	--	--	--
2,000	$99,652	$111,880	$120,899	$124,657	$124,637	--	--	--	--	--	--	--	--	--	--	--	--
2,500	$109,530	$118,481	$125,345	$127,098	$124,775	$121,311	--	--	--	--	--	--	--	--	--	--	--
3,000	$114,985	$120,926	$125,769	$127,257	$125,660	$122,263	$118,411	--	--	--	--	--	--	--	--	--	--
3,500	$117,017	$119,602	$124,633	$127,255	$126,946	$124,653	$121,201	$117,742	--	--	--	--	--	--	--	--	--
4,000	$115,380	$116,927	$123,420	$126,951	$127,660	$126,204	$123,313	$119,288	$115,521	--	--	--	--	--	--	--	--
4,500	$111,639	$112,897	$121,074	$125,335	$126,873	$126,222	$123,652	$119,956	$115,894	$111,647	--	--	--	--	--	--	--
5,000	$107,255	$108,421	$118,161	$123,033	$125,275	$125,379	$123,402	$120,099	$116,111	$111,781	$107,255	--	--	--	--	--	--
5,500	$102,143	$103,296	$113,039	$120,426	$123,281	$124,071	$122,685	$119,892	$116,175	$111,838	$107,285	$102,143	--	--	--	--	--
6,000	$96,968	$98,121	$107,865	$117,728	$121,125	$122,544	$121,732	$119,496	$116,155	$111,854	$107,296	$102,145	$96,968	--	--	--	--
6,500	$91,915	$93,068	$102,812	$115,071	$118,950	$120,942	$120,675	$119,005	$116,088	$111,848	$107,298	$102,146	$96,968	$91,915	--	--	--
7,000	$87,211	$88,364	$98,108	$112,521	$116,830	$119,343	$119,586	$118,472	$115,994	$111,830	$107,296	$102,146	$96,968	$91,915	$87,211	--	--
7,500	$82,623	$83,775	$93,519	$110,108	$114,801	$117,789	$118,506	$117,925	$115,886	$111,803	$107,291	$102,146	$96,968	$91,915	$87,211	$82,623	--
8,000	$78,111	$79,264	$89,008	$105,597	$112,881	$116,302	$117,457	$117,382	$115,771	$111,772	$107,283	$102,145	$96,968	$91,915	$87,211	$82,623	$78,111

Figure 2. Current scenario with turbines inside the WTP. Heat map shows estimated annual payback at 2010-2012 model settings for parralel turbines. Discharge (bypass) flow is set to 0.



Turbine 2, gpm

Turbine 1, gpm

	0	500	1,000	1,500	2,000	2,500	3,000	3,500	4,000	4,500	5,000	5,500	6,000	6,500	7,000	7,500	8,000
0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
500	$34,373	$67,211	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,000	$67,271	$96,642	$121,010	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,500	$96,660	$121,559	$141,987	$158,239	--	--	--	--	--	--	--	--	--	--	--	--	--
2,000	$121,270	$142,126	$159,642	$173,490	$183,505	--	--	--	--	--	--	--	--	--	--	--	--
2,500	$141,261	$158,942	$173,996	$185,557	$193,243	$198,467	--	--	--	--	--	--	--	--	--	--	--
3,000	$157,377	$172,240	$184,606	$194,407	$200,895	$204,404	$205,880	--	--	--	--	--	--	--	--	--	--
3,500	$170,167	$181,859	$192,346	$200,951	$206,655	$209,102	$209,084	$207,421	--	--	--	--	--	--	--	--	--
4,000	$179,627	$188,992	$198,170	$205,695	$210,487	$211,948	$210,744	$207,771	$204,076	--	--	--	--	--	--	--	--
4,500	$186,237	$193,706	$201,975	$208,253	$212,099	$212,716	$210,735	$207,128	$202,936	$198,691	--	--	--	--	--	--	--
5,000	$190,800	$196,596	$203,783	$208,804	$211,743	$211,832	$209,354	$205,792	$201,751	$197,956	$194,367	--	--	--	--	--	--
5,500	$193,273	$197,318	$202,899	$207,695	$210,045	$209,991	$207,911	$204,678	$201,381	$197,768	$193,978	$190,064	--	--	--	--	--
6,000	$193,983	$196,632	$200,433	$205,527	$207,790	$208,061	$206,610	$204,511	$201,881	$198,509	$194,974	$191,152	$187,366	--	--	--	--
6,500	$193,021	$194,010	$197,196	$203,372	$205,944	$206,881	$206,613	$205,225	$203,069	$200,051	$196,759	$193,103	$189,172	$185,501	--	--	--
7,000	$190,801	$190,901	$193,616	$201,209	$204,286	$206,372	$206,754	$205,769	$204,041	$201,305	$198,245	$194,724	$190,821	$186,847	$183,490	--	--
7,500	$187,634	$187,205	$189,720	$198,938	$203,029	$205,733	$206,511	$205,954	$204,682	$202,266	$199,484	$196,169	$192,418	$188,329	$184,683	$181,378	--
8,000	$183,549	$182,917	$185,537	$195,445	$201,811	$204,945	$206,150	$206,026	$205,163	$203,028	$200,374	$197,141	$193,523	$189,487	$185,810	$182,517	$179,135

Figure 3. Future scenario with turbines inside the WTP. Heat map shows estimated annual payback at 2010-2012 model settings for parralel turbines. Discharge (bypass) flow is set to 5,500 gpm.

- A defensible procurement basis for pre-approved equipment and partnering with that supplier early in the Project. The procurement will be phased. A document similar to this RFQ will be used to pre-qualify at least 3 vendors and then an RFP will be let in a later phase. The contract between the City of Unalaska and the manufacturer will be similar to that employed by the City of Unalaska powerhouse when purchasing generators and other capital equipment. In other words templates previously used by the City of Unalaska for similar procurements are available.

- Limitations such as consideration of hydraulic transients, cavitation, air entrainment, settleable solids or onerous permitting requirements.

- It is critical that we reconfigure or replacing the existing in-plant PRVs with automatic flow control valves to repurpose the 30 PSI head loss incurred to operate PRVs to the GPRVs. The existing PRVs are CLA-VAL Hytrols 16" 631G-36BCSVYKC.

  The PRVs are rated to operate at about 7 PSI but need about 30 PSI to open and close rapidly enough to keep up with the actual rapid flow fluctuations and keep the CT tank full. Keep rapidly varying flow in mind as one of the criteria for PRV replacement or modification and also the GPRV manufacturer selection.

  <u>If the current PRV energy loss is not addressed this is not a cost effective project.</u>

- How the MicroTurbines and ancillary equipment will fit into the existing space already dedicated to a future MicroTurbine inside the Pyramid WTP in a restricted plant floor space.

- The Water Division continuously measures and records flow data from the Icy Creek Reservoir spillway and the flowmeters inside the Pyramid WTP. Therefore, except if necessary for permitting, this is not a hydrology study and calculations can be made using historical data provided by the City of Unalaska recorded on an hourly basis from 2010-2012 and later. The caveat is reserving enough residual pressure to keep the CT Tank full. The estimated pressure available at the GPRV inlet at flow is available in the 2010-2012 model.

  The treated water supply, maintaining a full CT tank and maintaining contingency storage in Icy Lake and Icy Creek Reservoir will always be prioritized over power production. Therefore the Utility will not operate the storage system any differently than historical data indicates even with GPRVs.

- The equipment selection should not only use daily average and peak flows, but also consider actual flow duration and frequency versus equipment BEPs (efficiency hill chart).

- The most suitable types of GPRVs and manufacturers for this facility with BEPs and overlapping operating ranges that best fit the flow duration frequency and available plant floor space with domestic spare parts service and availability.

- The City of Unalaska will help identify land use requirements, provide ARC-GIS maps and AUTOCAD single line of the utility, front end documents, historical bid tabs and schedule of values, as-builts including CAD files of Pyramid WTP record drawings, SCADA data from the Icy Lake Reservoir and the Pyramid WTP, topographic maps, high resolution power production load data and customer metering information.

- Develop construction cost estimates in spring 2019 so that the City of Unalaska can use them in the CMMP process to fully fund the Project.

- The MicroTurbines will feed a NET metering system at market rates into the existing 34.5 kVA 3-phase primary. Evaluate whether load dumping or additional batteries are necessary.

- The City of Unalaska powerhouse will not be able to force the GPRV to make more power by increasing flow but they must be able to reduce power generation by remotely manipulating the MPPT or a flow bypass without impacting water production.

- Current electric service power analysis to analyze feasibility for sizing and penetration into the remote micro-grid system, taking into account current and future electric production demands.

- In the event of a utility power failure at the Pyramid WTP, an existing battery system maintains plant operations for 5-minutes while the back-up generator warms up. The MicroTurbine system must be compatible with this and all other operating scenarios.

- Consider the provided historical utility bills for the Pyramid WTP.

- Appropriate or typical or creative procurement methodology for this application, such as project manager at risk, and other related considerations.

- Revised Pyramid WTP control narrative and concept schematics of selected alternative.

- Construction windows and sequencing that minimizes Pyramid WTP down time. Due to the fish processing seasons this construction window is May or November-December.

- Permits to generate power from more than just the treated water could be a significant obstacle. The City of Unalaska is currently permitted to intermittently discharge extra water for the purposes of clearing turbidity from the raw water main only, but not solely for power generation. One result of the scoping study will be a decision by the City of Unalaska whether to pursue permits for additional take from Icy Creek, or to limit the sizing to treated water or a scalable system with capacity for higher flows future permits allowing.

- Enumeration and evaluation of required permits. The following permits or authorizations may be required.

    - FERC Licensing. Determination, exemptions, certifications and licensing.

    - ADF&G. May set terms and conditions for discharge of waters over those previously permitted.

    - ADNR Water Rights. The City of Unalaska currently only has rights to that water used to supply the drinking water distribution system.

    - APDES. The City of Unalaska currently is permitted only to discharge raw water that was used to purge the raw water line of turbidity and dechlorinated sample water. The CT Tank overflow was also retrofitted with a dechlorination device.

    - ADEC Water Division. Authority to Construct and Permit to Operate for Drinking water treatment system system changes and replacing PRVs with GPRVs and/or automatic flow control valves.

    - ASFM Review. Life safety and electrical/mechanical review.

2.2 PHASE III – DESIGN (NEGOTIATED WITH PHASE II CONSULTANT OR REBID)

- Manufacturer RFP
- 35%, 65% and 95% plans, specifications, project manual, cost estimate and City of Unalaska reviews
- Permitting
- Bid plans, specifications, project manual and bid services

2.3 PHASE IV – CONSTRUCTION SERVICES (NEGOTIATED WITH PHASE II CONSULTANT OR REBID)

- Construction administration
- Commissioning support
- Permit closeout
- Project closeout by June 30, 2020

2.4 PROJECT TEAM

The City of Unalaska anticipates the following primary support:

- Project Management
- Process Pipe Engineering
- Permitting
- Electrical Engineering and Powerhouse Link Process Controls (sourced to current City electrical engineering firm EPS under prime)
- Mechanical Process Controls (sourced to current City of Unalaska controls engineering firm Boreal Controls under prime)
- GPRV Supplier
- Construction Contractor

3.0 DELIVERABLES

Microturbine options will be refined with staff meetings to provide input and feedback with selections ultimately incorporated into the future improvement. The Scoping Study results should be summarized in a written technical memorandum and other visuals, including the 15% plans that present the information to the City of Unalaska. Anticipate 10% and 15% level reviews by the City of Unalaska with each review period lasting about 2 weeks.

An RFQ for the manufacturer will not be let until after the Scoping Study and 15% plans are complete. The selected respondent will generate the RFQ and participate in the selection process. It is anticipated that the RFQ is essentially an extension of the Scoping Study and 15% plans in that the technical memorandum should be written in anticipation of its usefulness in pre-qualifying manufacturers.

Project communication will be primarily through the City Engineer and Deputy Utility Director.

3.1 DOCUMENTS

Provide a PDF copy of draft documents; four bound hardcopies of the final document; one PDF copy provided on CD or flash drive; and all drawing files must also be provided in AutoCAD or ARC-GIS and PDF format.

4.0 SELECTION PROCESS

Only one Statement of Qualifications from any individual, firm, partnership or corporation, under the same or different names, will be considered. Should it appear to the City of Unalaska that any Respondent is interested in more than one Statement of Qualifications for the work contemplated, then all Statements of Qualifications in which such Respondent is interested will be rejected.

This does not preclude a subcontractor from appearing in more than one Statement of Qualifications. However; our recommendation is that the Statements of Qualifications focus on the project management and architectural team rather than other disciplines.

4.1 EVALUATION AND AWARD PROCESS

The Evaluation Team will be appointed by the City Engineer from among City of Unalaska staff. The entire scoring procedure, including Evaluation Team meetings and scoring materials, will be held strictly confidential until after negotiations are concluded.

All Evaluation Team members will be required to certify that they have no conflicts of interest and that they will strictly adhere to the procedures herein described.

- The City of Unalaska receives the Statements of Qualifications.
- Evaluation Team evaluates the Statements of Qualifications according to established criteria.
- The Evaluation Team will schedule and conduct a phone interview with at least the two highest scored Respondents.
- The Evaluation Team re-evaluates the interviewed Respondents according to the established criteria.
- City Engineer reviews final scores and forwards evaluation results to the Director of Public Works.
- Negotiation with the Respondent with the highest scored Statement of Qualifications or, if necessary, the next lower scored responsive Respondent and so on. The Contract will be the Engineering and Related Services Agreement, **Attachment B**. The City of Unalaska will be inflexible with regards to the Contract language. The Scope of Services, Schedule and Fee for Services are negotiable.

- Director of Public Works forwards evaluation results and the Contract to the City Manager.
- City Manager makes their recommendation to the City Council for Contract award.

The City of Unalaska and the successful Respondent execute the Contract and a purchase order. The purchase order serves as Notice to Proceed.

4.2 CONDITIONS

The City of Unalaska reserves the right to reject any and all Statements of Qualifications and/or to waive any informality in procedures.

This RFQ does not commit the City of Unalaska to award a Contract, or procure or Contract for any services of any kind whatsoever.

The selection of a successful Respondent shall be at the sole discretion of the City of Unalaska. No agreement between the City of Unalaska and any Respondent is effective until the contract is approved by the City Council of the City of Unalaska, signed by the City Manager and a purchase order completed.

The City of Unalaska is not liable for any costs incurred by Respondents in preparing or submitting Statements of Qualifications.

In submitting a Statement of Qualifications, each Respondent acknowledges that the City of Unalaska is not liable to any entity for any costs incurred therewith or in connection with costs incurred by any respondent in anticipation of City of Unalaska City Council action approving or disapproving any agreement without limitation.

Any perception of a conflict of interest is grounds for rejections of any Statement of Qualifications. In submitting a Statement of Qualifications, each Respondent certifies that they have not and will not create and/or be party to conflicts of interest with any City of Unalaska official or employee, including but not limited to any direct or indirect financial gain and/or gratuity or kickback or through unauthorized communication with City employees or officials not listed in this RFQ before the selection process is complete.

Nothing in this RFQ or in subsequent negotiations creates any vested rights in any person or entity.

4.3 TRANSMITTAL REQUIREMENTS

Statements of Qualifications must be delivered to the email addresses below by **2:00 p.m., local time, on January 17, 2019**.

mveeder@ci.unalaska.ak.us; rwinters@ci.unalaska.ak.us

Statements of Qualifications will only be accepted before and on the published date, and until the time specified.

Statements of Qualifications must be submitted in a single email no larger than **5 megabytes**. The email header must clearly identify the Project and the Respondent e.g.

Name of Consulting Firm – Statement of Qualifications for City of Unalaska Pyramid Water Treatment Plant Inline MicroTurbines Design

The City of Unalaska complies with Title II of the American with Disabilities Act of 1990 and the Rehabilitation Act of 1973. Individuals with disabilities who may need auxiliary aids or services or special modifications to participate in the RFQ process should contact the Director of Public Works at 907-581-1260.

4.4 DOCUMENT REQUIREMENTS

One (1) copy of the Statement of Qualifications must be submitted in an electronic PDF file less than 5 megabytes in size, organized with bookmarks, and printable to standard 8.5” x 11” and 11” x 17” paper.

Our intent is that the preparation and review of an RFQ is not an onerous task. So the recommended size of the Statement of Qualifications is about 3-5 pages not including resumes.

5.0 EVALUATION FACTORS

The purpose of the Statement of Qualifications is to evaluate each Respondent's capabilities for efficient execution of the Project. Evaluation criteria and weight are as follows.

Major Factor	Weight
1. Professional Qualifications	[40]
2. Experience and References	[30]
3. Narrative	[30]
Total	**[100]**

The Evaluation Team will rank each Respondent using a successive integer ranking system for each major factor. An Evaluator Score for each Respondent will be calculated.

$$100 – ((\text{Ranking}_1 \times \% \text{ Weight}_1 + \text{Ranking}_2 \times \% \text{ Weight}_2 + \text{Ranking}_3 \times \% \text{ Weight}_3)\text{-}1) \times 5$$

The Total Score for each Respondent is an average of all of the Evaluator Scores.

The *Evaluation Score Sheet* will be used by the Evaluation Team to score each Statement of Qualifications; **Attachment C**.

5.1 PROFESSIONAL QUALIFICATIONS

The Professional Qualifications section should include:

- A brief description of the number, qualifications and types of key personnel who would serve on this Project including employees and potential subcontractors.

- Identify and furnish resumes of up to three key personnel and/or subcontractors who will serve in key positions for this project, including specific experience for each person on similar or related projects.

- Billing rates of key personnel in tabular format.

- The location of the home office and the scope of services offered there.
- Any additional information reflecting on the Respondents ability to perform on this Project.

5.2 EXPERIENCE AND REFERENCES

The satisfactory completion of similar projects of equal size and complexity will be an important element in the evaluation.

- Provide information for two (2) projects for which the Respondent has provided services most related to this Project.
- Provide a reference from the above projects that can comment on the firm's professional capabilities and experience. Names, email addresses and phone numbers of individual to contact must be included.
- Provide a sealed sample floor plan and a sheet of details similar to this project that was prepared before 2019.

5.3 NARRATIVE WORK PLAN

Describe the methodology the Respondent will use to complete this Project for the City of Unalaska. The Narrative Work Plan will be developed into the *Scope of Services* referenced within the *Agreement Exhibit "A"*, **Attachment B**. The Narrative Work Plan must not conflict with or supersede the *Agreement;* however, the Respondent should note any potential conflicts they would prefer to negotiate.

Provide information about the Respondents availability to complete the work.

6.0 REFERENCES

The information and descriptions provided are for general informational purposes only and are not a substitute for industry knowledge, site inspection and completion of other necessary due diligence by interested Respondents. Respondents must make their own independent assessment of the conditions and may not rely entirely on any representation, description, or diagram provided by the City of Unalaska in preparing their Proposal. Various references are provided for informational purposes only at the below hyperlink as **Attachment C**.

References

6.1 REFERENCES INCLUDED

These are references we believe are most valuable for basic information needed to evaluate this RFQ.

- Electrical rates and billing for Pyramid WTP.
- Miscellaneous photographs.
- Water System Master Plan, HDR, May 2018.

  Includes a Microturbine analysis.
- SCADA Data and Turbine Model Spreadsheet, City of Unalaska, January 2018.
- Pyramid WTP Record Drawings, Larsen Consulting Group, September 2016.
- Technical Memorandum #2 Pyramid Water Treatment Plant Discharge System Design, Larsen Consulting Group, August 2013.

  CAD files and O&M Manual are available but not provided here.
- Technical Memorandum #1 Pyramid Water Treatment Plant Discharge Study, Larsen Consulting Group, February 2013.
- Inline Turbine for Energy Recovery at the Water Treatment Plant, HDR, May 2009.
- Pyramid Creek Hydroelectric Project Preliminary Design and Permitting Services, HDR, May 1999.

- Rural Hydroelectric Assessment and Development Study, Prepared for the Alaska Department of Community and Regional Affairs, Division of Energy, by Locker Interest LTD, Anchorage, Alaska, August 1997.
- Icy Lake Reservoir, Golder Associates, May 1995.
- Icy Creek Dam and Reservoir Improvements, Wince-Corthell-Bryson, April 1995.
- Icy Creek Power Recovery Study, PolarConsult Alaska, Inc., April 1994.
- Icy Lake Feasibility Study, Golder Associates, July 1994.
- Schedule A Pyramid Creek Waterline Replacement, James M. Montgomery Consulting Engineers, Inc., May 1993.
- Chlorine Contact Reservoir, CH2MHill, August 1992.

The below reports are referenced historically but the City of Unalaska was unable to locate copies.

- Unalaska, Alaska Final Small Hydropower Interim Feasibility Report and Environmental Impact Statement, U.S. Army Corps of Engineers, July 1984.
- Overview Pyramid Creek Hydroelectric Project, Energy Stream, Inc. (ESI), January 1985.
- North Fork Pyramid Creek Hydropower Study, Polarconsult Alaska, January 1993.
- Streamflow Data Report Pyramid Creek Drainage Basin, Carrick and Ireland, August 1996.

ATTACHMENT A

References

ATTACHMENT B

Draft Consulting Services Agreement

ATTACHMENT C

Evaluation Score Sheet

Proposal Evaluation

Pyramid Water Treatment Plant Inline MicroTurbines Design

Technical Attributes	***Weight***	***%***	**A**	**B**	**C**	**D**		
Professional Qualifications	*40*	*40.0%*	100.0	95.0	90.0	85.0		
Experiences and References	*30*	*30.0%*	85.0	90.0	95.0	100.0		
Narrative	*30*	*30.0%*	85.0	95.0	100.0	100.0		
Technical Proposal Raw Score	*100*	--	91.0	93.5	94.5	94.0		
Technical Proposal Adjusted Score	--	*100%*	91.0%	93.5%	94.5%	94.0%		

Enter the Price Proposal (if any) in USD

Cost Attributes	***Weight***	***%***	**A**	**B**	**C**	**D**		
Cost USD	*0*	--						
Price Proposal Score	--	*0%*	0.0%	0.0%	0.0%	0.0%		
Total Score			**91.0%**	**93.5%**	**94.5%**	**94.0%**		
Ranking			**4**	**3**	**1**	**2**		

Proposal Evaluation
Pyramid Water Treatment Plant Inline MicroTurbines
Design

For each Technical Attribute rank each Respondent starting with 1,2,3,4,5 and 6 and so forth. 1 is best, 2 is next best, 3 is third best, etc.. Do not skip or repeat numbers.

Attributes	***Weight***	***%***	**A**	**B**	**C**	**D**		
Professional Qualifications	*40*	*40.0%*	1	2	3	4		
Experiences and References	*30*	*30.0%*	4	3	2	1		
Narrative	*30*	*30.0%*	4	2	1	1		

Do not edit. The below calculates the rankings you entered above as a percentage. Each successive rank is a difference of 5%.

Attributes	***Weight***	***%***	**A**	**B**	**C**	**D**		
Professional Qualifications	*40*	*40.0%*	100.0	95.0	90.0	85.0		
Experiences and References	*30*	*30.0%*	85.0	90.0	95.0	100.0		
Narrative	*30*	*30.0%*	85.0	95.0	100.0	100.0		
Total Weight	*100*	*100.0%*	91.0	93.5	94.5	94.0		
Ranking			4	3	1	2		

I certify that I have no conflicts of interest and that I have strictly adhered to the procedures described in the Request for Qualifications.

Evaluator Signature:

Date:

Attachment 3

Scoring of Statements of Qualifications and Interviews

Final Scoring of Statements of Qualifications and Interviews

Post Interview Evaluation Summary
Pyramid Microturbines

Technical Attributes	***Weight***	**%**	**Coffman**	**Rentricity**	**HDR**			
Professional Qualifications	*40*	*40.0%*	91.7	97.5	97.5			
Experience	*15*	*15.0%*	91.7	97.5	97.5			
References	*15*	*15.0%*	92.5	95.8	98.3			
Narrative	*30*	*30.0%*	93.3	97.5	95.8			
Technical Proposal Raw Score	*100*	--	92.3	97.3	97.1			
Technical Proposal Adjusted Score	--	*100%*	92.3%	97.3%	97.1%			
Technical Proposal Successive Rank Difference	*5%*	--	3	1	2			

Enter the Price Proposal (if any) in USD

Cost Attributes	***Weight***	**%**	**Coffman**	**Rentricity**	**HDR**			
Cost USD	*0*	--						
Price Proposal Score	--	*0%*	0.0%	0.0%	0.0%			
Price Rank	--	--	1	1	1			
Total Score			**92.3%**	**97.3%**	**97.1%**			
Ranking			**3**	**1**	**2**			

Digitally signed by Robert Lund
DN: cn=Robert Lund, o=Department of Public Works, ou, email=rlund@ci.unalaska.ak.us, c=US
Date: 2019.02.22 13:31:32 -09'00'

Evaluation Summary
Pyramid Microturbines

Initial Scoring of Statements of Qualifications.

Technical Attributes	***Weight***	**%**	**EPS**	**HDR**	**KGS**	**Rentricity**	**Coffman**	
Professional Qualifications	*40*	*40.0%*	90.6	98.1	85.6	85.6	90.0	
Experience	*15*	*15.0%*	83.1	95.0	90.6	90.6	90.6	
References	*15*	*15.0%*	86.9	96.9	85.6	90.0	90.6	
Narrative	*30*	*30.0%*	88.8	93.8	88.1	88.8	90.6	
Technical Proposal Raw Score	*100*	--	88.4	96.2	87.1	88.0	90.4	
Technical Proposal Adjusted Score	--	*100%*	88.4%	96.2%	87.1%	88.0%	90.4%	
Technical Proposal Successive Rank Difference	*5%*	--	3	1	5	4	2	

Enter the Price Proposal (if any) in USD

Cost Attributes	***Weight***	**%**	**EPS**	**HDR**	**KGS**	**Rentricity**	**Coffman**	
Cost USD	*0*	--						
Price Proposal Score	--	*0%*	0.0%	0.0%	0.0%	0.0%	0.0%	
Price Rank	--	--	1	1	1	1	1	
Total Score			**88.4%**	**96.2%**	**87.1%**	**88.0%**	**90.4%**	
Ranking			**3**	**1**	**5**	**4**	**2**	

2/7/19

Attachment 4A
Rentricity

Rentricity Interview Response and Statement of Qualifications

CITY OF UNALASKA
PYRAMID WATER TREATMENT PLANT INLINE MICROTURBINES DESIGN
PROSPECTIVE CONSULTANT INTERVIEWS
FEBRUARY 21ST, 2018

888-363-4734
1258939
2149

I. Introductions:

City of Unalaska:

Tom Cohenour	DPW Director
Dan Winters	DPU Director
JR Pearson	Deputy DPU Director
Jeremiah Kirchhofer	Water Utility Supervisor
Erik Hernandez	Water Utility Operator
Kevin Kloft	Water Utility Operator
Lori Gregory	DPW Admin
Robert Lund	City Engineer
Mark Morrow	Engineering Technician

Consultant: **Rentricity Inc.**

II. Questions:

a) Compare and contrast a similar project you have worked on from scoping and pre-design through construction and final completion. What is something would you do the same and something you do differently on this project?

Rentricity assures active engagement by all stakeholders which maintains continuity (no delays) through all project phases from preliminary design to system start-up, and follow the same functional design approach as outlined in the introductory paragraphs of the Work Plan/Narrative section of our response to the RFQ. The Company's references will confirm this client-centered, active management approach.

Rentricity's has a proven track record of successful project design and implementation as measured by adherence to cost and schedule, power output, system reliability, and effectiveness of problem identification and resolution. All stakeholders have been committed and followed through cooperatively on their actions and responsibilities. The completeness of our design approach has been borne out by highly successful performance and reliability of our commercial projects.

Unalaska has demonstrated its commitment to this project and, if selected, Rentricity looks forward to working with Unalaska to achieve similar results. Some aspects we would reinforce/enhance from some prior projects:

- Added emphasis/proactive support in technical aspects of any electrical interconnect application to the extent it applies to the local utility/grid.
- Required detailed joint review of electrical design/equipment drawings prior to installation, termination and initial checkout by the electrical contractor.
- Onsite presence during construction to assure adherence to drawings and identification and timely resolution of technical or logistical issues as they may arise. This may be of particular importance given the Pyramid site location, communications, etc.

b) Discuss the top 3 critical functions and related control/flow sequences you envision in the current versus future flow scenarios.

The most important critical functions for the hydropower system are to maintain the existing supply and delivery hydraulics, preserve system integrity and reliability of performance following any planned or emergent shutdowns or transients, and provide full remote and local monitoring as well as the option for manual override control of the system at all times by the operations staff.

For the current flow/demand scenario, the normal design setup for a site such as the Pyramid WTF is to place each turbine generator assembly in parallel to the existing PRVs at the plant discharge. Each turbine generator assembly would be inclusive of a properly sized automated inlet control valve with full modulating capability. The turbine generator assemblies would be programmed to start and stop in a lead/lag arrangement with staggered startup and shutdown level permissives. It is expected that the turbines will be two different sizes; respective flow though puts will be different for the same available head. The precise values of the pressure and level permissives and set points are to be determined by analysis during Phase III and tuned for optimization during startup testing.

The PRVs will operate in a standby mode when one or both turbines are meeting the system demand. If demand conditions change, or a grid other system transient occurs tripping one or both of the turbines off line, the PRVs will open to make up for the loss of flow and prevent storage tank draw down. The staggered startup and engaging of turbines compensates for the slower open of the inlet control valves (typically 30 sec) and assures that the PRVs have sufficient time to close and not cause a significant pressure transient in the Pyramid WTF.

An overpressure or surge analysis is typically performed early in the design process to assure that all operating scenarios for start-up or shut down sequences, even under worst case scenarios, do not cause significant pressure transients on the intake or discharge lines reducing transients. Typically, the abrupt loss of grid power would result in the most pronounced pressure transients in the system. The design will provide for overpressure relief should any transient result in a pressure surge that is expected to rise above the design rating of the upstream piping.

All control and protection of the system are driven by signals from a PLC in the integrated electrical control panel. This panel typically includes all switchgear, protective relaying, controls and interface with SCADA.

Status of the system will be available to the operators at all times via mimicked displays in the SCADA system. As an option, the WTF control room operator can have the capability for override control of the system.

Section 2.7 notes that there are some transient demand conditions that challenge the PRVs to respond in a timely fashion and maintain the CT Tank at an even level. An additional concern is the need to preserve 30 psi for the PRVs to function in this arrangement. Locating the turbines in a parallel loop to the PRVs will diminish the ability to generate power.

Our initial recommendation is to situate the turbines/PRVs in a common hydraulic loop where the straight run of supply piping runs to the process loop and raw water discharge line. The turbines/PRV loop will consume essentially all available head other than what is reserved for pressure loss during water processing and that needed to fill the CT Tank up to the high-level set-point. In place of the current PRVs, it would be appropriate to deploy electrically actuated flow control valves. This type will provide granularity in control tank level via responsiveness without the need to reserve pressure to operate.

The future scenario is characterized by total flows that might be as high as 7000 gpm as noted in the RFQ and detailed in the 12/31/2018 version of the Turbine Model. The three main differences between the current and future scenarios are:

1. the allowance (once permits are attained) to utilize excess water solely for generation and expelled through the raw water line,
2. the size and possibly type of turbines used for generation
3. the additional control valve loop(s) to allow effective splitting of the flow without affecting process requirements.

We do not anticipate major issues managing the bifurcation of different amounts of flow into the raw water and process streams simultaneously. Updating net generation profiles based on turbine selection, possible equipment layouts and cost estimates would be part of the Phase II efforts.

Rentricity's energy recovery design goals always emphasize protection of all mechanical & electrical infrastructure and transparency to normal operations.

c) How would you accommodate an emergency such as a fast input requiring diversion and auto flush of 5,000 gpm to discharge due to a turbidity spike or a CT Tank overflow alarm?

Requirement to accommodate an emergency such as a fast input requiring diversion and auto flush (due to turbidity spike, etc.)

In the current flow scenario, downstream pressure will initially drop and the turbines will respond by passing more flow. If the flush demand still exceeds the output of the turbines, the PRV will open and downstream pressure will stabilize to the original set-point. For the future scenario, we would assume that total flow ~ 7000 gpm could be maintained by closing the inlet control valves to the process loop and further opening the inlet control valve to the raw water line. In either case, we would want to assure the opening time for the raw water discharge control valve and closing time of the valves (to isolate the process loop) is gradual enough to minimize any resulting pressure transient. Confirmation of this will be done during Phases II/III.

CT tank overflow alarm

The control strategy for operation of the turbines includes high level limits (different for each turbine). As the level exceeds the pre-set high level limits for each unit (one higher than the other but both values lower than the overflow) a signal in the main control panel will generate a trip of the respective turbine. Auto startup would commence when the condition clears (i.e. CT Tank level reaches a defined low level for each turbine).

d) Discuss the technical possibilities of replacing an existing PRV with a flow control valve or modifying a PRV for "net zero" head loss to control CT Tank Level, or? What are the related permitting challenges?

As outlined in our response to question b above, our initial recommendation is to repurpose the PRVs as part of the turbine hydraulic loop. The 16" PRVs are quite large relative to the minimum flow demands of the WTF (500 gpm). Utilizing the PRVs on the inlet supply line in conjunction with the turbine(s) and deploying electrically actuated flow control valves solves both the pressure reserve/tank level control problem and sets up the WTF to effectively and safely generate the maximum amount of power. This arrangement is similar to the vast majority of facilities we have assessed and supported system upgrades on.

An unofficial opinion from a representative at the ADEC suggests equipment changes of the type being discussed above should not cause any permitting issues. A temporary work permit would likely be required during construction. Finally, this representative's opinion was that any equipment changes should be certified to the NSF-61/372 standards (not simply compliant). This opinion is for current flow demand conditions.

III. Open Discussion:

For almost two decades Unalaska has examined and characterized in detail all of the major pre-requisites for the design and implementation of energy recovery at the Pyramid WTF. With the certainty of defined hydraulic, mechanical, structural and electrical boundary conditions, Rentricity is in an excellent position to design and implement the best solution for current and possibly future plant scenarios.

Rentricity has the breadth of experience in designing and supplying multi-turbine systems in configurations in water treatment facilities or the front end of large storage tanks (3-5 million gallons). Two of these project sites are commercial (part of our reference list in our response to the RFQ) and two others in California and Pennsylvania are fully designed. All of the equipment has been procured by Rentricity for the California project and it is expected to be commercial late this year.

Regardless of the number of conditions or scenarios, our top line functional criteria remain the same; i.e. those characterized in the second paragraph of the Work Plan/Narrative of our response to the RFQ. Most importantly, any added electromechanical system(s) will mimic either current or improved water operations in a protective and transparent manner.

The systems we design (and typically supply at our customers' requests) consider all electrical, controls, SCADA interface, mechanical, overpressure and structural aspects. The controls and valves are integral parts of these systems that are necessary to achieve the functional and detailed design and operational objectives. By way of example, a turbine installed in a loop and tripped for whatever cause will normally over-speed and eventually come to rest after a long and potentially damaging coast down. Rentricity minimizes this problem in the controlled shutdown procedure by the partial closing of the inlet control valve before disengaging the generator. Proper design of an integrated system inclusive of valves, an integrated control package and programmed precise operational sequences will avoid any severe hydraulic or mechanical system transients and allow the facility to continue providing quality water in an uninterrupted fashion.

Rentricity is a design and systems integrator. It is technologically agnostic; seeking to define and implement the best technology solution for a specific range of site conditions and constraints.

Rentricity's response to the interview questions reflect our expectations based on current understanding but further due diligence during the early portion of Phase II may affect some elements of the design.

a) Questions for the City?

Schedule – the narrative section of Rentricity's response included a schedule for Phase II. Does Unalaska have any questions/issues regarding the activities/durations? We would expect a similar duration for Phase III. Is this in line with Unalaska's expectations?

Project Status/Reviews – usually Rentricity conducts weekly progress conference calls during the early phase of a project and depending on extent of issues/resolution might back off to progress calls every other week. Is this acceptable to Unalaska?

Reviews of design at the 10%, 15%, 35%, 65% and 95% level – Usually projects are executed with deliverables at the 35/65/95 % complete level. Rentricity will work with the additional milestones called out in Phases II & III.

Are there any questions regarding Rentricity project team, utilization of resources, interface with Unalaska, etc.?

Does Unalaska require equipment that is independently certified by WQA to NSF to NSF-61/372 or is NSF 61/372 compliance sufficient?

What turbine technologies is Unalaska familiar with?

IV. Schedule:

a) The City will re-score the SOQs by March 1st, 2019 and send the results to respondents the following week.

b) Develop the scope of work for and negotiate fees for City Council award in early April 2019.

rentricity

Rentricity Inc.
Statement of Qualifications for City of Unalaska, Pyramid Water Treatment Plant Inline Micro Turbine Design

Background

Rentricity Inc. (www.rentricity.com) is familiar with the project details and has been in discussions with Unalaska regarding micro turbines since 2009. Rentricity's involvement included a visit to the Pyramid WTP site to better understand site specific challenges. Rentricity was contacted in early 2018 by Clint Huling, provided a Company update and is pleased to respond to the RFQ distribution of November 2018.

Rentricity has carefully analyzed the hydraulic information provided in the RFQ. Based on that data, our unique qualifications, and our familiarity with local site conditions, the Company is highly confident that a system can be designed to economically and efficiently generate electricity over a relatively wide range of flow conditions. Rentricity's design will uniquely and consistently deliver clean renewable power to the City. A detailed assessment of annual power prediction yield will be determined during the Phase II preliminary steps.

Rentricity will be the primary contracting entity for this project and will work in a sub-contracting agreement partnership with Taku,Engineering, LLC (www.takuengineering.com) an Alaska licensed professional engineering firm based in Anchorage. Taku and Rentricity's contractual arrangement will be consistent with the roles and responsibilities outlined in the professional qualifications section below. Given Rentricity's and Taku's combined experience, this proposal provides a logical, incremental and cost effective approach to design engineering, supply, installation support, and startup of an inline micro turbine system.

Professional Qualifications

Rentricity is a privately-owned renewable energy company focused entirely on recovering energy in solid piped water infrastructure from dams through distribution networks and irrigation/industrial systems to wastewater. Our capabilities include complete system/component design, permitting, supply and installation/startup of these energy systems. Our customer base includes investor owned water utilities, large and small cities, irrigation and privately held water systems. Our 12-commercial inline energy recovery projects have been constructed and successfully deployed in the US and Canada (the first was commissioned in 2010). We are actively involved with another 8 similar projects in various stages of permitting, design, and installation. This body of work provides a wealth of experience that is directly applicable to the Pyramid WTP Project.

Rentricity maintains an office in New York City but its biggest assets are its resources that are deployed in Northeastern US as well as independent consultants and partners around the country. These resources are part of or aligned with Rentricity and provide deep knowledge, experience and continuity in applications for energy recovery. We are able to professionally seal our design work in the majority of the US and Canada. We hold IP around our electrical/control system designs and the NSF 61/372 (safe water/low lead) certification of Cornell Pump Company turbines.

Taku Engineering is an Alaskan based and owned multi-discipline small business. Taku has been providing professionally licensed Electrical, Mechanical, Civil/Structural, Process/Chemical, and Materials Engineering design and consulting services in Alaska since 2001. They are a nimble and highly skilled group that is able to efficiently focus on developing engineering solutions for its clients.

Taku's personnel are experienced in all phases of project design and construction including site inspections, conceptual engineering assessments, risk analysis, detailed design, construction oversight, procurement oversight, equipment inspection, functional checkout, system commissioning, system acceptance, project as-builts, and documentation closeout.

The following attributes and competencies of the Rentricity/Taku Team provide Unalaska with the ability to achieve the highest value and lowest risk in bringing the Pyramid WTP inline micro turbine system into commercial operation:

a. Experience in use of a variety of in-line turbines from different suppliers;
b. Large commercial base of operational systems and ongoing project development;
c. Ability to optimally back-fit systems into difficult existing footprints (restricted spaces) w/o need for additional civil construction;
d. Experience in the design and analysis to minimize impact of any transients and supply of overpressure relief as necessary to assure mechanical integrity is not compromised;
e. Utilization of the same project and engineering resources involved in our commercial and ongoing work;
f. Use and adaptation of field-proven mechanical and electrical/control designs; and
g. Use of in-state resources for identification of any unique state requirements, review and final approval/sealing of drawings and documents and ability to provide local installation oversight.

All design work including systems and components drawings, calculations, specifications, and other documentation, as appropriate, will be in-part performed by and in all cases reviewed and approved by a Professional Engineer certified in Alaska. All final designs will be managed from the Taku Engineering offices located in Anchorage, Alaska. Taku's offices are fully staffed with licensed engineers who have a full suite of design software tools. This office will finalize and seal all documentation that will become part of the design record for the project. Taku's resources will also provide an onsite presence for any special meetings & reviews for the project that complement video/web conferencing from Rentricity offices which also includes mechanical, structural and electrical resources with a full suite of software aids including CAD.

Rentricity's project team members, responsibilities and organizational structure is shown in the figure below. These members have been chosen because of their competencies and experience in similar projects. Detailed information regarding their backgrounds and responsibilities for this project are found in biographies below and attached resumes.

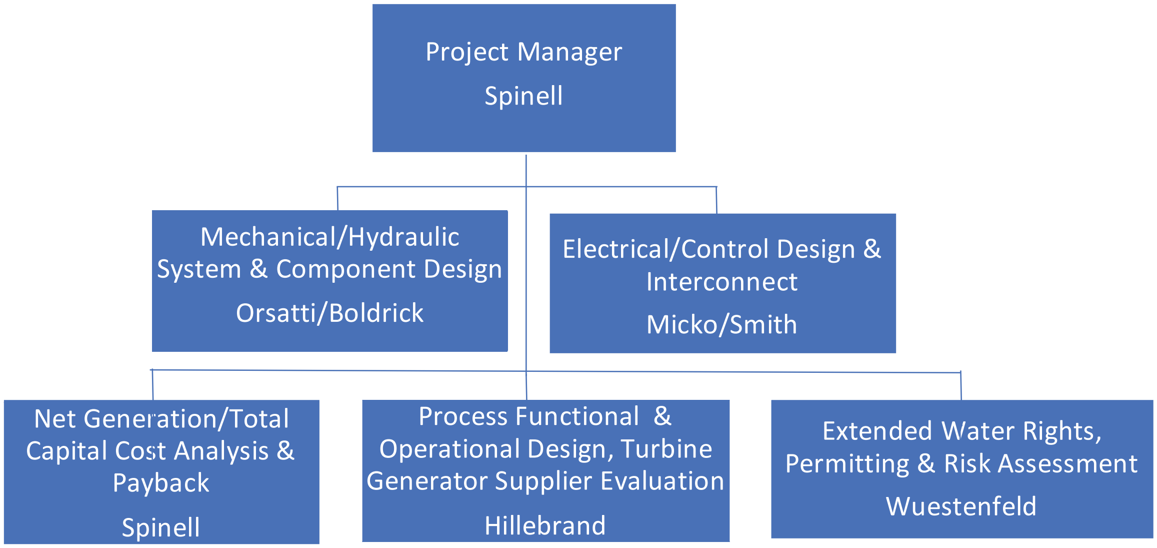
Select Biographies

Mr. Spinell has over 35-years of experience with three world recognized companies in the power and energy sectors; Combustion Engineering, Asea Brown Boveri (ABB), and Westinghouse. Mr. Spinell was an integral part of management teams responsible for design, procurement, and installation of power stations as large as 1100 MW in the US, Asia and Europe. Mr. Spinell joined Rentricity in 2004 as Co-Founder and holds the position of COO/CTO. He has been responsible for all of Rentricity's commercial projects and all of the current projects underway are under his management. Prior to his professional career, he received a B.S. in Engineering from U Mass at Lowell, and M.S. degrees in Engineering and Industrial Management from Purdue University.

Jeremie Smith, PE, PMP is the Principal Electrical Engineer at Taku Engineering, LLC. Mr. Smith will provide electrical engineering services including the review of designs relative to State and local requirements. He has a Bachelor and Master of Science in Electrical Engineering as well as a Master of Science in Engineering Management and is licensed by the State of Alaska to practice Electrical Engineering (AEL E 11789). Mr. Smith has over 14 years of experience including the NSB Microturbine Project (Ongoing, 100% Design Completion in January 2018) and ConocoPhillips Alaska, Inc. (CPAI)– Alpine Power Expansion (30MW)

Mr. Zach Boldrick, PE is the Senior Mechanical Engineer at Taku. Mr. Boldrick will provide mechanical engineering services including review of designs relative to State and local requirements. Mr. Boldrick has a Bachelor of Science in Mechanical Engineering and is a licensed Mechanical Engineer in the State of Alaska. Zach has a diverse mechanical engineering background that has spanned multiple states and included the mechanical design for projects from large scale energy (e.g. Walakpa-Microturbine project), and industrial facilities to marine header pipelines. Zach routinely designed HVAC, plumbing, water/wastewater and light commercial buildings in developed and rural Alaska.

Mark Wuestenfeld will provide permitting support for this effort. Matt is familiar with the regulators in Alaska and understands the logistical challenges of designing and executing projects in remote locations. Mr. Wuestenfeld has been a Project Engineer with Taku Engineering, LLC since 2012. Matt has extensive experience with the Alaska regulatory bodies through his support of the Barrow Gas Field, Nuiqsut Transmission Line and the Department of Public Works.



Team Menber Rate Schedule	
Name	**Rate/hr**
Hillebrand	200
Micko	215
Orsatti	225
Smith	208
Boldrick	178
Wuestenfeld	178
Spinell	250

Experiences and References

1. City of Keene, NH – Commissioned April 2011

One of Rentricity's first commercial installations installed April 2011- dual turbine 62 kW energy recovery system for the City of Keene, NH. The project is located in parallel to an existing PRV within the City's main Water Treatment Facility. Rentricity provided a full suite of engineering services including all design (drawing attached) procurement, installation and startup oversight on behalf of the City. The City of Keene WTP is now completely energy neutral at the WTP. The power is net-metered to Public Service of New Hampshire's grid. This project was nominated as a "technology project of the year" for the 2012 American Water Summit and has been highlighted as a best practice by industry observers.

The system is controlled entirely from the operator's console in the control room. All operational and performance information is integrated into the existing SCADA network. There are two Cornell turbines (4TR3 and 5TR3), each close coupled to a Marathon electric induction generator. The combined system generates between 20 and 60 kw depending on WTP flow rate. The units operate seamlessly and in parallel to the existing PRV.

Reference contact: Donna Hanscom, Asst. Director of Water Resources
dhanscom@ci.keene.nh.us 603-352-6550

2. Richmond Irrigation Company, Richmond, UT – Commissioned June 2017

The Richmond Irrigation Company (Utah) commissioned Rentricity to effect energy recovery as part of a capital improvement project to eliminate evaporation in their drought stricken area while also providing a flood control capability brought on by extreme downpours. Rentricity designed and installed turbine generator assemblies at two sites, inclusive of piping, fittings, control valves, and electrical control panels. The first site consists of two turbine generator assemblies in parallel to a pressure reducing valve and a surge release valve. This site aims to maintain the discharge head or pressure. The maximum differential head is about 177 feet, and the two turbines can each produce up to 120 kW of power with flows of about 8 CFS. The second site consists of a single turbine generator assembly parallel to a combination flow control/ surge relief valve. This system aims to maintain flow at a set rate. The differential head is about 260 feet, and the turbine can produce about 120 kw of power with a flow of about 6 CFS. Power from both sites is exported (net metered) to the electrical utility (Rocky Mountain Power) grid.

Reference contact: On behalf of RIC - Eric Franson, Managing Partner, Franson Civil Engineers American Fork, UT 801-592-3224 (c); 801-756-0309 (o) efranson@fransoncivil.com

3. North Slope Borough (NSB) Micro-turbine Project, Design Completion February 2018

The North Slope Borough's (NSB) remote Walakpa Gas Field (Walakpa) is currently powered by three 125kW Waukesha generators that have reached end of life and need to be replaced. Walakpa is a remote natural gas consolidation site located approximately 25 miles southwest of Barrow (Utqiaġvik), AK. The NSB has decided to replace the three generators with three Capstone Turbines C65 65kW Microturbine

Generators. Through a competitive bid, Taku Engineering, LLC (Taku) was selected to complete the engineering design package for the NSB Barrow Gas Field Microturbine Project. The design is complete and the implementation contractor has been selected for this project. Implementation will commence around January, 2019. Taku Engineering will provide construction administration support for the NSB on this project.

Reference/Contact: Melissa Bynum NSB-CIPM 1274 Ogvik St. Barrow, AK 99723 Phone: 907-852-0489, melissa.bynum@north-slope.org

Work Plan/Project Narrative

Rentricity's typical project approach is consistent with the framework and work scope defined by Unalaska in the RFQ. A top-level schedule below provides required breakpoints for review and approval of submittals as supplemented by periodic project update video/web conference calls.

In order to achieve an installation that is technologically and economically viable, Rentricity will follow the top-level priorities listed below. This listing forms the core of our Functional Design Specification.

a. Maximize the potential for power generation;
b. Achieve a high level of system/component reliability Be totally transparent & protective to water supply operations (i.e. cause no physical impact on the site facilities or affect reliability of water supply operations;
c. Supplying equipment including the turbine generators that has a reliable track record to maximize long term energy production;
d. Highest standards for the design and supply of electrical equipment consistent with the NEC, utility interconnect standards, and UL-508A (design and fabrication);
e. Assure continuous water supply in the event that one or more of the turbine generators is shut down for maintenance or as a result of transients such as grid perturbations; and
f. Optimize footprint of system to eliminate the need for civil construction (installation only).

Rentricity has reviewed the RFQ requirements in Section 2 and the references in Section 6. Of particular focus in the reference list were the following documents; Inline Turbine for Energy Recovery at the WTP (HDR, 2009), Water System Master Plan (HDR, 2918), and Pyramid WTP Record Drawings (Larsen, 2016). This documentation, supplemented by the findings from on-site visit and kick-off meeting by the design team, will allow the design process to proceed with a minimum number of uncertainties.

The top-level schedule reflects a reasonable and prudent amount of time to support the evolution of the (Phase II) Pre-Design Scoping Study as detailed in Section 2.0, with accommodation for review and comment by all stakeholders. The critical path in Phase II is evaluating all turbine generator options and selecting the unit(s) that can achieve the highest total annual projected output while minimizing its WTP footprint and system cost. Rentricity has worked with suppliers whose equipment should be actively considered.

Rentricity believes that there are at least three viable types of turbine generator assemblies from US-based suppliers that should be assessed for this project. Our knowledge of the equipment and relationships with the suppliers will allow for rapid technical, cost and mechanical evaluation against both historical water usage and targeted additional water usage. Phase II includes an assessment of the additional permits needed to utilize water rights beyond those for supply of Unalaska's drinking water demands. This assessment will review the requirements, time-line and risks of each type listed in Section 2.1 on Page 2.9 of the RFQ. We believe that the selection of the turbine generator supplier will not be greatly impacted by additional water rights usage assessments or timing. The estimated investment paybacks will be generated based on the various system capacities.

In all cases, the turbine generator(s) coupled with appropriate isolation, control, and relief valves, will be configured to be hydraulically connected in parallel with the existing PRVs. Confirmation will be made of proper setup and response time of the PRVs to preserve required backpressure in order to maintain storage tank level and dynamic response to system demands/transients.

The system design will accommodate all planned and unforeseen transients originating from all sources, which is critical to maintaining mechanical integrity. Our approach includes a full hydraulic analysis including design pressure ratings on existing equipment. The system design will offset the impact of these transients through the use of integrated control and valve response. An additional measure of safety will be achieved by including overpressure relief to assures protection against multiple independent single failures. Most of Rentricity's systems have this added level of safety.

The overall Phase II timeframe below would accommodate timely progression to Phase III (Design) and Phase IV (Construction Services) to allow for installation and commissioning by June 2020. Our experience indicates this is a prudent and conservative schedule that accommodates contingency and risk allowance during Phases II and III. However, there are options that could potentially shorten the overall schedule and may allow for install/startup in as early as December 2019. These options can be discussed further during the kickoff meetings.

Rentricity has a broad database of system, equipment, installation cost and schedule envelopes it uses to develop or update capital costs. We will adjust this database to accommodate work in Unalaska to customize the economics for each option. Site specifics will include alternatives as required so as not to interfere with water supply, siting of cabinets, routing of conduit, etc.

Timeline: Phase II – Pre-design Scoping - 4 months (16 weeks)

2.5 weeks:

- Review Phase I (Feasibility Study) materials and historical materials and documentation
- Draft Functional Specification Document
- Site visit and kickoff meeting (two people, two days inclusive of video conference)
- Edit project schedule, deliverables, and communication plan; e.g. type/frequency of update sessions and action Items

3.5 weeks:

- Conceptual design, equipment & vendor recommendations with sizing of turbine(s)
- Projection of annual power production based on historical data and selected current turbine options/performance curves
- Draft Operational and Sequence of Events Document
- Initial review & assessment of requirements for permitting of water rights for generation

3 weeks:

- Recommendations for equipment siting within WTP, inclusive of control panel and intertie to the WTP switchgear and power grid
- Preliminary mechanical and electrical design, inclusive of construction cost estimates
- Recommendations for future (optional) expansion to accommodate untreated water flow
- Draft turbine generator specification

2 weeks:

- 10% level project review by City, followed by video/web conference call

2 weeks:

- Preparation and submittal of summary report, inclusive of 15% design plans
- Review of requisite permits and recommendations, with conference calls as needed
- Update Functional Specification document & Operational/Sequence Events document.

3 weeks:

- 15% level project review by City, followed by video/web conference call
- Revisions to 15% level project review documentation and recommendations for Phase III (all materials to be submitted as PDF files and four bound hardcopies

Bob Orsatti, P.E.

Senior Process Mechanical Engineer

Mr. Orsatti has more than 39 years of experience in the planning, design, and construction of water and wastewater infrastructure for the federal government, municipalities, and private industry. His expertise also includes facilities evaluations, condition assessments, energy assessments, and value engineering. During his career as a registered professional engineer, Bob has served as the Engineer of Record on more than $500M in water & wastewater facilities improvements.

His water and wastewater technical capabilities span an extensive array of projects including many miles of gravity and pressure pipelines; and numerous water and wastewater pumping stations. He has also designed many water and wastewater treatment facilities from small, 20,000-gpd sites to large regional municipal plants in excess of 50-mgd. His construction phase experience includes full construction administration, equipment startup, operator training, and facilities commissioning. Bob maintains responsible charge of all water/wastewater engineering in Colorado for Lamp Rynearson, Inc. including technical reports, cost estimating, construction drawings, project manuals and specifications.

A significant component of Bob's experience has come from designing and building water and wastewater facilities in cold, alpine conditions, with short construction seasons and minimal logistical support. His passion is bringing together diverse stakeholders and creating solutions to challenging technical conditions by applying state of the practice technology, innovation and energy efficiency. He understands that active stakeholder collaboration is the foundation to any successful infrastructure project. Listed below are several examples of award-winning water and wastewater infrastructure projects completed by Mr. Orsatti.

Education

BS Environmental Engineering – Rensselaer Polytechnic Institute

Licensing

- Registered Professional Engineer in Colorado, Georgia, Idaho, New Mexico, Arizona

Professional Affiliations

- American Water Works Association
- Water Environmental Federation
- American Public Works Association

Project Experience

Manitou Springs WTP Hydropower Project

City of Manitou Springs, Colorado

Rentricity's Lead Mechanical Engineer for the planning & design of a 175 KW hydroelectric power generation facility. Work included project conceptualization, alternatives analysis and design of pump as turbine power generation facility within an existing water treatment plant. With the City constructing a new raw water pipeline to the WTP, Bob represented Rentricity's local technical representation in the development of design alternatives for the facilities construction. An innovative approach employed the construction of a raised platform within the WTP to make use of unused space and provide above ground, all weather access for operation and maintenance without the requirement to construct additional building improvements. Project elements included new Cornell Pump as Turbine (PAT) with associated electrical power and control equipment, automated pressure reducing valve and automated raw water screening equipment

Nederland Advanced Wastewater Treatment Plant

Town of Nederland, Colorado

Project Manager and Principal in Charge of the design and construction for a new 0.5 MGD advanced WWTP that discharges into Barker Reservoir, a drinking water supply for the City of Boulder. Innovative design and delivery approach acquired "Green Funding" at 0% interest from Colorado SRF. Project included new headworks facility followed by an advanced sequencing batch reactor process tuned for maximum nutrient removal and energy recovery. Final advanced treatment employed continuous backwashing filers for suspended solids and metals removal. Disinfection prior to discharge utilizes on-site Hypochlorite generation. Project was awarded the ACEC Excellence Award, its highest honor for outstanding Colorado project of the year. Value added design elements included conversion of the reclaimed site to an outdoor lakeside entertainment venue for the Town and geothermal preheating of headworks ventilation.

Avon Water Treatment Plant Expansion

Upper Eagle Region Water Authority, Vail, Colorado

Project Manager for planning, design, and construction of surface water treatment plant expansion to 10 MGD. Project included 10 MGD raw water pump station, surface water intake structure, and 1.8 miles of 36" raw water pipeline improvements. Treatment improvements included new ozone contact basins, influent flow control, four new chemical storage and feed systems, flocculation tanks, sedimentation basins, multimedia rapid sand filters, and a backwash reclaim system. Building improvements entailed a new SCADA control system, laboratory, and administrative area. Duties included project and client management, coordination of all sub-consultants, civil and hydraulics engineering design. Construction cost was $8.2 million.

Canyon Village AWT Plant

Yellowstone Nation Park, Wyoming

As Project Manager, Mr. Orsatti led the design of a 0.5-mgd facility to replace a 20-year old package plant. The new facility used a conventional three-stage aerated lagoon system followed by chemical addition, flocculation, and sedimentation. Multimedia filters provided final advanced treatment; followed by disinfection prior to discharge into the Grand Canyon of the Yellowstone River immediately below Tower Falls. Treatment process achieved Title 22 water quality standards for non-potable reuse. Programmable logic control was tied into a microcomputer-based SCADA system to provide remote plant monitoring automatic plant control. All infrastructure was designed on the site to be visually screened from public view and hidden in the natural landscape on the canyon rim. Design and construction required heavy consideration of long-term cold weather operation & maintenance.

Raw Water Pump Station Improvements

Pueblo West Metropolitan District, Pueblo West, CO

Project and Client Manager for the planning, design and construction of pump station expansion to 35MGD. Project elements included providing a hydraulic and piping design capacity of 35 MGD at 350 psi maximum design pressure, and preparing construction documents for a pumping capacity to 30 MGD. The planning and design efforts included fail-safe surge abatement, high pressure piping and equipment design, and construction sequencing to maintain full pumping capacity during construction. Also provided was the existing building rehabilitation design, including all new HVAC, lighting, emergency power generation, SCADA communication with the treatment plant and pipeline freeze protection. Approximate construction cost was $11.9 million.

Raw Water River Intake, Pump Station & Pipeline

Town of Kremmling, CO

Project Manager for the planning, design and construction of a new raw water supply delivery system. Specific project elements included a 4.0 MGD buried intake gallery in the Colorado River, raw water pump station and approximately 14,000-feet of 16" transmission pipeline to the existing treatment plant. Scope of work included site planning of all infrastructure components, intake gallery, pump station & pipeline design, architectural, civil and electrical power engineering design, including instrumentation and control, pump selection, construction document preparation, permitting, bidding and construction phase services. Approximate construction cost was $3.1 million

Education

B.S. Electrical Engineering Technology

University of Pittsburgh at Johnstown

Professional Registration:
Pennsylvania, Idaho, Maryland, Utah, Vermont, West Virginia, Colorado, and Ohio

Vice President of Electrical Engineering at Steel Nation Engineering, Inc. and serves as a Project Engineer for various projects.

Professional Experience

- Practiced electrical engineering for 26 years at which time he had been responsible for engineering, design and commissioning of power distribution, lighting, process controls, system integration and emergency power systems.
- Over 7 years spent in the construction field performing hands-on electrical testing and commissioning.
- Other duties include: conceptual design, analysis, specifications, shop drawing approval, bid evaluation and final project checkout.

Marty J. Micko, PE

Senior Electrical Engineer

Steel Nation Inc.

2016 - present

Project Experience

- **Rentricity Projects**
  Served as lead electrical engineer on 10 commerical projects (beginning in 2009). Also eight ongoing projects under development and installation including 2 two turbine designs in CA and PA, Services have included preliminary and final design of all site systems and equipment, technical equipment specifications, and technical content of interconnect applications with electric utilities. Also an integral part of the startup team that was on site to successfully commission each unit.

  Mr. Micko's experience has led to a number of incremental design and performance improvements that have allowed Rentricity's designs to extend the performance of pumps as turbines over a wider range of hydraulics; thereby increasing overall net annual generation and improved payback.

- **Municipal Authority of the City of McKeesport**
  Double-ended 4,000A electrical service with complete 480 VAC plant distribution system

- **Kiski Valley Water Pollution Control Authority**
  Electrical distribution system, 350 hp VFD-driven raw sewage pumps and three 600 kW emergency standby diesel generators

- **Rostraver Township Sewage Authority**
  Wastewater treatment plant protective device coordination study

- **Authority of the Borough of Charleroi**
  17 cellular based remote terminal control units

- **Erie Water Works**
  Arc flash hazard analysis study for nine facilities

- **City of Cumberland Maryland**
  24 radio-based monitoring and control units

- **Borough of Rouseville**

Education

B.E. Engineering
Stony Brook University

M.S. Engineering Geoscience:
University of California, Berkeley

Perform preliminary assessments of potential for power generation and revenue to be realized by installation of Rentricity "Flow to Wire" technology at client sites.
· Prepare proposals for Feasibility studies and needs assessments, proposal and contract preparation, contract negotiations
· Project manager for all stages of project development and execution, from preliminary and detailed design phases through procurement and installation and site acceptance testing. Responsibilities include project planning, identification of objectives and operational constrictions, coordination of tasks, information gathering, and design functions between all parties (client, mechanical/civil contractor, electrical engineering contractor)
Managing client relations at all stages

Cary Hillebrand

Regional Director and Project Manager
Rentricity, Inc.
2008 – Present

Project Experience

As project manager for Rentricity, Cary has responsibility for coordinating all phases of project development from functional through detailed design, equipment selection and procurement, installation, system startup and training as well as post installation support.

Mr. Hillebrand has worked closely with several turbine generator equipment suppliers for over a decade; particularly Cornell Pump Company, focusing on all aspects of mechanical design, ease of application, and overall performance. This experience has afforded Rentricity to seamlessly integrate robust, high quality turbine generator designs into optimized solutions.

Representative Rentricity Projects

Manitou Springs, CO

Preliminary assessment and design of a complete in-pipe system at the front end of the City's main WTP. Preliminary design completed 1/18. Completion and implementation of design expected 12/19.

Richmond Irrigation Company, Utah

Two site, three turbine generator systems, up to 360 KW power production, export to grid

Halifax Water, Nova Scotia, Canada

Installation of 32 KW turbine generator within flow control chamber, Generated power exported to grid. Energy recovery control system integrated with Halifax Water's SCADA system.

City of Keene, New Hampshire

Installation of two turbine generators (22 KW and 40 KW) in parallel to raw water input PRV at intake to water treatment facility. Capacity to regulate water input flow into WTF filter trains by operation of either turbine or both in parallel. Power used behind the meter.

Previous Professional Experience

Regional Manager, North America

Peak-Dynamics Ltd.

Product development, business development, and project support for energy management and optimization system serving the water utility sector in the US and Canada. For water utilities, energy costs are typically the largest operational expense. Peak-Dynamic addresses this growing financial strain through development of a dedicated energy management system, PeakWater, for real time optimization of pump scheduling within municipal and regional potable water treatment and distribution systems, PeakWater integrates with the utility's process monitoring and control system to optimize pump scheduling, minimizing electrical power costs while maintaining production requirements and assuring operational constraints.

Regional Manager (North America)

Derceto Inc.

North American representative for Derceto, a New Zealand based consultancy. Derceto had developed a real time energy management system.

Managed preparation and delivery of feasibility studies for clients in the United States, Canada, and England. Scope of the feasibility studies generally included reviewing the clients existing infrastructure, operational requirements and limitations, and energy costs, and estimating the projected cost savings as well as identifying operational benefits to be gained through operation of Derceto, as well as the projected scope and cost of implementation.

Participated in project teams to prepare detailed analysis and design studies for clients as well as managing client relations at all stages.

Representative Rentricity Projects (Cont).

Municipal Authority of Westmoreland County, Pennsylvania

Installation of single 32 KW turbine generator to recover energy at gravity fed raw water mandated discharge point. Power produced used behind the meter at adjoining water treatment plant. Control panel accommodates future integration to MAWC SCADA.

Pennsylvania American Water Company, Butler, Pennsylvania

Installation of single 32 KW turbine generator in parallel to flow control valve on gravity feed raw water input line to water treatment plant. Power produced used behind the meter at the plant. Control panel accommodes monitoring and control integration with WTP SCADA system.

rentricity

KEENE WTP PROCESS PIPING ISOMETRIC VIEW DESCRIPTION

Rentricity installed an in-pipe hydropower system in parallel to the existing PRV inside the City of Keene, NH. Water Treatment Plant (WTP). The system went into commercial operation in 2011. Because of the significant range in diurnal flows, the in-pipe hydropower system consists of two turbine generators with different capacities in order to maintain continuous operation during all flow and pressure differential ranges. The in-pipe hydropower system also consists of control and surge relief valves, associated electrical controls and water process controls.

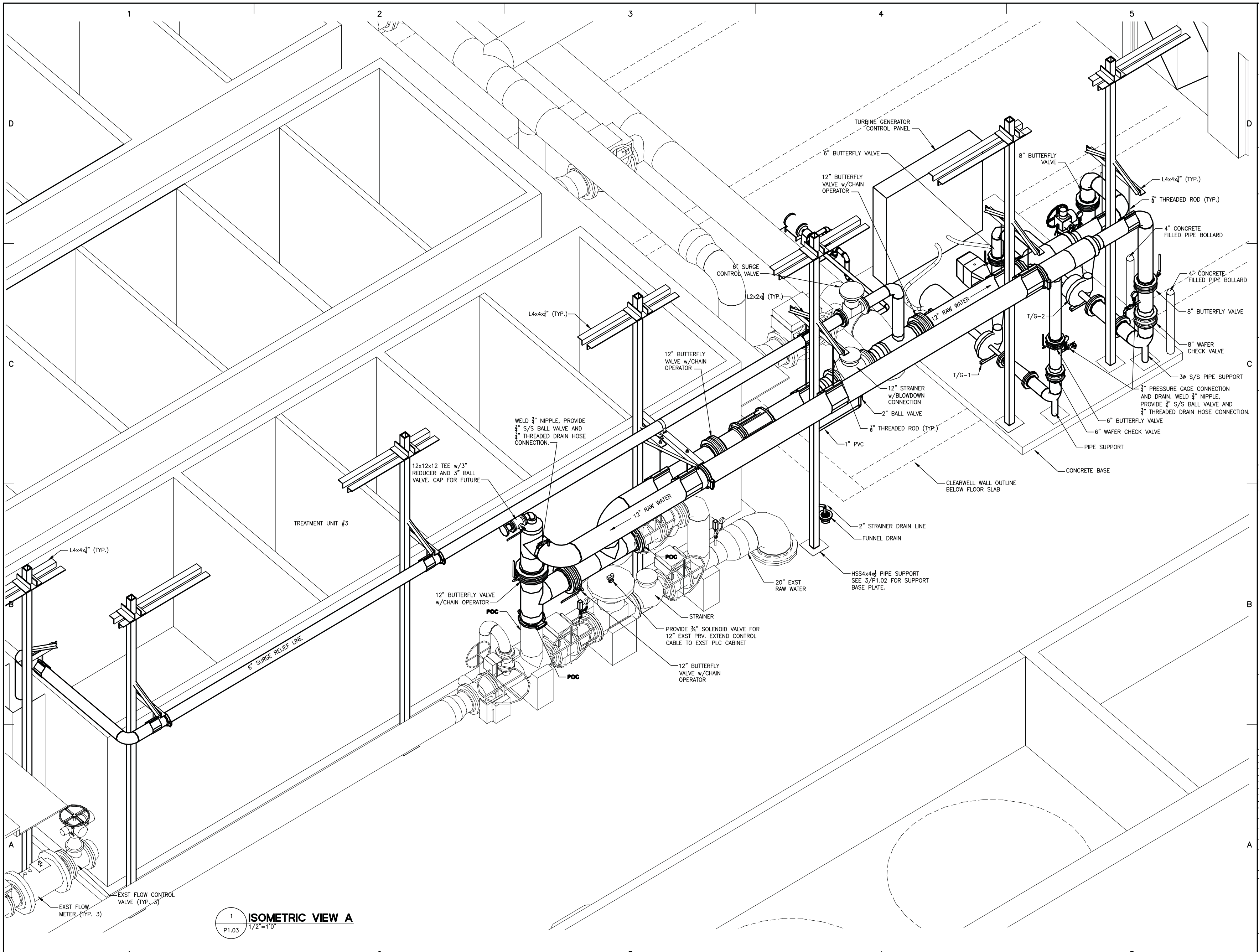
Rentricity's design maximizes flexibility in operations while maintaining complete transparency to the City's primary mission – providing safe, reliable drinking water. The operating ranges of the system includes:

- Turbine Generator 1 at 190-196 feet differential-head around 700 GPM generating 17-18 kW power;
- Turbine Generator 2 at 190-196 feet differential-head around 1400 GPM, generating 36 - 38 kW power;
- Turbine Generators 1 and 2 operating in parallel at 176-189 feet differential head and around 2100 GPM, generating 50 to 55 kW power;
- Either one or both of the turbines operating in combination with the PRV; or both turbines non-operational with pressure reduction through the PRV.
- Full automation through SCADA, switching between scenarios seamlessly as flow rates change. All electrical, hydraulic data, and turbine generator status are also monitored providing Keene with the real-time operation information.

The layout of the system as back-fit in the WTP is shown in the attached three-dimensional sealed layout/isometric drawing. Keene required a clear access way for utility forklifts to operate adjacent to existing flow control & PRV valves. Accordingly, the turbine generators and electrical/control panels were located in another nearby location.

Start-up of either one or both turbine generators can be initiated either by operator selection through SCADA or local control panel. Shutdown can be initiated by operator keyboard control (through SCADA), local control panel, or automated by protective devices during various upset conditions such as loss of utility power, voltage surges, etc., or switching between turbine generator and PRV combination listed above according to flow rate. A surge release valve operates in accordance with local conditions to prevent overpressure or water hammer effects in the event of a rapid unplanned turbine shut down. Surge release discharges into a waste drop box that in turn drains into the recycled water storage tanks.

A switchgear cabinet was installed inside the electrical room for interconnect to the water treatment facility's electrical distribution system in accordance with the Public Service Company of New Hampshire (PSNH) cogeneration interconnection and net metering requirements.



ISOMETRIC VIEW A

1/2"=1'0"

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MJ Project No. : 17395.00

IT IS A VIOLATION OF THE LAW FOR ANY PERSON, UNLESS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER, ARCHITECT, OR LAND SURVEYOR, TO ALTER AN ITEM IN ANY WAY. IF AN ITEM BEARING THE STAMP OF A LICENCED PROFESSIONAL IS ALTERED, THE ALTERING ENGINEER, ARCHITECT, LANDSCAPE ARCHITECT, OR LAND SURVEYOR SHALL STAMP THE DOCUMENT AND INCLUDE THE NOTATION "ALTERED BY" FOLLOWED BY THEIR SIGNATURE, THE DATE OF SUCH ALTERATION, AND A SPECIFIC DESCRIPTION OF THE ALTERATION

PROJECT
CITY OF KEENE
WATER TREATMENT FACILITY
ENERGY RECOVERY PROJECT
555 Roxbury Street
Keene, NH

OWNER
CITY OF KEENE
3 Washington Street
Keene, NH 03431
TEL (603) 352-0133
http://www.ci.keene.nh.us

STATE OF NEW HAMPSHIRE
American Recovery and Reinvestment Act

ABBREVIATION LIST	
POC	POINT OF CONNECTION
EXST	EXISTING
T/G	TURBINE GENERATOR
TYP.	TYPICAL
PRV	PRESSURE REDUCING VALVE
PIT	PRESSURE INDICATING TRANSMITTER

SEAL
DONALD P. HARRIS
No. 11636

MARK	DATE	DESCRIPTION
4	10/28/09	CONSTRUCTION DOCUMENTS
3	10/23/09	90% DESIGN SUBMISSION
2	09/25/09	50% DESIGN SUBMISSION
1	08/28/09	PRELIMINARY SUBMISSION

PROJECT NO: 17395.00
CAD DWG FILE: P1.03 PROCESS PIPING ISOMETRIC VIEW A.DWG
DRAWN BY: ####
CHK'D BY: ####
COPYRIGHT:

SHEET TITLE

PROCESS PIPING ISOMETRIC VIEW A

P1.03

SHEET – OF 3

N:\17395.00 Keene WTF_Models\Keene WTF\Sheets\Proces Piping\P1.03 PROCESS PIPING ISOMETRIC VIEW A.dwg, 10/27/2009 5:11:13 PM

Attachment 4B
HDR

HDR Interview Response and Statement of Qualifications

CITY OF UNALASKA
PYRAMID WATER TREATMENT PLANT INLINE MICROTURBINES DESIGN
PROSPECTIVE CONSULTANT INTERVIEWS
FEBRUARY 21ST, 2018

888-363-4734
1258939
2149

I. Introductions:

City of Unalaska:

Tom Cohenour	DPW Director
Dan Winters	DPU Director
JR Pearson	Deputy DPU Director
Jeremiah Kirchhofer	Water Utility Supervisor
Erik Hernandez	Water Utility Operator
Kevin Kloft	Water Utility Operator
Lori Gregory	DPW Admin
Robert Lund	City Engineer
Mark Morrow	Engineering Technician

Consultant: HDR

II. Questions:

a) Compare and contrast a similar project you have worked on from scoping and pre-design through construction and final completion. What is something would you do the same and something you do differently on this project?

HDR completed a 240 kW energy recovery project in 2018 for the City of Sheridan, WY on the raw water supply to the City's water treatment facility. The Sheridan project is a grid parallel design where the City sells power produced to the local utility. HDR was involved with the Sheridan project from conceptual design, FERC conduit permit support, interface with Wyoming DEQ, project support for the Power Purchase Agreement and Interconnection Agreement with the local utility, final project design, bid document preparation, bid support, grant funding support, construction support, SCADA integration with the water plant and startup/commissioning. The HDR team brings this recent, direct energy recovery experience to the Unalaska Pyramid project.

The total system flow on the Sheridan water project was comparable and the maximum new head on the Sheridan micro turbine was significantly higher than the Pyramid location (about 370 feet of net head at Sheridan versus about 180 ft for Pyramid).

HDR developed a system design that retained the full capability of the existing PRVs and added a new energy recovery turbine in parallel with the existing PRVs for system operation. For final design HDR located a turbine manufacturer who could supply a single Francis turbine that could replace two smaller pump derivative turbines. This saved space and optimized system performance. Similarly HDR will work to optimize the turbine selection and system operation for Pyramid project.

Relative to things to do differently, HDR would have pushed for earlier finalization of project objectives, scope and layout with all parties. Here are a few examples from Sheridan:

1) *Operations Review - Operations and operations staff were apparently not involved in reviewing the conceptual layout we had submitted a year before. Before starting detailed design we did a review of the conceptual layout with a walk-through of the facility with the City's engineering and O/M staff. We made several changes from the conceptual layout including a separate above ground electrical / controls enclosure rather than install this equipment in the vault. We also relocated of the turbine / generator since we had more space available.*
2) *Extra System Modifications - The City wanted to include replacement of current system isolation valves and other system maintenance modifications into the final scope. Again we accommodated but this came up midway in the process.*
3) *Electrical System - On the electrical side the local Wyoming utility, MDU, wanted system changes that came out during the PPA and interconnection discussions. MDU already had a supply meter for vault service. We expected to add a separate meter for power generation. MDU wanted to utilize a single meter with facility consumption and generation being net metered at one point with net generation power sold to MDU. Because of the voltage difference we had to add a service transformer and add additional vault electrical work into the project. MDU also wanted additional unit metering and SCADA feedback which we accommodated in partnership with the turbine / generator equipment supplier. Again we accommodated but this request but it came up midway in the process.*

b) Discuss the top 3 critical functions and related control/flow sequences you envision in the current versus and flow scenarios.

3 Critical Functions:

   1) *There is little buffer capacity in the CT tank, so the turbine and PRV system will need to be fast-acting to respond to rapid changes in flow, and to some extent head.*

2) *Flushing function. The new systems need to accommodate flushing of settled turbidity out of the raw water pipe from the reservoir.*
3) *There is a wide range of potable water demand on the Pyramid WTP, so the new systems need to accommodate a wide range of flow.*

c) How would you accommodate an emergency such as a fast input requiring diversion and auto flush of 5,000 gpm to discharge due to a turbidity spike or a CT Tank overflow alarm?

We would install a downstream turbine discharge bypass for this case so that you could continue to generate even though the flow through the water treatment systems would be shut down.

d) Discuss the technical possibilities of replacing an existing PRV with a flow control valve or modifying a PRV for “net zero” head loss to control CT Tank Level, or? What are the related permitting challenges?

PRVs need at least some line pressure in order to function properly. If the turbine is extracting all of the energy (pressure) out of the downstream pipe then the PRVs won’t work properly. Therefore you want a PRV system downstream that can allow zero pressure loss when operating on the turbine. This can be accommodated with the right combination of pilot systems and electrical controls on the existing PRVs.

HDR could also evaluate relocating the PRV to the “Hard Bypass” pipe (as shown on the City’s conceptual sketch) so that the PRV is piped in parallel with the two turbines shown. The PRV would be installed just downstream of the MOV shown on the “Hard Bypass” pipe. This arrangement would allow the PRV to handle rapid changes in flow so that the turbines can run at a steadier rate. The challenge with this option would be keeping the CT tank level at least about 310’ to keep the WTP pipes flooded.

Permitting Challenges:

- *All work subject to ADEC Drinking Water Plan Approval*
- *FERC conduit exemption*
- *Change in pressure through treatment systems could require modifications to prevent backflow and to ensure that the chlorine injection system will still work*
- *Disposal of additional bypass water beyond what is currently permitted for turbidity flushing would require an APDES permit modification.*

III. Open Discussion:

a) Questions for the City?

1. *What is status of the Captains Bay Road Water Main project?*

2. *The RFQ indicates the City wants a 34.5 kV distribution interconnect with net metering for the hydroelectric generator. Similarly, we connected to a high voltage distribution system at Sheridan. You have to include a capacitor bank for power factor connection and appropriate relaying (similar at Sheridan). Is the City aware of the significant challenges and costs associated with tying the Pyramid WTP hydroelectric generator directly into a 34.5 kV system? For the 100 kW of expected output this seems unnecessarily complex. Will City Electrical division staff be included in the design process?*

IV. Schedule:

a) The City will re-score the SOQs by March 1st, 2019 and send the results to respondents the following week.

b) Develop the scope of work for and negotiate fees for City Council award in early April 2019.

January 17
2019

Statement of Qualifications

Pyramid Water Treatment Plant Inline MicroTurbines Design

DPU Project No. 17401

City of Unalaska, Alaska
Department of Public Works

HDR

Table of Contents

A. HDR's Professional Qualifications

HDR is a global firm with 10,000 employees in 225 locations throughout the world, with approximately 350 working in the hydropower industry. HDR started in Alaska as a water resources engineering practice in 1979, and we are known in this state for small hydroelectric feasibility studies, design, and permitting. Examples include Delta Creek (King Cove), Waterfall Creek (King Cove), Tazimina (INNEC), Gartina Creek (IPEC - Hoonah), Gunnuk Creek (IPEC - Kake), Triangle Lake (Metlakatla), Mahoney Lake (Ketchikan), Cooper Lake (Chugach Electric Assoc.), Pelican Creek (Pelican), and several studies of your Pyramid Creek and WTP.

The HDR team's skills are directly aligned with the City of Unalaska (City) for the Pyramid WTP Inline Turbine design project engineering design service needs. Our project staff experience on similar and cost-effective inline GPRV turbines for energy recovery in potable water systems and experience working with you on the recent Water Master Plan and the 2009 Pyramid WTP Inline Turbine Study set us up for immediate productivity. From our depth of experience, we have organized a focused team of three key personnel, combining local leadership with experienced small hydro experts. Resumes for the three following individuals are attached and billing rates are provided in the table below.

Paul Berkshire, PE, will be our **design lead**. Paul has 28 years of experience and led the design of over 15 small hydro projects, many of them in Alaska. In the last four years, he has designed and overseen the construction of two completely new hydro projects (Waterfall Creek and Gartina Creek). He has executed the approach you have indicated you wish to follow. Paul is currently working on another similar GPRV energy recovery project in Loma Rica, CA.

Wescott Bott, PE, will be our local **project manager** and will provide design support. Wescott led your water master plan project, is familiar with Unalaska's water system and your Public Utilities team and protocols. Wescott has also been involved with several hydroelectric and energy recovery feasibility study and design projects. Having performed numerous water system designs in Alaska, Wescott will handle the permitting with Alaska DEC to obtain Approval to Construct and an APDES permit modification (if necessary).

David Summers, PE, will oversee project **quality**. David has 38 years of experience on hydropower engineering around the world, including multiple projects in Alaska. David performed your 2009 Pyramid WTP Inline Turbine study and recently finished design and construction of a nearly identical GPRV project for Sheridan, Wyoming. David is currently working with Paul on the GPRV project in Loma Rica, CA. He is based in HDR's Charlotte, NC office.

HDR brings full complement of supporting staff such as structural engineers, cost estimators, and pipe designers. HDR's **Paul McLarnon**, a fish biologist by trade, will handle agency consultation and permitting/licensing/exemptions with ADF&G, ADNR, and FERC if necessary. This is something Paul has performed on numerous other hydroelectric projects.

Billing Rates of Key Personnel	
Paul Berkshire	$233.66
Wescott Bott	$203.01
David Summers	$252.61

We understand that we will be contracting **Electric Power Systems Inc. (EPS)** for electrical engineering and **Boreal Controls** for controls engineering. We had a successful partnership with EPS on a City of Soldotna project several years ago. We also worked with Boreal Controls on preliminary engineering of Unalaska's groundwater well project. We made contact with Bill Farrell of EPS and Rob Swanson of Boreal Controls and we look forward to working with them again.

Being active in the hydropower industry allows HDR to forge strong relationships with the likely turbine vendors who will supply equipment for your project. These relationships are valuable to you when it comes to ensuring smooth coordination between the manufacture and supply of the turbine-generator and design and construction of piping, structural modifications, and electrical/controls systems. To maximize project success we recommend using vendors that understand the unique aspects of the economic efficiency required for small inline hydroelectric projects.

HDR's home office is in Anchorage. The scope of services that will be performed from the Anchorage office on this project will be project management, hydropower engineering, pipe design, and permitting.

B. Experience and References

The following two HDR projects are examples of similar projects of similar size and complexity:

Sheridan, WY, Beckton Hall GPRV Energy Recovery Project

CLIENT REFERENCE:
Hanns Mercer, PE
City Engineer
City of Sheridan, WY
307.675.4237
hmercer@sheridanwy.net

KEY HDR STAFF:
David Summers, PE,
Design Lead

The City of Sheridan, Wyoming (City) commissioned studies in 2002 and 2009 for screening of potential hydropower generation within the potable water supply system. This study identified the Beckton Hall Road pressure reducing valve (PRV) vault as the most feasible site for energy recovery turbine(s) to operate as energy reduction devices in place of PRVs.

In 2014, more favorable renewable energy interest loans and direct grant funding became available. The City hired HDR to provide hydropower, mechanical, electrical, and controls engineering to develop an updated review of the Beckton Hall site.

HDR's regulatory studies determined that the licensing submittals would include an application for exemption of small conduit hydroelectric facilities and self-certification of qualifying facility status, rather than a FERC hydropower license application.

The City decided to proceed with the project in 2015 and selected HDR to finalize design and develop bid documents. The final project configuration included a single 240 kW SOAR GPRV Francis turbine generator along with ancillary electrical and mechanical equipment. The single GPRV was installed in parallel with the three existing PRVs. A small, prefabricated equipment enclosure was added above ground to house the electrical equipment and controls. The project was installed 2017 and began operation in 2018.

King Cove, AK, Waterfall Creek Hydroelectric Project

CLIENT REFERENCE:
Gary Hennigh
City Manager
City of King Cove, AK
907.274.7563
ghennigh@kingcoveak.org

KEY HDR STAFF:
Paul Berkshire, PE,
Design Manager

Wescott Bott, PE,
Engineering Support

HDR's second hydroelectric project for the City of King Cove, the Waterfall Creek Hydroelectric Project is a run-of-river system consisting of a small diversion structure and intake; 20-inch-diameter, 5000-foot-long HDPE penstock; and a powerhouse with single 435 kW Pelton turbine/generator unit supplied by Canyon Industries.

HDR provided a full range of engineering, design, environmental, and regulatory services to help the City of King Cove take this project from initial concept to commercial operation. HDR assisted the Owner with separately procuring the turbine, generator, switchgear and penstock materials and the coordination with the general contractor for their installation. Construction of this project began in August, 2015 and the project began operating in March 2017.

Previously HDR designed the 890 kW Delta Creek hydroelectric project for the City of King Cove. This project utilized a 2-jet horizontal Turgo turbine manufactured by Gilkes. The City of King Cove also uses Delta Creek watershed as its primary source of drinking water, therefore requiring integrated planning and operation of both the hydroelectric and drinking water systems to manage the water supply. In 2010 HDR also performed a feasibility study of replacing a drinking water transmission main PRV with a GPRV for energy recovery.

C. Narrative Work Plan

Based on the objectives expressed by the City in the RFQ, we anticipate that the Work Plan described herein will provide the basis for the contract Scope of Work for the project. We understand that the City or others on behalf of the City of Unalaska have conducted several studies over the past two decades or more to evaluate the feasibility of energy recovery within the water supply system. The City was forward-thinking on the future implementation of an energy recovery system by reserving footprint and piping space in the water treatment plant. HDR has developed this Work Plan to describe the anticipated scope of work needed to pick up where we left off in the 2009 study and carry the micro-turbine design through the Phase II Pre-Design Scoping and Supplier Procurement.

As identified in the RFQ, we understand that the City desires this project to consist of the following:

- Pre-Design Scoping Study
- Assistance with the competitive selection of GPRV manufacturers
- 15% Plans and Specifications based on the availability and specific dimensions and requirements of the available qualified GPRV units that meet the desired energy recovery characteristics of the site.

HDR's proposed Work Plan consists of the following breakdown of tasks and deliverables, in anticipation of an overall budget of $50,000 or less:

Task 1 – Review historical data, reports, and information, including previous and recent HDR and City reports specifically discussing the micro-turbine feasibility and the recently collected water use data.

Task 2 – Identify data gaps or other information necessary to competently select an appropriate GPRV energy recovery micro-turbine system. Current information now available includes the original 2009 feasibility study recommending evaluation of the GPRV units, but also the recently collected water use data that will help characterize the available energy and timing of current demand flows in more detail than the 2009 study.

Task 3 – Based on the design input data generated in Task 2 above, HDR will select several appropriately sized and rated micro-turbine systems. This effort will consider future implementation of additional turbine capacity for bypass flows in excess of the treatment plant capacity and the City's established water right for Icy Creek. Though the City has made it clear that utilizing additional flows beyond their current water right would require additional permits, the system should be designed to accommodate this addition.

Task 4 – Develop 15% Plans and Specifications, anticipating that the Phase III effort would include direct input from the micro-turbine manufacturer to complete the design documents. The 15% design is anticipated to determine a schematic layout of the current-demand GPRV units, but should also consider the layout and configuration of flow bypass and piping system necessary to shunt future additional raw water capacity through the GPRV unit(s) when available. More specifically, in order to accommodate the currently planned GPRV units on the downstream side of the primary chlorination units, and also potentially additional raw water inflows that would be bypassed directly back to Icy Creek, it will be critical to properly select units of broad enough capacity in head and discharge to accept this added capacity. The 15% design will need to identify whether the future raw water head and discharge range can be accommodated within the efficient operating range of one or more GPRV's, or whether additional dedicated units would be necessary. Given the City's expressed desire to explore future raw water bypass to the energy recovery system, it will also be necessary to determine whether the reserved space within the existing building is adequate to house a potential additional unit if dedicated to raw water only, or whether one or more current-demand capacity units and the associated bifurcations and control valve systems can fit within the reserved space.

Design will also consider the appropriate materials for potable water contact (NSF-61 and lead-free) as well as preventing cross-connection between raw and treated water piping. These items, along with potential modifications to the flow control valves, are what ADEC will focus on when it comes time to submit the plans for Approval to Construct.

Deliverables

Deliverables for this project are anticipated to include the following, as identified in the RFQ:

Pre-Design Scoping Study

We expect that this deliverable will include a detailed discussion of the current- and future-demand turbine application, with recommendations regarding whether the treated water GPRV system can accommodate the additional head and discharge that would arise with implementation of additional raw water supply through the GPRV system. Manufacturer's catalog cuts and full discussion of operating unit capacity and head range, as well as generating efficiency, will be included in this study report. This study will identify specific GPRV units, schematic layouts, and other information secured from qualified manufacturers working with the design team on the project. The study will identify permits that will be required for implementation of the current-demand GPRV units, to include ADEC Approval to Construct and Alaska State Fire Marshall review. It will also identify necessary permits needed to utilize additional available bypass raw water supply for generation.

15% design-level construction plans and specifications.

Working with specific manufacturers of qualified GPRV units, we will develop detailed layout drawings of the micro-turbine energy capture system. In addition, the 15% design-level construction plans development will include an opinion of probable construction cost commensurate with an AACE Class 3 construction cost estimate. The design plans will show the selected units from various manufacturers meeting the required specification, along with the required piping, control and isolation valves, and inclusion of the existing primary treatment system upstream of the unit(s).

Schedule

In developing this schedule, we assume that the City can provide review and comments on deliverables within two (2) weeks of receipt of draft deliverables. The table below provides estimated schedule for development of the project deliverables and outcome.

Task	**Duration (weeks)**	**Initiation (weeks after NTP)**	**Completion (weeks after NTP)**
Task 1 – Review of data and information	2	0	2
Task 2 – Pre-Design Scoping Study	4	1	5
Task 3 – GPRV unit selection	2	7	9
Task 4 – 15% Design Plans and Specs	6	10	16

D. Attachments

Resumes

Sheridan, WY – Beckton Hall GPRV Floor Plan and Detail Sheets

King Cove, AK – Waterfall Creek Hydro Floor Plan and Detail Sheets

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EDUCATION
M.S., Civil Engineering, University of Washington, 1997

REGISTRATIONS
Professional Engineer, Alaska, United States, No. 8657

INDUSTRY TENURE
28 years

HDR TENURE
13 years

Paul Berkshire, PE

Senior Engineer, Design Lead

Paul has more than 28 years of experience in consulting civil engineering, small hydropower development and generation facility operation. He has performed at a high level throughout much of his career as Lead Civil Engineer and/or Project Manager for both public and private clients throughout the United States and Latin America, though most of his projects have been in Alaska. Paul is well versed in small hydropower development and has completed a substantial number of project evaluations, feasibility studies, and designs of new projects and due diligence reviews of existing facilities. His design and construction oversight experience in public works and infrastructure projects includes roads, canals and pipelines and water storage and diversion structures. Paul has proven himself to be a highly capable engineer with diversity of experience and knowledge well suited to the hydropower industry.

RELEVANT EXPERIENCE

Waterfall Creek Hydroelectric Project, City of King Cove, AK. Paul served as the design manager for a small 325 kW hydroelectric project. The project included site investigations, access road layout and preliminary design level drawings of the intake, pipeline and powerhouse.

Delta Creek Hydroelectric Project, City of King Cove, AK. Project Engineer. Led design and construction of an 800 kW hydroelectric project in rural Southwest Alaska. Project included site investigations; structural design for two reinforced concrete intake structures, retaining walls, and powerhouse foundation; steel design for heavily loaded hatch covers; hydraulic analysis of sluiceway; slide gate selection; trashrake design; safety design of access ladders, handrails, and gratings; and, site layout and grading for switchyard and staging facilities. Assisted in turbine/generator vendor coordination and equipment selection.

Inside Passage Electric Cooperative, Gartina Falls Hydroelectric Project, Hoonah, AK. Project Manager for the complete development of the 455 kW Gartina Falls project. Work on this project includes design, permitting and FERC licensing. Paul led an aggressive FERC licensing strategy that involved extensive agency negotiations and expedited timelines. He is currently managing the preparation of license compliance documents and plans and specifications for construction.

INNEC, Tazimina Hydroelectric Project, Alaska Peninsula, AK. Design Manager. Led final design of the 700 kW Tazimina Hydroelectric Project located in remote Southwest Alaska. Coordinated a 25-person design team, including geotechnical, structural, electrical, civil, and mechanical engineers located in three different offices. Unique project features include a “diversion-less” intake structure, an underground powerhouse with a 26-foot diameter, 130-foot deep access shaft and a 300-foot long horseshoe tunnel through highly fractured bedrock, and seven miles of all-weather access road. The access shaft contains a self-supporting 3-dimensional space frame that houses the 2-man access elevator, egress ladders, HVAC ducting, and power cableways. Analysis included physical model tests of the intake, 3-dimensional computer modeling of the geology, and two 3-dimensional finite element analyses of structural features.

Alaska Energy Authority (AEA), Susitna Hydroelectric Project Evaluation, AK. Project Engineer for the 2010 re-evaluation of the Susitna river hydroelectric complex. Paul's work consisted of detailed energy modeling and cost estimating. As part of this work he participated in a Railbelt Integrated Resource Plan providing the technical input associated with the hydroelectric projects being considered.

Haida Corporation, Reynolds Creek Hydroelectric Project, Hydaburg, AK. Project Manager. Managed development of a small hydroelectric project on Prince of Wales Island in Southeast Alaska. Determined optimal project development and led team in preparing FERC licensing documents including an Applicant Prepared Environmental Assessment. Participated in land use and power sales negotiations. Developed regional energy plan for the island to demonstrate project need and present project economics. Assisted in securing federal grant funding for the project.

Cape Fox Corporation, Mahoney Lake Hydroelectric Project, Ketchikan, AK. Project Engineer. Responsible for the design of a 9.6 MW hydroelectric project in southeastern Alaska. Project features include a lake tap, a series of tunnels and shafts. Performed in-depth hydraulic modeling of the basin and project operation. Participated in negotiations with agency personnel pertaining to establishing fish habitat flow requirements and operational parameters. Responsible for the technical content of the FERC license application and Applicant Prepared Environmental Assessment.

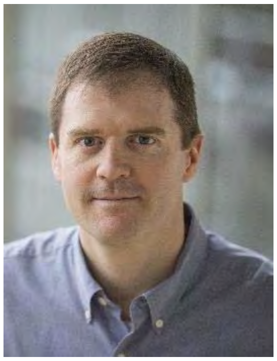
Alaska Power & Telephone, Schubee Lake Hydroelectric Project, Skagway, AK. Paul was the project manager for the feasibility level investigation of the Schubee Lake hydroelectric project located near Haines. He conducted site investigations, created conceptual designs, and prepared energy and cost estimates.

Chenega Corporation Hydroelectric Project, Chenega, AK. Paul was project engineer for the feasibility level investigation of a small hydroelectric project located in Chenega. He participated in conceptual design and was responsible for energy and cost estimates.

Homer Electric Association, Grant Lake Hydroelectric Project, Moose Pass, AK. Paul was the project engineer responsible for the conceptual design of a small hydroelectric project on Grant Lake. He was responsible for energy modeling and cost estimating.

AEA Southeast Alaska Integrated Resource Plan, AK. Paul provided the technical input associated with the hydroelectric projects being considered. Work involved identifying over 300 potential hydroelectric projects in southeast Alaska and detailed analysis of projects identified for further review.

Loma Rica Hydroelectric Energy Recovery System, Nevada Irrigation District HDR is currently designing a large hydroelectric system for energy recovery in Loma Rica, California. Paul is providing engineering support.



Wescott Bott, PE

Civil Engineer

Wescott is a professional civil and environmental engineer with HDR. He has a diverse background in water and wastewater engineering, heavy civil construction, and rural Alaska infrastructure. As a project engineer and manager, he has performed studies and design on a wide range of water, wastewater, hydroelectric, transportation, and mining projects all over the Alaska, but primarily in rural Alaska. Wescott also has experience in construction management from working for several general contractors early in his career and from providing bidding abd construction-phase services on most of the projects he designs.

EDUCATION
Virginia Military Institute,
Bachelor of Science,
Civil Engineering, 1999

Virginia Tech,
Master of Science,
Structural Engineering,
2005

REGISTRATIONS
Professional Engineer - Environmental, Alaska, No. 14371

Professional Engineer - Civil, Alaska, No. 11521

PROFESSIONAL MEMBERSHIPS
Alaska Water Wastewater Management Association, Past President

Water Environment Federation, Member

Alaska Miners Association

INDUSTRY TENURE
18 years

HDR TENURE
13 years

OFFICE LOCATION
Anchorage, AK

RELEVANT EXPERIENCE

Unalaska Water System Master Plan*, Unalaska, AK*
Wescott managed and was the primary author of the 2018 Unalaska Water System Master Plan. The plan updated City population and water demand projections, evaluated regulatory drivers, and identified a number of projects that would provide economic, hydraulic, or operational improvements. A major focus of the master plan was an update and economic business case study of the Pyramid WTP inline hydroelectric turbine project.

Unalaska Groundwater Supply*, Unalaska, AK*
The City of Unalaska has been working on a project to expend its groundwater supply with a new well in Iliuliuk Valley. As a sub to Shannon & Wilson, HDR has provided watershed hydrological and stream flow measurement services, as well as preliminary engineering services for the wellhouse and interconnections with the Unalaska water system. Wescott provided project management and engineering input for these projects.

King Cove – Delta/Waterfall Creek Hydroelectric Project, City of King Cove*, AK*
Wescott provided technical assistance on the Waterfall Creek hydroelectric design and construction project.

King Cove Water Transmission Main GPRV Study, City of King Cove*, AK*
Wescott performed a small feasibility study of an inline turbine in a PRV vault for the City of King Cove. The inline GPRV turbine would have been installed in parallel with the existing PRV on a major water transmission line from the Delta Creek water system. This project was not constructed due to poor economics.

Peter Pan Seafoods Emergency Water Supply, City of King Cove*, AK*
Wescott managed the design, materials procurement and delivery, and construction of an emergency pump system and waterline designed to provide necessary processing water to King CoveFhydro’s Peter Pan Seafoods processing plant. The project involved a custom-built pump skid and 7,500 linear feet of 6 inch pipe that was designed, delivered, installed, and operational in less than 2 months.

Kantishna Roadhouse – Micro Hydroelectric Turbine Feasibility Study, Doyon Ltd., ***Kantishna – Denali National Park, AK***
Wescott provided technical guidance for a feasibility study of the potential for hydroelectric power generation on a small creek near the Kantishna Roadhouse in Denali National Park.

Confidential Mining Project/Client – Water Pipeline Energy Recovery Study, ***AK***
Wescott was the project manager and lead engineer on a water management engineering plan for a confidential mining project for a confidential client. Part of the engineering plan included a treated wastewater outfall pipeline with considerable elevation head. HDR performed a preliminary study of energy recovery with inline hydroelectric turbines.

Homer Water Treatment Plant Design, City of Homer, ***Homer, AK***
Wescott was a project engineer on the design and construction of a new membrane water treatment plant for the City of Homer. This was the first large-scale membrane water treatment plant in Alaska.

Eklutna Water Treatment Facility – Capacity Increase Study, Anchorage Water & Wastewater Utility, ***Anchorage, AK***
Wescott was the project manager and assistant process engineer on a study of alternatives to increase capacity of Anchorage's main WTP. The improvements considered included chemical mixing, plate settlers, and membrane filtration. The WTP includes an inline hydroelectric turbine and HDR included turbine capacity and generation increase in the evaluation.

Pelican Water Treatment Plant and Hydroelectric Project, Village Safe Water, ***Pelican, AK***
Wescott was the project engineer and later project manager of a project for the town of Pelican to design a new water treatment plant, raw water supply system, water storage tank, and circulating water distribution system. The raw water supply for the drinking water system is from Pelican's hydroelectric dam and penstock, therefore modifications to the drinking water system must carefully evaluate impacts to the hydroelectric system, and vice-versa.
During the Pelican Village Safe Water project, HDR was contracted to provide hydroelectric engineering services to the Alaska Energy Authority, which was in the process of a major project to reconstruct the Pelican hydroelectric system including the intake, flume, penstock, and controls. HDR provided peer review services of the design by others. Wescott assisted on this with technical review and coordination with the parallel water treatment plant project.

Juneau Salmon Creek UV Disinfection Water Treatment Plant, ***Juneau, AK***
Wescott was the project manager on the process engineering of a UV disinfection system for the Salmon Creek WTP in Juneau. As a sub to Carson-Dorn, HDR provided preliminary design of the UV system, piping layout, and a performance specification for UV equipment procurement.

Atka Water & Sewer Project, Village Safe Water, ***Atka, AK***
Wescott was a project engineer on the design of water and sewer improvements for the Aleutian village of Atka. The project included a new water treatment plant which includes pressure filtration and disinfection.

Kenai Water Treatment Plant Design, HDL / City of Kenai, ***Kenai, AK***
Wescott was a technical advisor on the design and construction of a new water treatment plant for the City of Kenai. The project involved extensive pilot testing of process alternatives. The selected process design is addition of poly alumina chloride and polymer, followed by pressure filtration and disinfection.

David Summers, PE

Senior Engineer, Quality Control

David Summers has 38 years of experience in the mechanical design and operational support of hydroelectric generating facilities including equipment assessment, systems design, equipment specification, and procurement. Mr. Summers' work experience includes feasibility study, design, construction, project engineering, and startup of very small energy recovery projects such as Uanalska's Pyramid Creek and Sheridan, Wyoming's recently completed GPRV as well as large-scale hydroelectric systems including Duke Power's 1,065 MW Bad Creek Pumped Storage Project. His hydroelectric experience also includes major refurbishment projects for conventional hydroelectric facilities with responsibilities for project management and mechanical systems design.

EDUCATION

MBA, Wingate University, 2002

B.S., Mechanical Engineering, North Carolina State University, 1980

REGISTRATIONS

Professional Engineer, Wyoming, South Carolina, North Carolina, Virginia, Texas, Colorado, and California

INDUSTRY TENURE

38 years

HDR TENURE

13 years

RELEVANT EXPERIENCE

Beckton Hall PRV Energy Recovery Project, City of Sheridan, Wyoming

Served as Mechanical Lead for feasibility study, economic analyses, design, and installation of an energy recovery turbine (GPRV) at the Beckton Hall pressure reducing valve (PRV) vault. This PRV station is one of the main drinking water supplies of the City of Sheridan, WY. The system consists of a single SOAR 240 kW Francis turbine-generator installed in parallel with the three existing PRVs. The turbine-generator and associated piping was installed within the existing vault and a small prefabricated equipment enclosure was added above ground to house the electrical equipment and controls. The project was installed in 2017-2018 and began operating in the spring of 2018.

Unalaska Pyramid Creek WTP Inline Energy Recovery Turbine Preliminary Design Study, City of Unalaska, Alaska

As part of the Pyramid Creek WTP LT2 regulatory compliance, HDR studied the potential of generating energy in the Pyramid Creek watershed. HDR was tasked with a feasibility study of installing an inline hydroelectric turbine in the pipe that supplies raw water to the WTP. Using 2007 and 2008 daily flow data provided by the City, HDR developed a flow duration curve that statistically projects future flows from past records. HDR expanded the statistical hydrology study to include generation percent exceedance curves for both a single inline turbine-generator and two turbine-generators. HDR developed cost estimates and performed conceptual layout studies to determine the required footprint of the equipment. The results of the study indicated that it is technically feasible to install in-line energy recovery turbine-generators at the Pyramid Creek site. The estimated installed capacity is approximately 64 kW, with an average annual energy production of approximately 281 MWh, representing a utilization factor of approximately 50 percent.
David served as the lead engineer for the study, preliminary design, and cost estimates for this project.

Bozeman Hyalite/Sourdough WTP, Energy Recovery, City of Bozeman, Montana

HDR designed and provided construction administration services for a new 22-mgd membrane WTP and raw water supply. The $32 million project included design and construction of a new raw water intake, raw water supply pipelines, and a new state-of-the-art pressure membrane. David served as the lead engineer for the feasibility study, conceptual design and cost estimates of an in-line energy recovery system.

Cooper Lake Hydroelectric Station, Conceptual Design Study, Alaska, Chugach Electric Association
Part of an engineering team that performed conceptual design studies for modernization and uprate study on the two-unit hydro station near Anchorage, Alaska. Responsibilities included tunnel loss and turbine performance calculations.

Cooper Lake Pumped Storage Study, Alaska, Chugach Electric Association
Part of an engineering team that performed conceptual design studies of the potential for adding pumped storage facilities to the existing Cooper Lake Hydroelectric Project.

Loma Rica Hydroelectric Energy Recovery System, Nevada Irrigation District
HDR is currently designing a large hydroelectric system for energy recovery in Loma Rica, California. David is providing technical support and review.

Lower Bear Hydroelectric Facility, Micro Turbine Design, California, Pacific Gas & Electric
Served as Mechanical Lead for design of an energy recovery micro turbine.

Coleman Hydroelectric Station, Penstock Replacement Project - Transient Analysis, California, Pacific Gas & Electric
Served as Mechanical Lead for hydraulic head loss and transient analysis for the Coleman Station for design of a single new penstock to replace two penstocks.

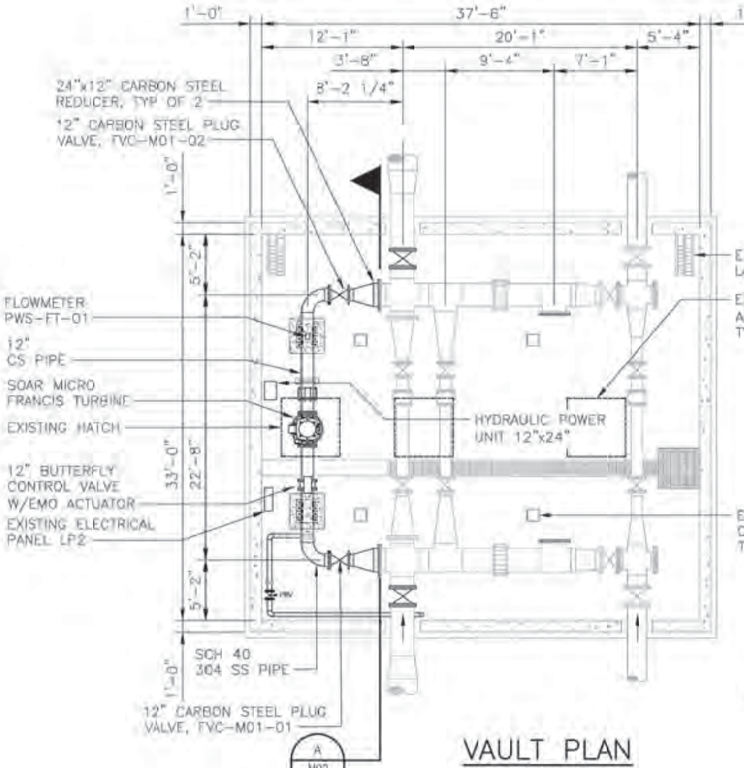
Britton Hydroelectric Station, Powerhouse & Penstock Design - Transient Analysis Project, California, Pacific Gas & Electric
Served as Mechanical Lead for hydraulic transient analysis for the new Britton Powerhouse. Transient analyses were performed to evaluate bypass valve and turbine operational impacts on penstock pressure.

Potter Valley Hydroelectric Station, Bypass Valve & Penstock Design - Transient Analysis Project, California, Pacific Gas & Electric
Served as Mechanical Lead for hydraulic transient analysis for the bypass valve addition at the Potter Valley Powerhouse. Transient analyses were performed to evaluate bypass valve operational impacts on penstock pressure.

New Linville Hydroelectric Station, Transient Analysis Project, North Carolina, Duke Power
Served as Mechanical Lead for hydraulic transient analysis for the new Linville Hydroelectric Station.

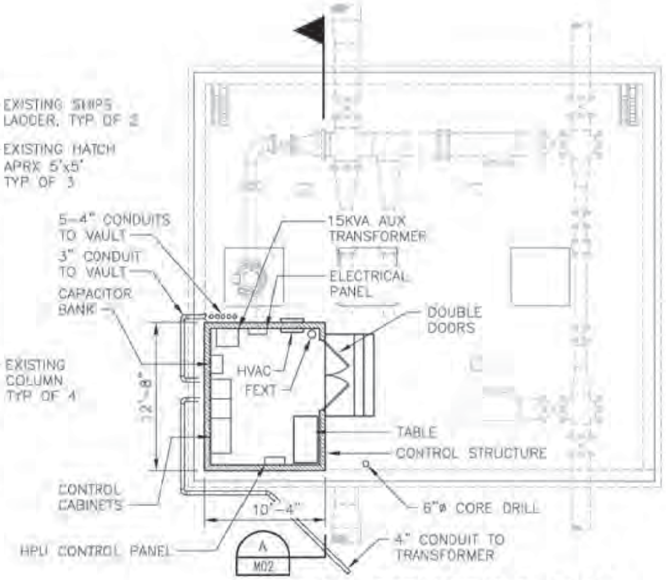
Deep Creek Hydroelectric Station, Transient Analysis Project, Maryland, Brookfield Power
Performed hydraulic transient analysis to assess governor timing impacts for the Deep Creek Hydroelectric Station.

Nantahala Hydroelectric Projects, Modification Design, North Carolina, Duke Power
Served as Mechanical lead for minimum flow modification designs at the Wolf Creek, White Oak and Cedar Cliff projects and cost estimates.



VAULT PLAN

SCALE: 3/16"=1'-0"



CONTROL STRUCTURE PLAN

SCALE: 3/16"=1'-0"

HDR

HDR Engineering, Inc.

440 S. Church Street, Suite 1900
Charlotte, NC 28202-2075
704.338.6700

0	12/05/16	ISSUED FOR CONSTRUCTION BID ONLY
ISSUE	DATE	DESCRIPTION

PROJECT MANAGER D. SUMMERS, P.E.

DESIGNED BY	M. NAPOLEONE
DRAWN BY	B. CARVER
CHECKED BY	D. SUMMERS
PROJECT NUMBER	000000000288865

DAVID N. SUMMERS
PE 13408
12/5/16

Beckton Hall Energy Recovery Project

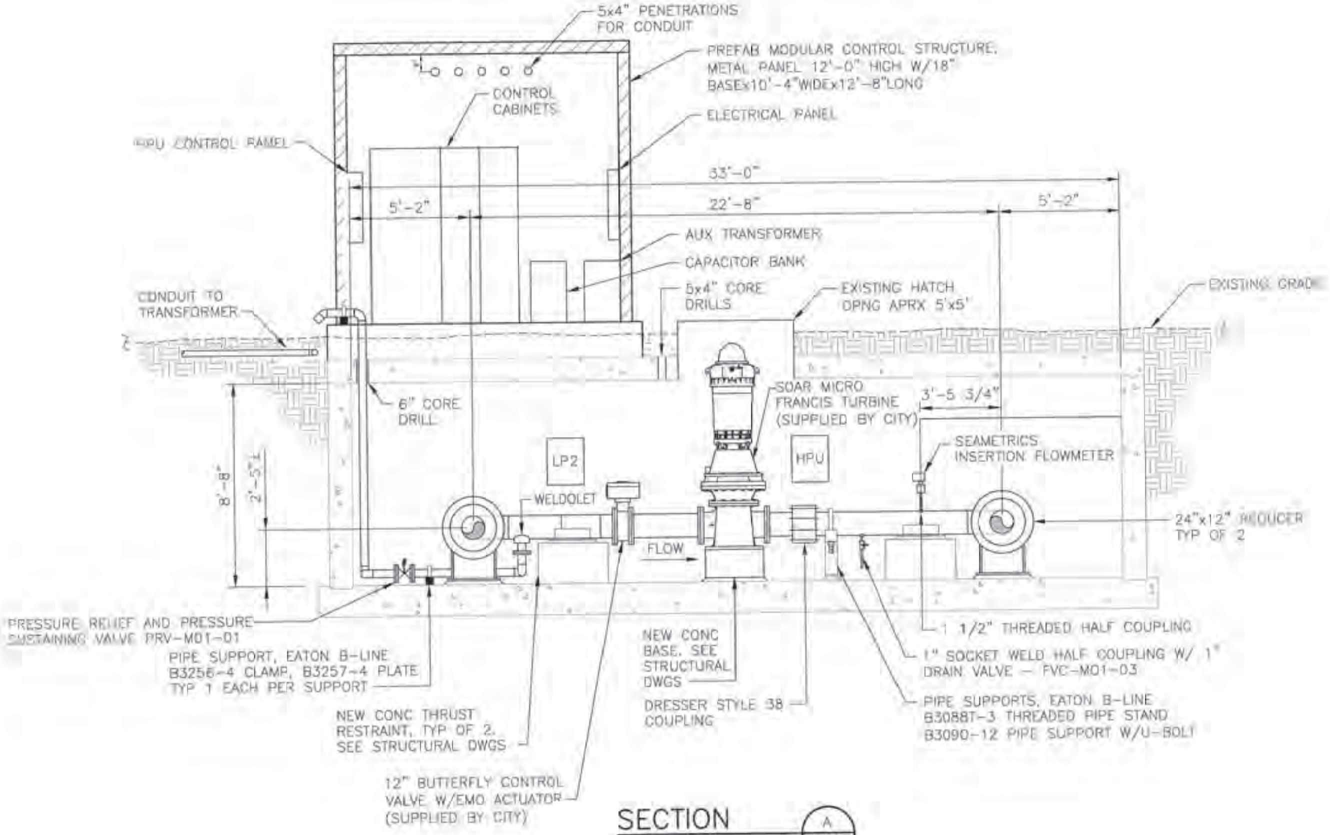
Contract Drawings

CITY OF SHERIDAN WYOMING

SITE WORK
VAULT PLAN & CONTROL STRUCTURE PLAN

FILENAME 1-0M-01.dwg
SCALE AS NOTED

SHEET 1-0M-01



SECTION

A
M01

SCALE: 3/8"=1'-0"

HDR Engineering, Inc.

440 S. Church Street, Suite 1000
Charlotte, NC 28202-2075
704.338.6700

ISSUE	DATE	DESCRIPTION
0	12/08/16	ISSUED FOR CONSTRUCTION BID ONLY

PROJECT MANAGER D. SUMMERS, P.E.
DESIGNED BY
DRAWN BY
CHECKED BY
PROJECT NUMBER 000000000268855

DAVID N. SUMMERS
12/8/16

Beckton Hall Energy Recovery Project

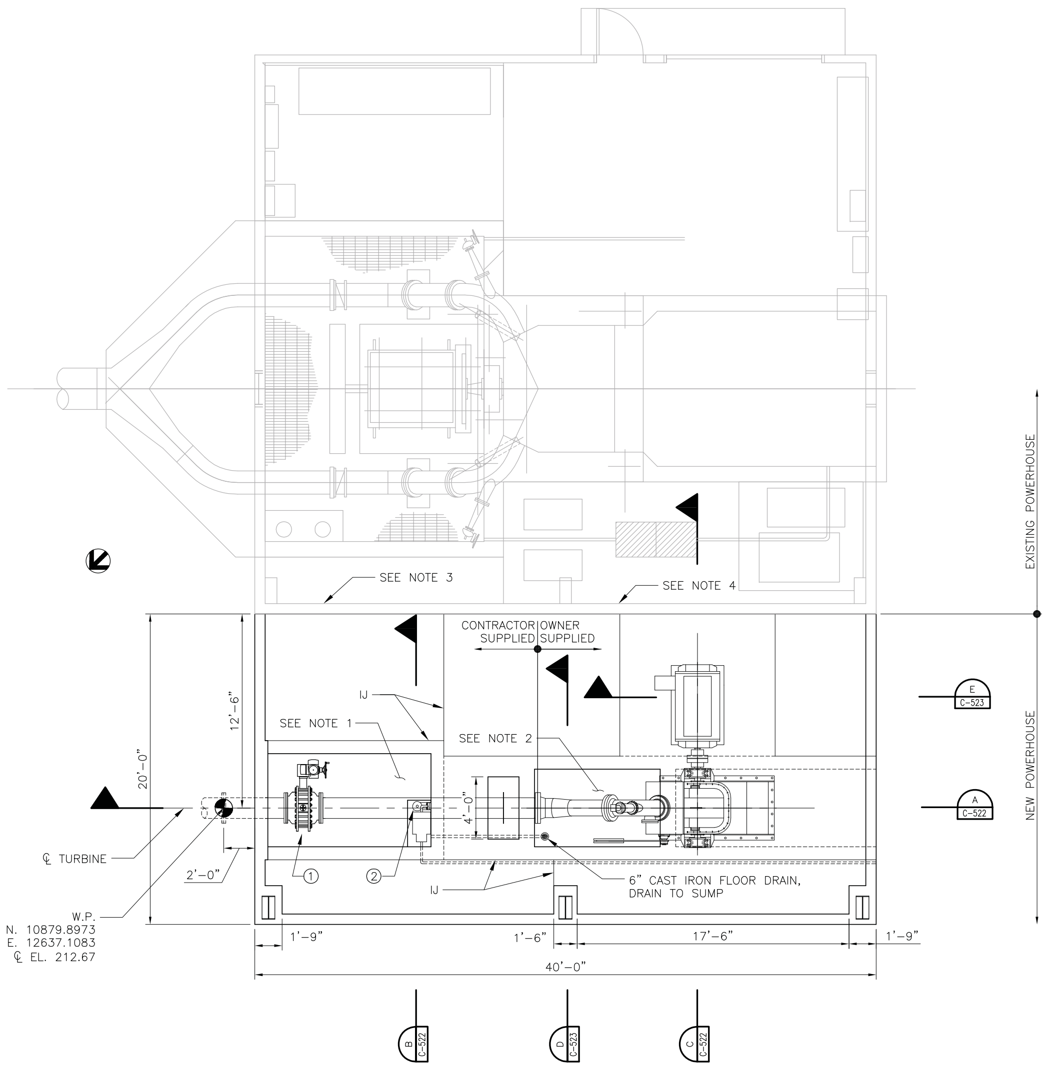
Contract Drawings

CITY OF SHERIDAN
WYOMING

SITE WORK VAULT SECTION

FILENAME 1-0M-02.dwg
SCALE AS NOTED

SHEET
1-0M-02



NO.	QTY.	EQUIPMENT SPECIFICATION
①	1	Butterfly Valve, 16-inch diameter, AWWA Class 250, cast iron body, wafer type, cast iron disc with SS edge, 304 SS shaft, Buna-N seat ring on an adjustable SS backing support ring, teflon/epoxy shaft, bearings for cold water service, with integral dismantling flang,with electric actuator, NEMA-4 enclosure, 48 VDC motor, reversing starter, manual clutch and back-up manual operator with handwheel, torque overload switches, local 3-push button control station, adjustable travel limit switches, remote position indication, local/remote select switch, remote on/off contacts, compartment heater, mounted and factory tested.
②	1	Sump Pump, 115 VAC, single phase, 60 Hz, 1/2 Hp motor, 15 feet of head, integrated float switch with automatic operation, thermal overload protection, McMaster-Carr, Model 9989K62 or approved equal

NOTES:

1. SLOPE FLOOR TO SUMP
2. SLOPE FLOOR TO DRAIN
3. REMOVE EXTERIOR PANELS AND PURLINS THIS BAY.
4. REMOVE EXTERIOR PANELS, CROSSBRACING AND PURLINS THIS BAY.
5. PROVIDE PROTECTION FROM WEATHER FOR EXISTING POWERHOUSE EQUIPMENT DURING CONSTRUCTION.

4 0 4 8 FEET
1/4" = 1'-0"

FILE PATH:00000000189714/13.00_CAD/WCH_Design _Documents/WCH_Sheet Files/01C-521.DWG PLOT DATE:9/3/2014 1:01 PM PLOT SCALE: 1:2 USER:wilhelm

HDR
Alaska, Inc.

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	B.BUTERA
DESIGNED	P. BERKSHIRE
DESIGNED	
CHECKED BY	
DRAWN BY	
DESIGNED	
DESIGNED	
CHECKED BY	
PROJECT NUMBER	

Paul A. Berkshire
No. C-8657
9-5-2014

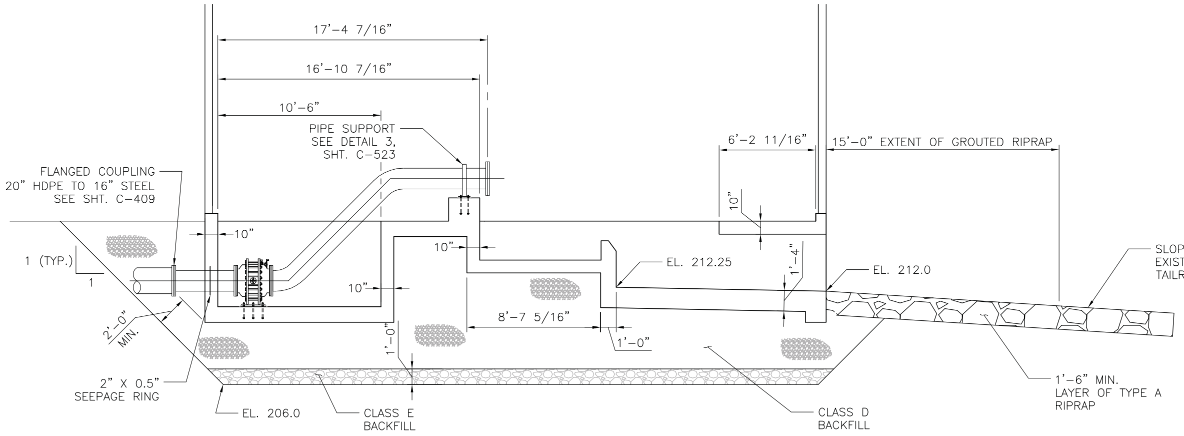
WATERFALL CREEK
HYDROELECTRIC PROJECT

King Cove, AK

POWERHOUSE
PLAN

FILENAME	01C-521.DWG
SCALE	1/4"=1'-0"

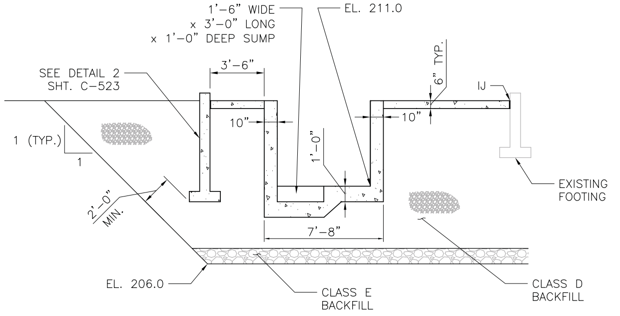
SHEET
C-521



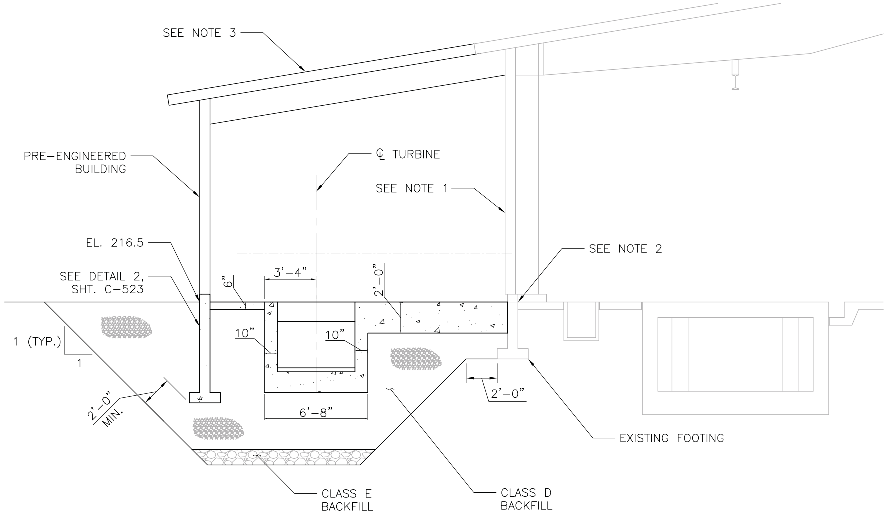
SECTION A / C-521
SCALE: 1/4"=1'-0"

NOTES:

1. REMOVE EXTERIOR SIDING AND INSULATION ALONG ENTIRE NORTH WALL. PROVIDE PROTECTION FROM WEATHER FOR EXISTING POWERHOUSE EQUIPMENT.
2. REMOVE 6" CURB BETWEEN EXISTING COLUMN BASES. PROVIDE SMOOTH FINISH AT EL. 216.5.
3. NEW BUILDING ROOF SLOPE TO MATCH EXISTING ROOF SLOPE.
4. CONCRETE FINISH SCHEDULE:
   - A. TROWEL FINISH ON INTERIOR FLOOR SLABS AND EQUIPMENT BASES.
   - B. BROOM FINISH ON ALL EXTERIOR WALKING SURFACES.
   - C. GROUT CLEANED FINISH ON REMAINDER OF ALL EXPOSED CONCRETE SURFACES.



SECTION B / C-521
SCALE: 1/4"=1'-0"



SECTION C / C-521
SCALE: 1/4"=1'-0"

4 0 4 8 FEET
1/4" = 1'-0"

HDR Alaska, Inc.

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	B.BUTERA
DESIGNED	P. BERKSHIRE
DESIGNED	
CHECKED BY	
DRAWN BY	
DESIGNED	
DESIGNED	
CHECKED BY	
PROJECT NUMBER	

STATE OF ALASKA 49TH Paul A. Berkshire No. C-8657 9-5-2014 REGISTERED PROFESSIONAL ENGINEER

WATERFALL CREEK HYDROELECTRIC PROJECT

King Cove, AK

POWERHOUSE SECTIONS

SHEET 1

FILENAME 01C-522-523.DWG
SCALE AS SHOWN
SHEET C-522

FILE PATH:0000000000189714/13.00_CAD/WCH_Design _Documents/WCH_Sheet Files/01C-522-523.DWG PLOT DATE:9/3/2014 1:04 PM PLOT SCALE: 1:2 USER:wilhelm

Attachment 4C
Coffman

Coffman Interview Response and Statement of Qualifications

CITY OF UNALASKA
PYRAMID WATER TREATMENT PLANT INLINE MICROTURBINES DESIGN
PROSPECTIVE CONSULTANT INTERVIEWS
FEBRUARY 21ST, 2018

888-363-4734
1258939
2149

I. Introductions:

City of Unalaska:

Tom Cohenour	DPW Director
Dan Winters	DPU Director
JR Pearson	Deputy DPU Director
Jeremiah Kirchhofer	Water Utility Supervisor
Erik Hernandez	Water Utility Operator
Kevin Kloft	Water Utility Operator
Lori Gregory	DPW Admin
Robert Lund	City Engineer
Mark Morrow	Engineering Technician

Consultant: Coffman Engineers

Martin Miller, P.E.	Project Manager
Carl Garrison, P.E.	Mechanical Engineer
Lon Johannes, P.E.	Electrical Engineer

II. Questions:

a) **Compare and contrast a similar project you have worked on from scoping and pre-design through construction and final completion. What is something would you do the same and something you do differently on this project?**

Coffman's experience scoping and designing municipal and process piping systems and power generation systems gives us a deep understanding of the key factors that ultimately make this type of project successful. The project highlighted below is one recent example from a similar municipal water facility.

In 2018, Coffman completed scoping and design work on an existing City of Anacortes, Washington, pump station. Coffman's design was to reconfigure the pump station to cost effectively accommodate increased design flow and pressure requirements without having to increase the electrical feed requirements or generator size. The project had a design flow up to 2,200 gpm and required increasing pressure from 107 psi to 137 psi. The existing pump station used two 3 hp pumps, one 20 hp pump, and one 125 hp pump. We evaluated several pump configurations and decided on three 5 hp variable speed drive pumps and upsizing the impeller in the large 125 hp pump. The design used all available power without requiring electrical upgrades, saving thousands of dollars. If Coffman did a similar project, the one thing we would do differently is upsize the supply and discharge headers by 2” in diameter to reduce as many dynamic pipe losses as possible. By having larger pipes, we could have likely improved the peak flow by 2-4%. Two of the biggest benefits to our re-design, aside from not having to upgrade the electrical systems, were that (1) we used a sch. 10 stainless steel pipe header that the contractor appreciated for its ease in manufacture and its salt air corrosion protection; and (2) we simplified maintenance by staging three identical stainless vertical turbine type domestic pumps. The new configuration simplified maintenance, eliminated water hammer issues and efficiently met the new design flow and pressure requirements. Coffman signed all paperwork for State Health approval. The pump station has worked without incident for approximately 6 months.

On the energy modeling side, recent experience in Galena, Alaska (Biomass & district heating), and Bethel, Alaska (Combined Heat and Power) highlight the need to develop energy and cost modeling with full consideration of equipment limitations, control sequences, time of use, and uncertainty. In both cases, the upfront energy modeling resulted in successful projects by helping to identify risks, and reliable economic models, but resulted in conceptual designs that differed from the Owner’s original intent.

Success in the case of the Bethel CHP project involved stopping work at completion of the conceptual design as the economics were not as favorable as originally anticipated by the Owner.

In the case of the Galena project, the design team incorporated design of a water distribution network and services to a 14-building campus, in addition to the biomass boiler and district heating upgrades. Coffman provided engineering support for the City’s efforts to secure additional funding and the project schedule was maintained.

b) Discuss the top 3 critical functions and related control/flow sequences you envision in the current versus and flow scenarios.

Our design intent is to leave existing control functions intact and unchanged to the extent possible. We believe that piping the turbine in parallel with the existing PRVs would (1) minimize impact to the Water Treatment Plant (WTP) controls and (2) maximize energy capture by bypassing the PRVs under normal conditions. We propose to incorporate the turbine to provide the same control functions currently being provided by the PRVs.

Primary control:
Under normal operating conditions, the wicket gates that come integral with the inline turbine(s) would be controlled to modulate flow through the turbine(s) in order to maintain CT tank level, essentially replacing the primary control function of the existing PRVs. If the turbine is installed in parallel with the PRVs, the PRVs would be normally closed to prevent bypassing flow around the turbine(s). The PRVs would maintain their existing functionality during any planned or unplanned turbine outage or as needed at times of high demand, which may exceed the maximum turbine flow capacity.

Although installing PRVs in series with the turbine(s) is not preferred from a power generation standpoint due to pressure loss across the valves, the system can be modified to function in this configuration. If the PRVs are installed in series with the inline turbine(s), the valve harnessing would be modified to maintain full-open position while the turbine is operating but keep the existing CT tank level control functionality. The PLC would be set up to select the operating mode.

Low Reservoir Level Control:
The turbine response to a low-reservoir water level condition will be coordinated with the PRVs and WTP inlet valve response, including ramping down flow and actuating a turbine inlet shutoff valve as needed to shut off flow to the WTP. PRVs would normally be closed while the turbine is operating. We do not anticipate impacting the response time or overall system hydraulics.

High Turbidity & Low UVT Control:
The turbine response to either a high turbidity or low-ultraviolet transmittance condition will be similar to the PRV response to these events. The turbine wicket gates and inlet valve will close, in conjunction with opening the WTP bypass valve. We do not anticipate impacting the response time or overall system hydraulics.

There may be opportunities to improve project economics by looking at adjusting the CT tank control sequence. For instance, if the CT tank were allowed to fluctuate between, say, 70% and 90% full, we may be able to reduce the turbine size, but would require more time to fill the tank back up to 90% after a period of high-water use. An hourly analysis of the WTP flow meter data would be used to determine if this is feasible.

c) How would you accommodate an emergency such as a fast input requiring diversion and auto flush of 5,000 gpm to discharge due to a turbidity spike or a CT Tank overflow alarm?

A turbine installed in parallel with the PRVs would not impact the WTP's current bypass and auto flush control logic. The turbine inlet valve will shut off flow to the turbine using the same logic as the existing PRV controls. Diversion and turbidity sensing occur upstream of the turbine inlet pipe and would remain.

Alternately, if the turbine is installed in series with the PRVs, upstream of the WTP bypass, a new control sequence will need to be developed for a diversion and auto flush scenario. The turbine would ramp up in conjunction with opening the bypass valve, likely controlled to maintain the desired flow rate at the main WTP flow meter.

d) Discuss the technical possibilities of replacing an existing PRV with a flow control valve or modifying a PRV for "net zero" head loss to control CT Tank Level, or? What are the related permitting challenges?

In the preferred piping arrangement, with the turbine installed in parallel with the PRVs, there is no need to reduce pressure drop across the existing PRVs. PRVs would remain in place and would be reconfigured to be fully closed under normal conditions, forcing all water through the turbine.

In the alternate piping arrangement, with the turbine installed in series with the PRVs, minimizing PRV pressure drop will be an important aspect of the design, and careful analysis of this issue is warranted to ensure that flow duration curves, pressure drops and valve control sequences are fully understood and modeled correctly in order to generate accurate energy modeling and resulting economic calculations.

The existing PRVs are industry standard for the application. Review of the Cla-val cutsheet indicates that even at full open position, the 16" valve will see a significant pressure drop at anticipated flow rates. Replacing an existing PRV with a different type of valve may be feasible, but presents numerous design challenges, including:

- Valve selection – tradeoffs between control authority and full-open pressure drop
- Actuator selection – tradeoffs with respect to failure position (spring return required?) actuator size, closure time to prevent water hammer
- Safety – Process Hazard Analysis or similar evaluation may be warranted to determine reliability requirements, levels of redundancy, etc.

We do not expect that water rights, water quality or fish habitat permitting would be impacted by the project, whether valves are replaced or not. If additional water rights are pursued, the Alaska Department of Natural Resources, Department of Environmental Conservation and Department of Fish and Game approval would be required. FERC licensing would only be required if an existing FERC permit would need to be modified or if development on land owned by the federal government is required.

III. Open Discussion:

a) Questions for the City?

Has the City considered piping the turbine in parallel with the PRVs?

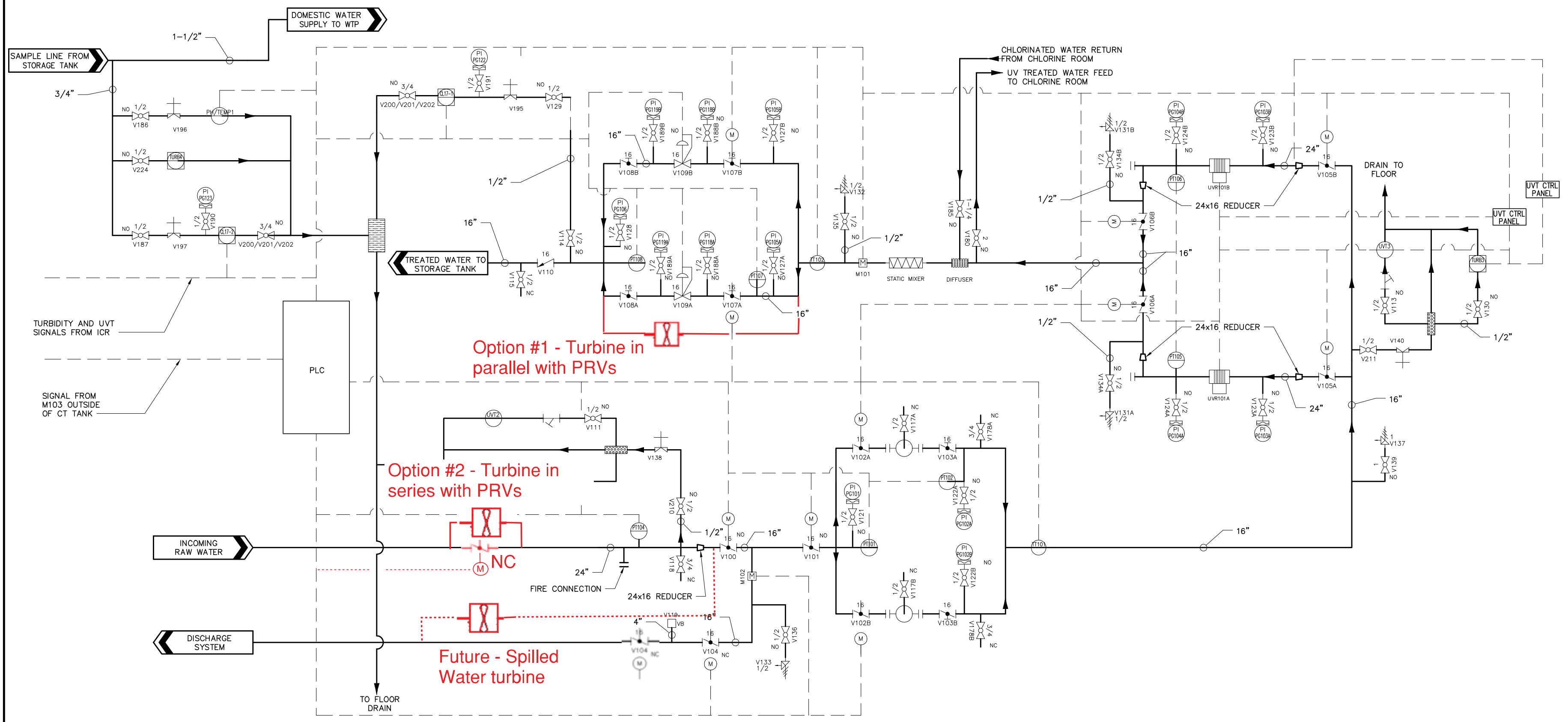
IV. Schedule:

a) The City will re-score the SOQs by March 1st, 2019 and send the results to respondents the following week.

b) Develop the scope of work for and negotiate fees for City Council award in early April 2019.

P&ID LEGEND

SYMBOL	DESCRIPTION
———	PROCESS FLOW
— — —	CONTROL SIGNAL LINE
——▶——	FLOW DIRECTION
	PIPE REDUCER
	STATIC MIXER
M	MAGNETIC FLOW METER
	BLIND FLANGE
	UV REACTOR
	STRAINER
NO 1/2 V129	BALL VALVE NO–NORMALLY OPEN NC–NORMALLY CLOSED
CL–1	CHEMTRAC CHLORINE MONITOR
TURB2	TURBIDIMETER
PT106	PRESSURE TRANSDUCER
UVT1	UV TRANSMITTANCE MONITOR
16 V110	CHECK VALVE
	DIFFUSER
	STRAINER
	ACTIVATED CARBON FILTER
CL17–1	HACH CL–17 CHLORINE ANALYZER
16 V108A	MANUAL BUTTERFLY VALVE
V132 1/2	AIR RELIEF VALVE
PI PG106 1/2 V128	PRESSURE GAUGE WITH ISOLATION VALVE
M 16 V102B	AUTOMATIC BUTTERFLY VALVE
16 V109A	ALTITUDE FLOW CONTROL VALVE
TT101	TEMPERATURE SENSOR
PH/TEMP1	HACH DPD1P1 PH TEMPERATURE SENSOR
	DIAPHRAGM VALVE
VB	VACUUM BREAKER
	BUBBLE TRAP



FLOW PROCESS & INSTRUMENTATION DIAGRAM

SCALE: NOT TO SCALE

Plotted By: Curtis
Date/Time: 02 Dec 2013 10:35 am
Layout: P&ID
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Jon Michael Menough
CE-12301
12/2/13

NO.	DATE	BY	REVISION
△	12/2/13	JM	ISSUED FOR BID

LARSEN CONSULTING GROUP, Inc.
architecture · engineering · surveying

3710 Woodland Dr.
Suite 2100
Anchorage, AK. 99517
(907) 243-8985

CITY OF UNALASKA

PYRAMID WTP
UNALASKA, ALASKA

FLOW PROCESS AND
INSTRUMENTATION DIAGRAM

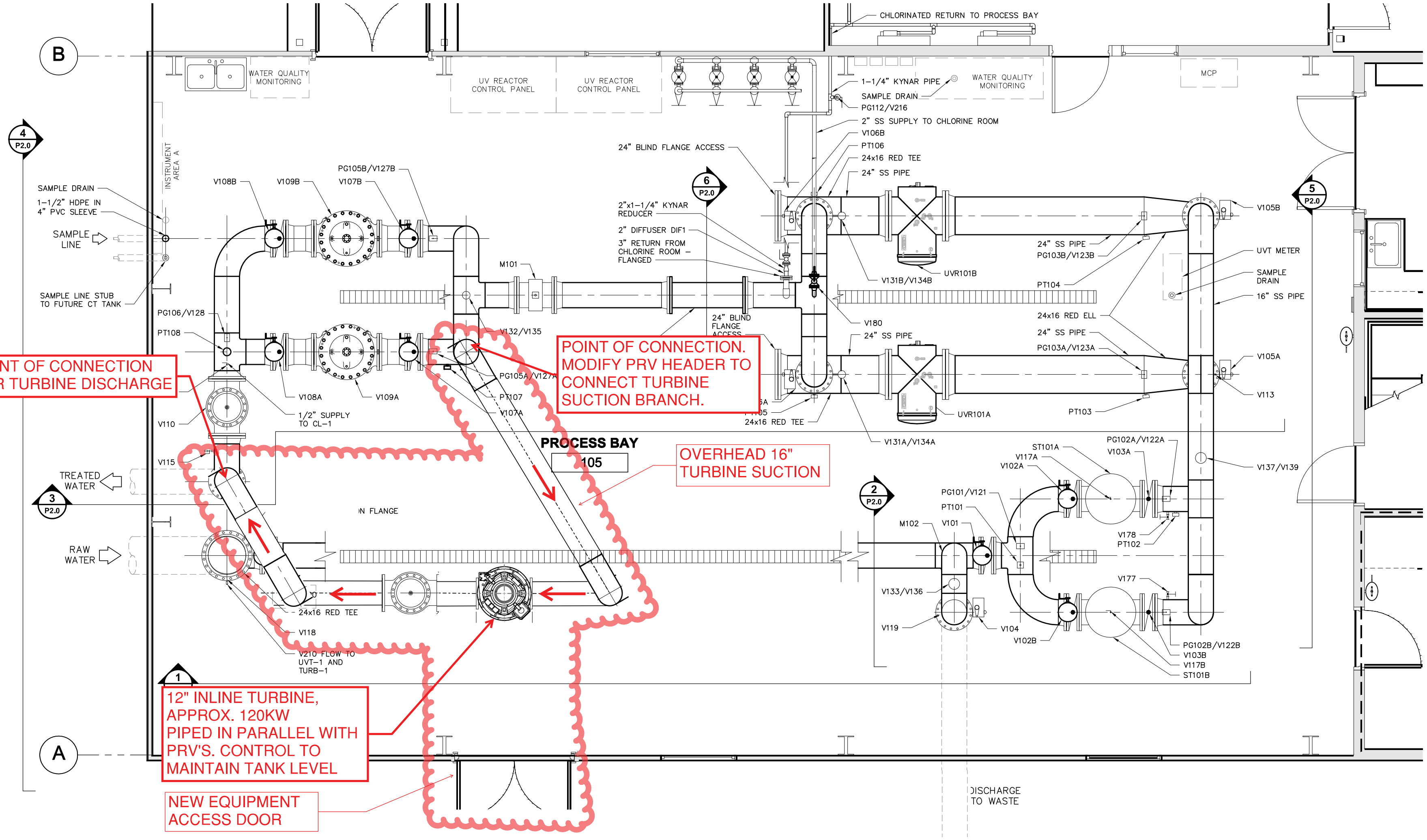
SCALE: AS SHOWN
DESIGNED BY: JM
DRAWN BY: CRS
CHECKED BY: GWF
DATE: 12/2/13
FILE NO. 850.01

SHEET NUMBER
P1.3 OF

Option 1 - Turbine in parallel with PRVs

NOTES

1. ALL PROCESS STREAM PIPING IN THE PROCESS BAY SHALL BE 16-INCH DIAMETER STAINLESS STEEL, UNLESS CALLED OUT OTHERWISE.
2. FOR THE PROCESS STREAM PIPE SUPPORTS, SEE STRUCTURAL. FOR FIRE LINE PIPE SUPPORTS, SEE MECHANICAL. FOR THE OTHER PIPING, COORDINATE WITH BUILDING MANUFACTURER AND PROVIDE PIPE SUPPORTS AS NECESSARY PER THE PIPE MANUFACTURER'S RECOMMENDATIONS.
3. WALL SUPPORT FOR MONITORING, PANELS, PUMPS, PIPING, AND APPURTENANT EQUIPMENT SHALL BE IN ACCORDANCE WITH BUILDING AND EQUIPMENT MANUFACTURER RECOMMENDATIONS.


POINT OF CONNECTION FOR TURBINE DISCHARGE

POINT OF CONNECTION. MODIFY PRV HEADER TO CONNECT TURBINE SUCTION BRANCH.

OVERHEAD 16" TURBINE SUCTION

12" INLINE TURBINE, APPROX. 120KW PIPED IN PARALLEL WITH PRV'S. CONTROL TO MAINTAIN TANK LEVEL

NEW EQUIPMENT ACCESS DOOR

PIPING PLAN

SCALE: 3/8"= 1'-0"

Plotted By: Curtis
Date/Time: 02 Dec 2013 10:35 am
Layout: Piping Plan
Filename: F:\Civil Projects\850.01_Unalaska_WTP\dwg\850.01_DSI_Piping_Unalaska.dwg

Jon Michael Menough
CE-12301
12/2/13

NO.	DATE	BY	REVISION
1	12/2/13	JM	ISSUED FOR BID

LARSEN CONSULTING GROUP, Inc.
architecture · engineering · surveying
3710 Woodland Dr.
Suite 2100
Anchorage, AK. 99517
(907) 243-8985

CITY OF UNALASKA

PYRAMID WTP
UNALASKA, ALASKA

PIPING PLAN

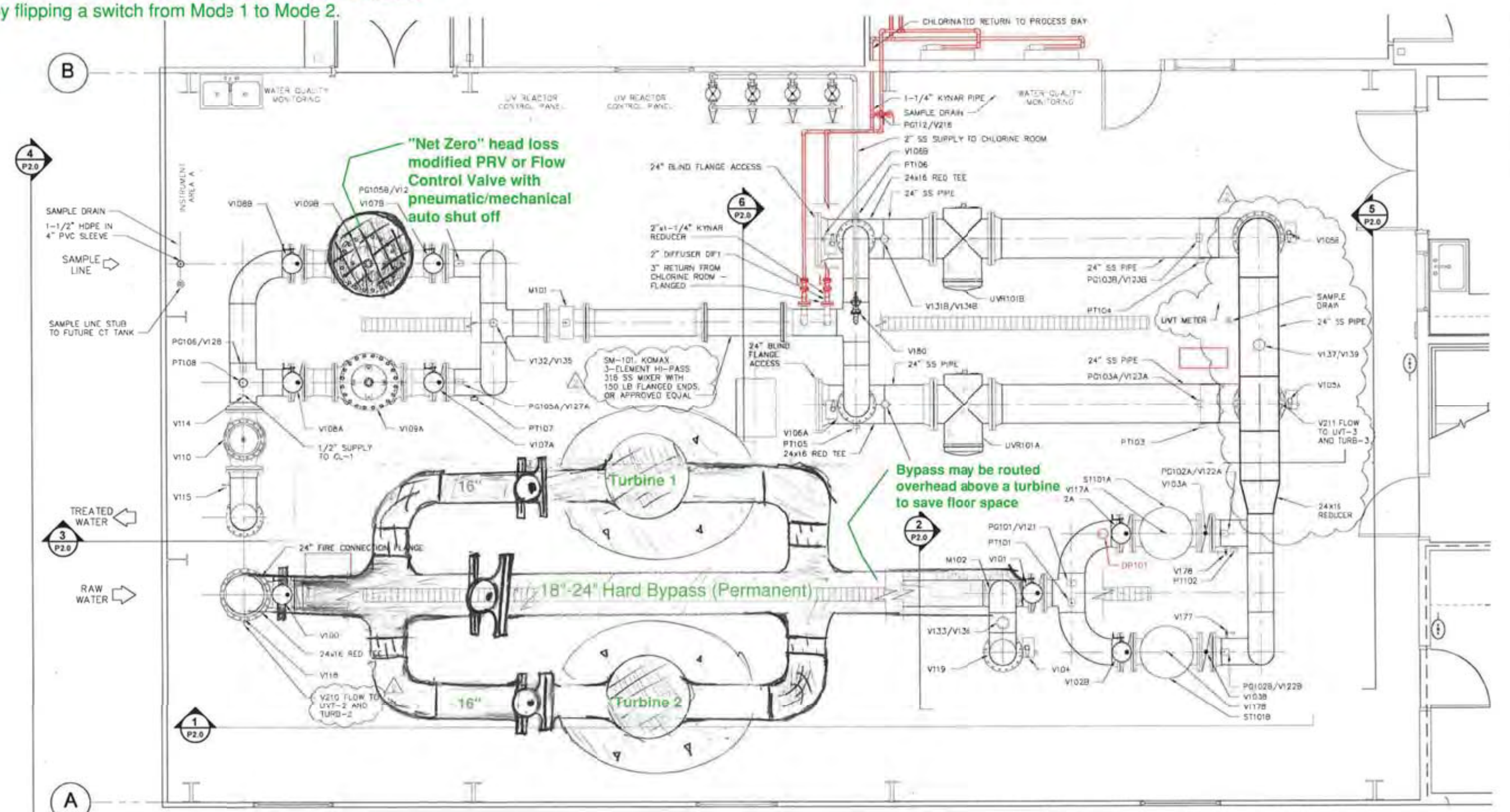
SCALE: AS SHOWN
DESIGNED BY: JM
DRAWN BY: CRS
CHECKED BY: GWF
DATE: 12/2/13
FILE NO. 850.01

SHEET NUMBER
P1.6 OF

This layout is only a conceptual sketch to indicate what the City has been thinking to date as far as a GPRV flow sequence. It is purely intended serve as a springboard for discussion. The utilities intent is that the plant can operate without any reliance on the GPRVs and that a future high flow scenario is initiated by flipping a switch from Mode 1 to Mode 2.

Option 2 - Turbine in series with PRVs

CONTRACTOR MAY SUBSTITUTE 1-1/2" KYNAR PIPING FOR 1-1/4" KYNAR PIPING.



PIPING PLAN

SCALE: 3/8"= 1'-0"

RECORD DRAWINGS

THESE RECORD DRAWINGS HAVE BEEN PREPARED FROM INSPECTIONS, CONTRACTOR FURNISHED INFORMATION, AND BASED ON PERIODIC FIELD OBSERVATIONS BY THE ENGINEERS. THE CONTRACTOR PROVIDED INFORMATION APPEARS TO REPRESENT THE PROJECT AS CONSTRUCTED. ANY USE OF THESE DRAWINGS SUBSEQUENT TO THIS DATE SHALL BE FOR INFORMATION AND RECORD PURPOSES ONLY AND NOT FOR CONSTRUCTION.

BY: Thomas Regan, P.E. Thomas Regan DATE: Sept 1, 2016

NO	DATE	BY	REVISION
3	9/7/16	TF	RECORD DRAWINGS
2	4/7/14	JM	CONFORMED DOCUMENTS
1	12/2/13	JM	ISSUED FOR BID

LCG Lantech Inc
architecture · engineering · surveying
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Anchorage, AK 99501
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F (907) 243-5629
www.lcgak.com

CITY OF UNALASKA

PYRAMID WTP
UNALASKA, ALASKA

PIPING PLAN

SCALE:	AS SHOWN
DESIGNED BY:	JM
DRAWN BY:	CRS
CHECKED BY:	CWF
DATE:	12/2/13
FILE NO:	850.01

SHEET NUMBER
P1.6 of

Plotted By: Curtis
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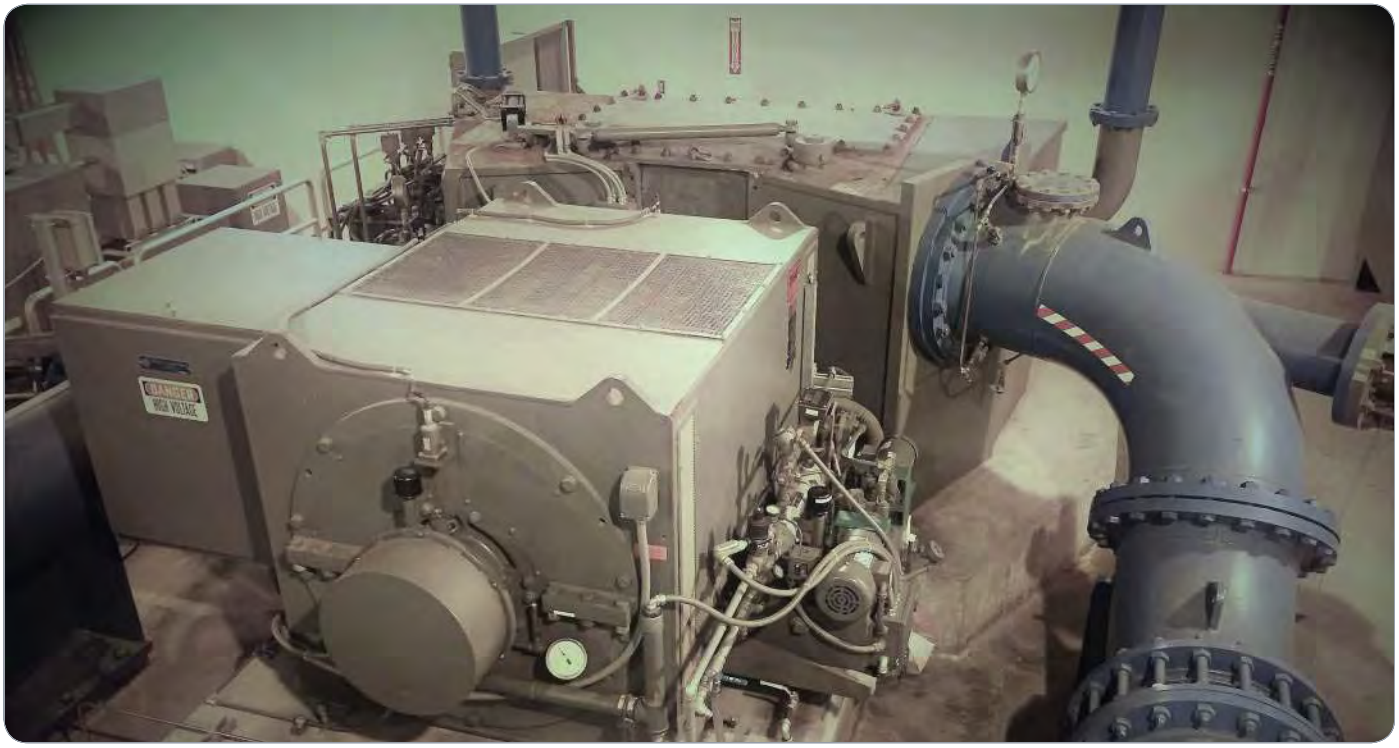
SOQ for the City of Unalaska
Pyramid Water Treatment Plant Inline MicroTurbines Design

DPU Project Number: 17401

January 17, 2019



Eklutna Water Treatment Plant Turbine

800 F Street | Anchorage, Alaska 99501

COFFMAN
ENGINEERS

January 17, 2019

City of Unalaska - Department of Public Works
Robert Lund, PE, City Engineer
rlund@ci.unalaska.ak.us
PO Box 610
Unalaska, AK 99685

Subject: City of Unalaska Pyramid Water Treatment Plant Inline MicroTurbine Design

Dear Robert:

Coffman Engineers, Inc. (Coffman) appreciates the opportunity to provide this statement of qualifications for engineering services for the Pyramid Water Treatment Plant (WTP) Inline Microturbine project. On the following pages we present our qualifications and recommended methodology to accomplish the Phase 2 scope of work. As a full-service, multi-discipline engineering firm, we have the resources in place to move directly into detailed design and construction support and can meet the schedule outlined in the City's RFQ.

We look forward to the opportunity to work with the City of Unalaska on this exciting project. If you have any questions or would like further information, please don't hesitate to contact me.

Sincerely,

Martin Miller, PE
Project Manager, Mechanical Engineering
Coffman Engineers
800 F Street
Anchorage, AK 99501
(907) 257-9292
millerm@coffman.com

PROFESSIONAL QUALIFICATIONS

Coffman has provided multidiscipline engineering services in Alaska since establishing our Anchorage office in 1979. We provide mechanical, electrical, control system, fire protection, civil, structural, and corrosion engineering, along with landscape architecture and project management services. Our clients include water/waste water utilities, power generation, oil & gas industry, commercial and government entities.

Coffman excels at working in concert with our clients to understand their unique challenges and develop creative solutions. Our decades of experience with similar projects in municipal water pumping, treatment and pressure reducing facilities gives us the necessary experience to successfully execute this project and maximize long-term benefit to the City of Unalaska.

Coffman has over 100 employees in Anchorage, and approximately 500 staff overall. Our Anchorage staff has a long history of providing engineering solutions to water utility and power generation clients throughout Alaska on projects of similar size and complexity to the Pyramid WTP Inline MicroTurbine Project.

For this project, we intend to manage the work from our Anchorage office, while drawing on the deep technical expertise of our Burlington, Washington office (formerly Garrison Engineering), which has specialized in public and municipal water system consulting and design services since 1994.

The Coffman team will leverage our experience in municipal water system and power generation planning, design and operations to focus on the key attributes of reliability, maintainability, upfront cost, and energy yield to make this project a success.

We intend to work with Electric Power Systems (EPS) and Boreal Controls for this project to complete the scope of work, as outlined in the RFQ. We will draw on their knowledge of the City of Unalaska infrastructure to ensure that the project design integrates with existing operations as seamlessly as possible. We have recent success working alongside EPS at AWWU’s Eklutna Power Plant and on ConocoPhillips’ CD5 bridge signal project, among others. We are open to subcontracting to these firms or working alongside them, through the City’s existing term contracts.

Other subconsultants for this project include HMS Estimating (Cost Estimating) and Solstice Alaska Consulting (Permitting). Both have significant experience on similar projects in the Aleutian region and throughout rural Alaska. We intend to leverage SolsticeAK's local employee in Unalaska to help facilitate coordination with local entities as needed and support information gathering efforts, helping to minimize project costs and risk.

KEY PERSONNEL

PROJECT MANAGER

Martin Miller, PE (AELM 12030)

COFFMAN - ALASKA

Martin has 15 years of design and project management experience in Alaska and abroad including experience in all stages of project development, planning, energy auditing, design, installation, commissioning, and operations. He is responsible for design and construction administration for utility, commercial, and industrial projects throughout Alaska. Martin also provides project management and design of energy projects with a focus on integrating renewable energy generation into existing isolated electrical grids for power plants in Teller and St. Mary’s.

MECHANICAL ENGINEER

Carl Garrison, PE (31581 WA)

COFFMAN - WASHINGTON

With 30 years of experience in water system design, treatment and rehabilitation, Carl will be an integral part of concept development and QA/QC for this project. Carl founded Garrison Engineering in 1994, and has spend the past 25 years working with municipal water utilities on a wide range of engineering and planning projects in Washington and the surrounding areas. His experience includes water storage, pumping, treatment, and pressure regulation.

QA/QC

Lon Johannes, PE (AELE12169)

COFFMAN - ALASKA

Lon has 16 years of multidiscipline experience as an electrical designer and project manager. His experience includes a variety of electrical engineering applications with special emphasis in SCADA system design, programming, and commissioning. Lon has a deep understanding of water utility operations through his extensive work with AWWU, where he works hand in hand with AWWU's operators and engineers to develop, implement, and test all types of municipal water projects.

Key Personnel Rates and Availability (%)

Company	Name	Role	Rate	%
Coffman	Martin Miller, PE	Project Manager	180	50
Coffman	Carl Garrison, PE	Mechanical	180	35
Coffman	Lon Johannes, PE	QA/QC	180	40

We anticipate additional support from other disciplines and team members, and rates are available upon request.

PROJECT REFERENCES

Our goal as a company is to work with our clients to provide designs that result in successful long-term relationships. We measure that goal by providing engineering to the same clients on many projects over several years, becoming a part of their team. We understand our utility and industrial clients are very knowledgeable about the operation and function of their facilities and leveraging that knowledge through collaboration is the best method to incorporate that knowledge into the designs we produce for them. Some of our long-term Municipal Water and Electric Utility clients are:

Sample of Municipal Water Utility Clients:

- Anchorage Water and Wastewater Utility (AWWU)
- Town of Cusick, WA
- City of Anacortes, WA
- Juniper Beach Water District, Camano Island
- Town of Hamilton, WA
- Silver Springs, NV
- Beatty, NV
- Yearington, NV
- Skagit Public Utility District

Sample Electric Utility Clients:

- Chugach Electric Association
- Municipal Light & Power
- Kodiak Electric
- Department of Defense
- Alaska Village Electric Cooperative

We encourage the review committee to contact our references:

Reese Cheney – ICS Manager
AWWU
(907) 564-2700 (main), (907) 550-5901

Jeff Marrs - WTP Manager
City of Anacortes
(360) 428-1598

Kevin Plambeck - President
Juniper Beach Water District
(425) 508-5010

Mike Maloney – Chief Executive Officer
Canyon Hydro
(360) 592-5552

Dustin Highers – Senior Manager Production
Chugach Electric
(907) 563-7494

PROJECT EXPERIENCE

Coffman's project history in this market is wide ranging and includes municipal and small water systems. Our projects include water system planning, pump station and pressure reducing station design, SCADA design, programming and implementation, computer modeling, wells, pump testing, storage reservoirs, new and replacement pipelines, water treatment for a variety of contaminants, and pilot testing. The sample projects listed below highlight our experience working in similar municipal water and related projects.

Eklutna Water Treatment Plant Turbine AWWU
Anchorage, Alaska

Coffman developed a root cause analysis and repair design for an arc-fault event in the Eklutna Water Treatment Facility (EWTF) energy recovery system switchgear. The facility consists of a 750kw induction turbine generator, and a 30-in submerged sleeve valve for control of flow when the induction turbine-generator is not in operation or when the available flow exceeds the turbine's capacity. Work included review of the existing turbine and turbine control system, specification of new medium voltage fused contactors with modern protection relay, controls verification and integration with the existing energy recovery control system, and commissioning and start-up support. **Reference: Reese Cheney – ICS Manager AWWU;** (907) 564-2700 (main), (907) 550-5901

Inline turbine regenerative blowers – Soar Hydropower Technologies
Multiple sites, Hawaii

Coffman worked with Soar Technologies (now Canyon Hydro) to specify and design the piping, controls, and a regenerative blower assembly for two microhydro turbine installations on the Big Island of Hawaii (one at Volcano, HI; the other at Kaloko, HI). The blowers were used to pressurize the cavity of the 30 hp turbines so that water could discharge above the elevation of the turbine outlet. The blowers were cast aluminum rather than steel for corrosion resistance to the Big Island's volcanic gases (VOG). These blowers replaced compressors that failed due to corrosion issues. **Reference: Mike Maloney – Chief Executive Officer - Canyon Hydro;** (360) 592-5552

Anchorage Water and Wastewater Utility (AWWU)

Coffman has performed a wide range of engineering projects for AWWU over the past 20+ years, including:

- Eklutna Water Treatment Facility filter to waste cycle engineering: electrical, mechanical and structural design
- AWWU / Municipal Light and Power Heat exchanger: feasibility and cost/benefit analysis of using powerplant cooling water to heat AWWU water service
- Eklutna pipeline valve control study
- Corrosion Control engineering term, including cathodic protection designs; soil corrosivity evaluations; coating specifications; NACE certified coating inspectors

Coffman has performed several engineering projects in Washington, including:

- City of Anacortes, WA - Mechanical and Electrical redesign of a municipal pump station to increase the flow from 1,000 gpm to 1,850 gpm and increase the pumping pressure from 107 to 137 PSI
- Juniper Beach Water District, WA - Long term client since 2003. Projects include development of a comprehensive plan, and design of a concrete storage tank, pipeline replacement, addition of fire pumps, and a 125kVA back-up generator
- Town of Cusick, WA - Redesign of a 25+ year old 400 GPM surface water treatment plant, including updated controls, addition of filter to waste, and management of a grant and two loans to complete the work


Unalaska

Kodiak Electric Cooperative
Terror Lake Penstock Integrity Evaluation
Coffman supported development of a penstock integrity inspection plan and supported implementation of the inspection once approved by the Federal Energy Regulatory Commission (FERC).

NARRATIVE WORK PLAN AND METHODOLOGY

The project execution methodology outlined in the RFQ is in line with the Front End Loading (FEL) engineering process that we use on a daily basis for other utility and industrial clients, and is a good fit for this type of project.
The goal of our Phase 2 effort will be to confirm the project feasibility from a technical and economic perspective in order to proceed with public outreach, equipment procurement, and project financing for the inline microturbine configuration. Our focus will be to:

1. Clarify equipment performance requirements for inclusion in the turbine RFP

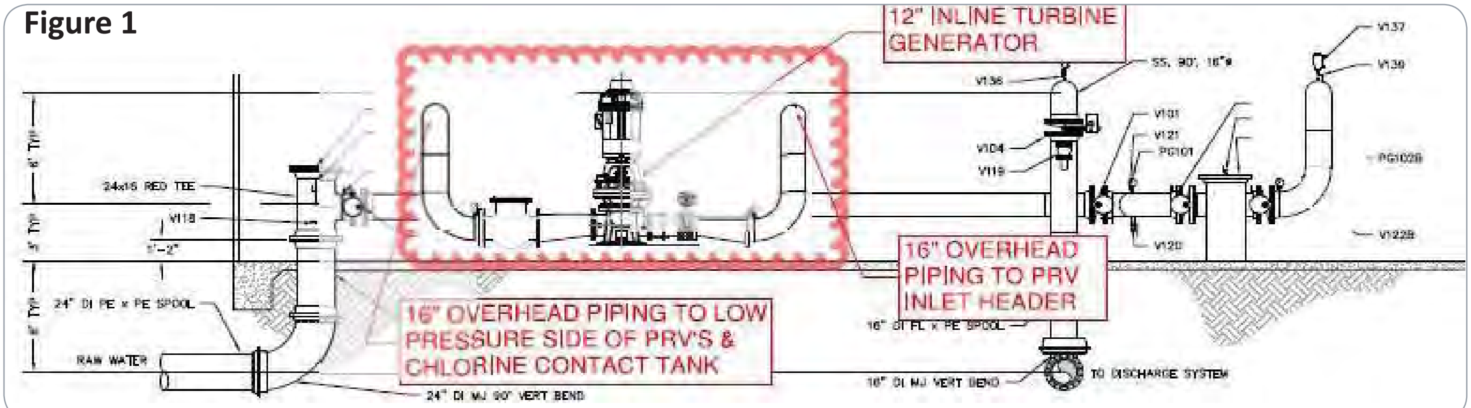
2. Define significant installation scope, as well as shutdown duration and timing, temporary facilities, and coordination with operations and other ongoing projects. This effort will help establish project requirements and reduce uncertainty with respect to cost and benefits of the project

Based on an initial review of the 20136 Pyramid WTP design drawings and the City's water flow data, there appears to be adequate space within the existing facility to install 1 or 2 inline turbines of an appropriate size (see attached concept sketch). The turbine should be installed in parallel with the existing PRVs and modulated via internal wicket gates to maintain the desired chlorine contact tank level. This arrangement will maximize energy capture by eliminating throttling across the PRVs under most operating scenarios. The PRVs are then only used when the municipal flow exceeds maximum turbine flow, or if the turbine requires maintenance.

Our Phase 2 efforts will focus on the following specific areas:

Clarify operational requirements and constraints
The Coffman team will define the constraints in the equipment RFP and require the turbine suppliers to address the requirements in their response. We plan to develop a Piping and Instrumentation Diagram (P&ID) and Electrical One-Line diagram, as well as narrative operational and cut-over requirements for the new work. We intend to work closely with Cla-Val to develop a solution that minimizes required PRV pressure drop for the rapidly changing flow conditions. Turbine installation in parallel with the PRVs would maximize energy capture while leaving open the option of a second turbine upstream of treatment to capture spilled water once water rights are in place.

Figure 1



3. **Define physical parameters for new equipment**
   Coffman will confirm or develop equipment weight and dimensional requirements/limitations for installation. Such limitations will include consideration of transportation, staging, lifting/crane work, maintenance access once installed. Due to existing equipment and piping layout, new equipment will need to be located near the raw water entrance to the facility, as shown in the attached concept sketch, Figure 1. We expect the turbine to be approximately the same footprint as a PRV, with the motor mounted vertically upwards. However, our intent is to maximize flexibility for the equipment manufacturer without impeding on the City's ability to use the facility as needed during construction and maintain the new equipment over the life of the project. For this "Pre-design Scoping" level of study, and based on the limited budget identified in the RFQ for Phase 2 work, onsite investigative work can be shifted to a later project phase, when appropriate. Such decisions would be made in concert with the City of Unalaska.

4. **Define installation requirements**
   Careful consideration of all major systems required for construction – civil/structural, mechanical, electrical, controls, corrosion – as well as evaluation of any impact to operations of the water or power utility is needed to ensure that all major cost items are identified and quantified in the Total Installed Cost (TIC) estimate.

5. **Confirm Energy Modeling results**
   Our prior experience indicates that the energy modeling needs to be revisited throughout the design process to confirm validity as the design progresses. We intend to review modeling results in light of operational constraints and final turbine sizing to ensure that the economic calculations are consistent with the planned infrastructure. Equipment selection will need to consider adaptability, such as seasonal nozzle replacement, to maximize energy capture. Prior studies indicated the intent to use the onsite generation to offset facility electricity consumption. While this is a worthy first step, the possibility of selling power to the utility should also be evaluated even if the revenue would be limited to the avoided cost of offset diesel.

6. **Customer water use and water rights/permitting**
   Water rights play a key role in economic calculations for this project, with impacts to basic infrastructure such as turbine sizing. Coffman and Solstice, our permitting consultant, are prepared to investigate the likelihood of obtaining additional water rights, and the timeline for doing so, under this Phase 2. This work will only be undertaken at this time if needed to properly select the turbines or evaluate project economics.

Our team is looking forward to helping the City of Unalaska develop this important project.


Eklutna Water Treatment Plant Turbine

KEY PERSONNEL RESUMES

Years of Experience

With this Firm: 5

With Other Firms: 10

Education

BS Mechanical Engineering; University of Virginia; 2002

License

Alaska; Licensed Mechanical Engineer; AELM12030; 2008

Professional/Community Activities

Refrigerating and Air Conditioning Engineers (ASHRAE)

IEEE Power and Energy Society

References

Dustin Highers, Chugach Electric Cooperative, (907) 762-4775

Jim Taiclet, Alyeska Pipeline Service Company, (907) 787-8807

Kris Manke, Yukon-Kuskokwim Health Corporation (907) 543-6054

MARTIN J. MILLER, PE

Project Manager, Mechanical Engineering

Martin has 15 years of design and project management experience in Alaska and abroad including experience in all stages of project development, planning, energy auditing, design, installation, commissioning, and operations. He is responsible for design and construction administration for utility, commercial, and industrial projects throughout Alaska. Martin also provides project management and design of energy projects with a focus on integrating renewable energy generation into existing isolated electrical grids.

Project Experience:

Yukon Kuskokwim Health Corporation
Bethel Hospital CHP Microturbines, Bethel, AK
Martin led a multi-discipline team in developing a concept for YKHC to self-generate heat and power onsite at their Bethel facility, The work included civil, structural, fire, electrical and mechanical facilities design, along with detailed energy analysis and cost estimating to enable comparison of the cost of ownership of the project vs. purchasing heat and power from the local utility.

AVEC Power Plant Engine Coolant Heat Exchanger Design, Bethel, AK
Martin was involved throughout the development of this project from concept development to commissioning. He was the project technical lead for the design development and supported final design of the new heat exchanger module for upgrades to the Bethel power plant heat recovery system. Upgrades included a new module to house heat exchangers totaling 30MMBTU/hr capacity and total pumping capacity of 2,850 GPM to serve current and anticipated future loads. During design, Coffman provided all engineering disciplines and management of cost estimating, architecture and geotechnical of sub-consultants. Martin was the project manager and primary technical representative during fabrication, installation and commissioning.

2016 Alyeska G004 PS01 Black Start Generator,Anchorage, AK
Martin was project manager for an alternatives analysis and front end engineering and design (FEED) to support upgrades to the onsite power generation system. He led Coffman's efforts from a technical and administrative perspective. The analysis included a review of reliability for equipment and fuel supplies to an isolated industrial facility, powered primarily by two gas turbines in the 5-13MW capacity range. Reciprocating and turbine generators in the 1MW capacity range were considered to meet blackstart and contingency power needs. The scope of work included project management
(project engineering), preliminary design, close coordination with Operations, and cost estimating to support the business case for recommended upgrades.

Solar PV 500kW Concept, Anchorage, AK
Martin was the project manager for this multi-stage solar PV project. The initial phase was a concept development to demonstrate commercial/utility scale photovoltaic (PV) in Anchorage up to 500kW DC, and to evaluate technologies and grid integration issues. Considerations included; siting options (ground-mount, rooftop, canopy, and wall mounted) on the main Chugach Electric Campus; construction cost and risk; levelized cost of energy; review of incentives like tax and financing, and PV panel efficiency -standard vs. premium. As project manager, Martin supported development of the concept, led development of the proposal response, provided bidding support, and is now acting as the Owner's Technical Representative during project execution.

CARL GARRISON, PE
Operations Manager

Carl Garrison is the operations manager of Coffman's office in Burlington, Washington and has been providing engineering services for nearly three decades. He has worked on various types of buildings including residential,commercial, institutional, and industrial projects. His experience includes water systems and treatment, HVAC, plumbing, fire protection, supervision of multi-disciplined engineering projects, and business management.

Project Experience:

City of Anacortes Rock Ridge Pump Station, Anacortes, WA 2017
Project manager and engineer of record for modifications to this city owned pump station. The design pressure was raised from 103 to 107 PSI and the flow was increased from 1,100 GPM to over 1,800 GPM without increasing the generator size or electrical service size. The selected VFD pumps were 4 – 5 HP vertical inline type, as well as replacing the impeller on the larger 125 HP fire protection pump. Included in the design was a new pump header and related fittings, system hydraulic analysis, and electrical upgrades.

Juniper Beach Water District, Camano Island, WA
Water systems engineer for Juniper Beach Water District projects since 2003. Projects include: two system mergers. One for a small transient public water supply and one for a group of 24 homes. In each case, a low interest loan and/or grant was obtained through the government to replace the systems so that it met the requirements of the larger utility. Carl designed and managed the projects on behalf of the JBWD to replace approximately 8500 lf of pipeline in the beach area homes and he assisted in setting up a utility local improvement district (ULID). Other projects include: design of a 120,000 concrete storage tank; the addition of twin 20–hp booster pumps and a 125 KVA 3-phase generator for new development and for fire protection; and major upgrades to iron and manganese filters and booster pumphouse.

Soar Technologies, Big Island of Hawaii
Provided engineering services in collaboration with Soar Technology for micro hydro turbines. Carl assisted Mike Maloney of Soar Technologies in developing plans and a process diagram for two projects; one in Volcano, HI and one in Kaloko, HI. Both micro hydro turbines had about 400’ of head and generated 30 Hp. Each installation used 5 hp regenerative blowers to evacuate the turbine blade housing so water could be discharged approximately 15 feet upgradient of the outlet of the turbine. A specific design consideration was the use of aluminum parts as the previous carbon steel compressor system failed after a year due to corrosion from the Big Island’s volcanic gases or VOG.

Total Years of Experience: 30

Education
Bachelor of Science in Mechanical Engineering; California State University, Chico 1989

License
Washington; Mechanical #31581
(also licensed in 6 additional states)
NCEES Certified

Professional/Community Activities
American Water Works Association (AWWA)
Sedro-Woolley Rotary, 1995-Present

Years of Experience

With this Firm: 10

With Other Firms: 6

Education

BS Electronics Engineering Technology; Western Washington University; 2002

License

Alaska; Licensed Electrical Engineer; AELE12169; 2008

Professional/Community Activities

Institute of Electrical and Electronic Engineers (IEEE)

International Society of Automation (ISA)

LON JOHANNES, PE

Engineer, Electrical Engineering

Lon's 16 years of multidiscipline experience as an electrical designer and project manager includes a variety of electrical engineering applications with special emphasis in applications for industrial and commercial and public safety projects. Lon commonly performs internal electrical QA/QC reviews on a number of projects for various clients. His SCADA experience includes remote project site monitoring systems, local platform PLC Systems, logic modifications, facility HMI screen updates and more.

Project Experience:

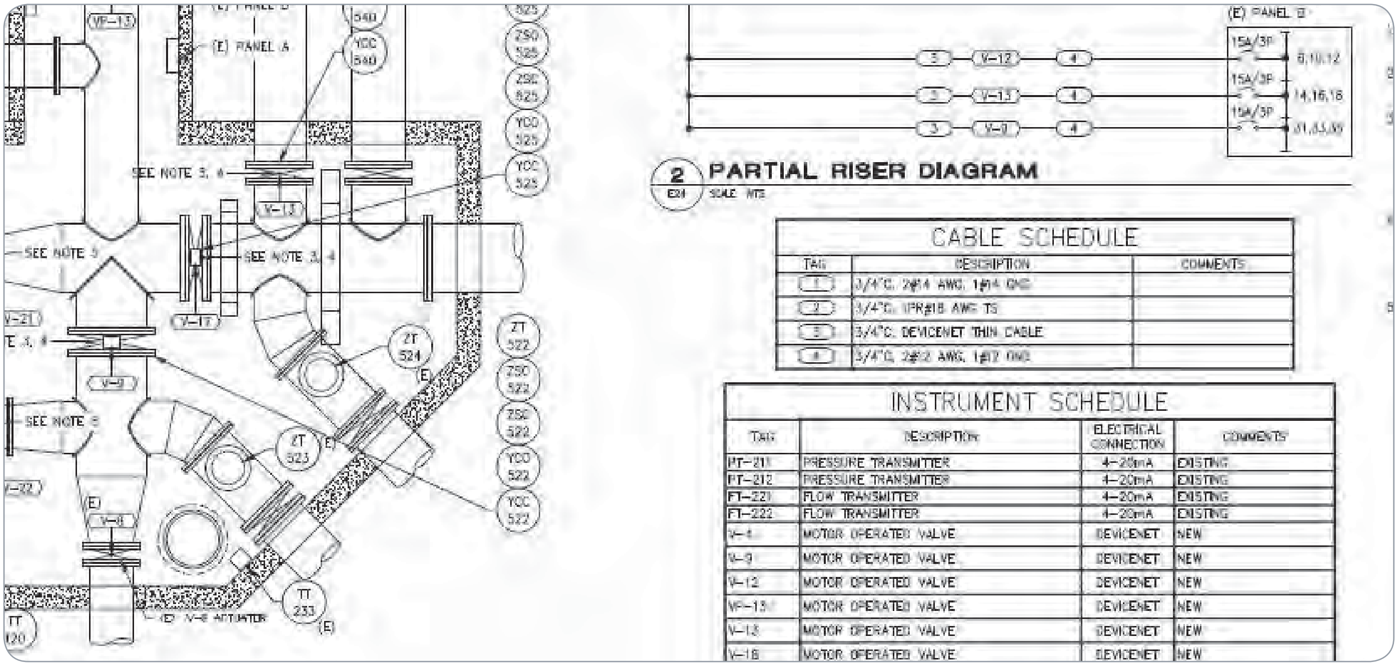
Anchorage Water and Wastewater Utility (AWWU)
Eklutna Water Treatment, Anchorage, AK
Electrical engineer for designing and preparing construction documents to implement filter to waste cycle for the existing filter beds. Coffman provided the all the associated design components for bidding, permit and construction to include specifications, drawings, and assistance with cost estimating.

Anchorage Water and Wastewater Utility (AWWU) SCADA Support
Anchorage, AK
Electrical engineer for SCADA technical services to support the maintenance and upgrade of AWWU's 130+ SCADA monitored and controlled sites. The sites are located across the Anchorage Bowl from Girdwood to Eklutna. The Term contract has included integration of a new generator at the Eklutna water treatment plant, programmable automation controllers at over 100 of the water and waste water distribution sites, integration of a new aeration system at the Eagle River waste water treatment plant and renovation of the Ship Creek Energy Recovery Station to include new controllers, motorized operated valves, pressure reducing valves and heat exchanger.

Finegayan Tank Replacement
Naval Base Guam Telecommunications Site (NBGTS)
The objective of the project was to replace the North and South Finegayan elevated water tanks with 500,000 gallon ground level, pre-stressed cylindrical concrete water storage tanks located on the Naval Base Guam Telecommunications Site. Coffman's scope of work included the design of PLC based control systems for the two replacement water storage tanks and their associated booster pump stations. The system design included installation of new motor control centers (MCC), new back-up generators, new flow, temperature, and pressure instrumentation and controls for the elevated water tanks and booster pumps. The solution included wireless Ethernet communication integration for each site into the existing remote monitoring system. The design was scheduled to occur between December 2015 and March 2016 and was completed on time and for the contracted budged without any contract change orders. 15 RFIs were issued during construction, which was completed between March 2016 and June 2017. The construction schedule was extended four months due to delays in pump procurement. There were no disputed changes or claims that remained at substantial completion.

Baza Gardens Cross-Island Pumping and Conveyance System
Hagatna, Guam
The objective of the project was to install a cross island wastewater pumping and conveyance system including Screening and Grit Removal headworks, Equalizing Tanks, and three Effluent Pump Stations. Coffman's scope of work included the electrical and instrumentation and controls design for the headworks screening and accumulation facility, 8 miles of sewage pipe and three pump stations. Each facility had generator backup power, PLC based control systems and wireless Ethernet communication integration into the existing Guam Water Association control network.

SAMPLE DRAWINGS

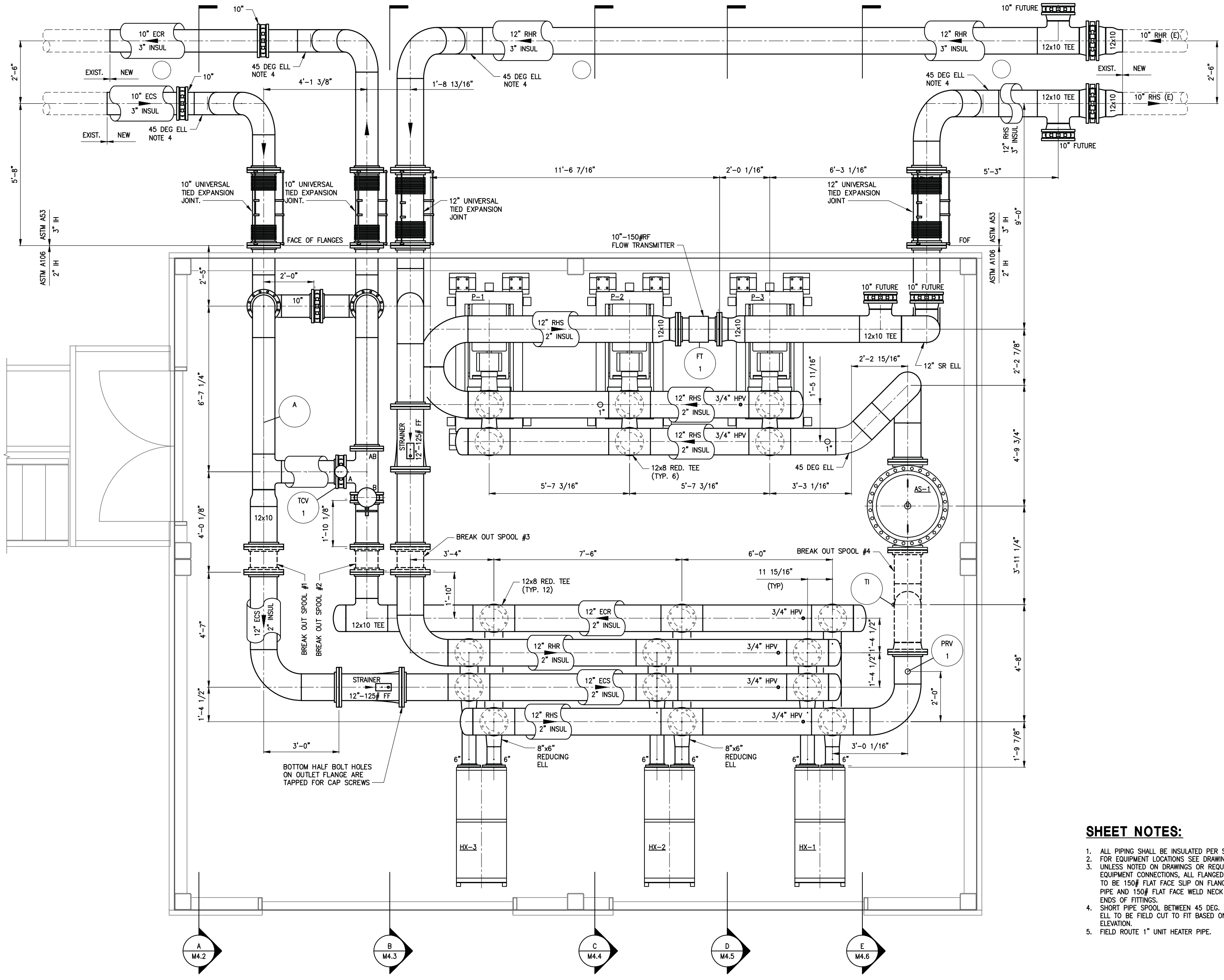


CABLE SCHEDULE

TAG	DESCRIPTION	COMMENTS
1	3/4"C, 2#14 AWG, 1#14 GND	
2	3/4"C, 1PR#18 AWG TS	
3	3/4"C, DEVICENET THIN CABLE	
4	3/4"C, 2#12 AWG, 1#12 GND	

INSTRUMENT SCHEDULE

TAG	DESCRIPTION	ELECTRICAL CONNECTION	COMMENTS
PT-211	PRESSURE TRANSMITTER	4-20mA	EXISTING
PT-212	PRESSURE TRANSMITTER	4-20mA	EXISTING
FT-221	FLOW TRANSMITTER	4-20mA	EXISTING
FT-222	FLOW TRANSMITTER	4-20mA	EXISTING
V-4	MOTOR OPERATED VALVE	DEVICENET	NEW
V-9	MOTOR OPERATED VALVE	DEVICENET	NEW
V-12	MOTOR OPERATED VALVE	DEVICENET	NEW
VP-13	MOTOR OPERATED VALVE	DEVICENET	NEW
V-13	MOTOR OPERATED VALVE	DEVICENET	NEW
V-18	MOTOR OPERATED VALVE	DEVICENET	NEW



PLAN NORTH

TRUE NORTH

1 PIPING PLAN

M4.1

SCALE: 1/2" = 1'-0"

1/2"=1'-0" 0 1 2 4 6

SHEET NOTES:

1. ALL PIPING SHALL BE INSULATED PER SPECIFICATION.
2. FOR EQUIPMENT LOCATIONS SEE DRAWING M4.0
3. UNLESS NOTED ON DRAWINGS OR REQUIRED AT EQUIPMENT CONNECTIONS, ALL FLANGED CONNECTIONS TO BE 150# FLAT FACE SLIP ON FLANGES AT ENDS OF PIPE AND 150# FLAT FACE WELD NECK FLANGES AT ENDS OF FITTINGS.
4. SHORT PIPE SPOOL BETWEEN 45 DEG. ELL AND 90 DEG. ELL TO BE FIELD CUT TO FIT BASED ON FINAL MODULE ELEVATION.
5. FIELD ROUTE 1" UNIT HEATER PIPE.

ISSUED FOR CONSTRUCTION

JEFFREY L. GILES
Feb 10, 2017
No. ME10943

COFFMAN ENGINEERS
AECC249
800 F Street
Anchorage, Alaska 99501
907.276.6664 www.coffman.com

NO.	DATE	BY	REVISIONS
0	02/10/17		ISSUED FOR CONSTRUCTION
A	07/22/16		ISSUED FOR 95% DESIGN REVIEW

SCALE	DATE	SHEET
AS NOTED	02/10/17	
NO.	M4.1	REV. 0

User: WALKER Feb 10, 2017 - 10:25pm
Drawing: P:\ANC\16JOBS\160318 AVEC BETHEL HX AE FINAL\0.0 DWGS\160318_M4.1.DWG - Layout: PIPING PLAN

SHEET NOTES:

1. ALL PIPING SHALL BE INSULATED PER SPECIFICATION.
2. FOR EQUIPMENT LOCATIONS SEE DRAWING M4.0
3. UNLESS NOTED ON DRAWINGS OR REQUIRED AT EQUIPMENT CONNECTIONS, ALL FLANGED CONNECTIONS TO BE 150# FLAT FACE SLIP ON FLANGES AT ENDS OF PIPE AND 150# FLAT FACE WELD NECK FLANGES AT ENDS OF FITTINGS.
4. ELECTRICAL ITEMS NOT SHOWN FOR CLARITY.

Feb 10, 2017
No. ME10943

COFFMAN ENGINEERS
AECC249
800 F Street
Anchorage, Alaska 99501
907.276.6664 www.coffman.com

NO.	DATE	BY	REVISIONS
0	02/10/17		ISSUED FOR CONSTRUCTION
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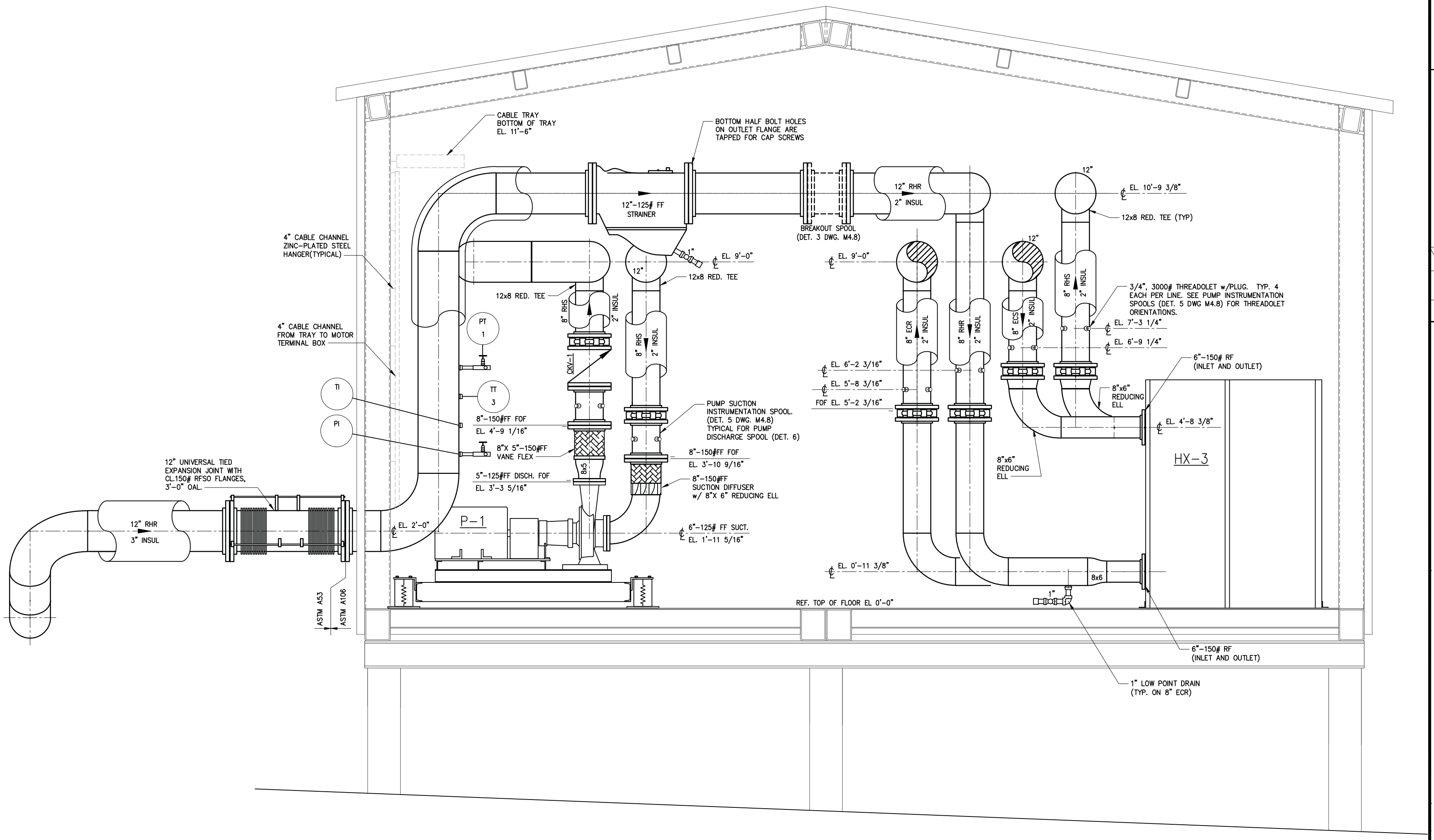


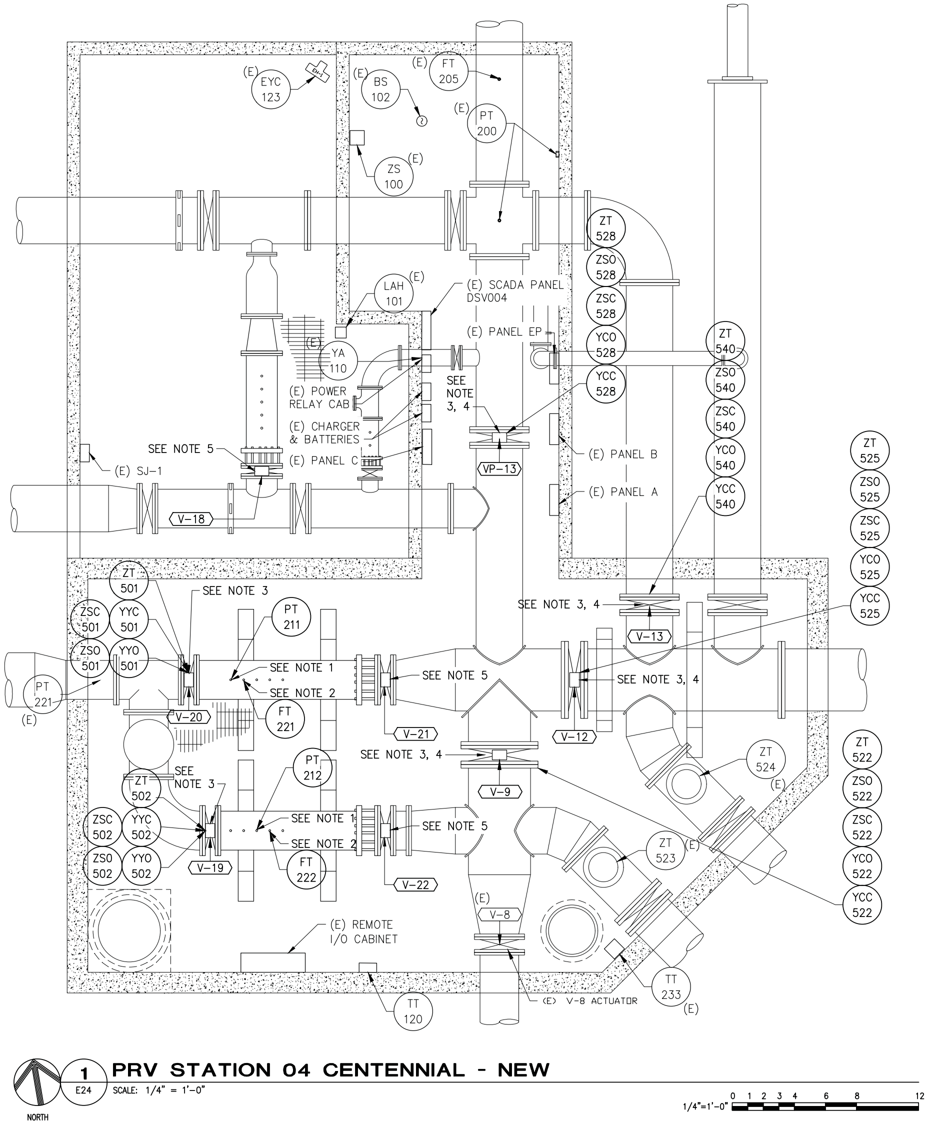
B PIPING SECTION B

M4.1
SCALE: 3/4" = 1'-0"

3/4"=1'-0" 0 1 2 4

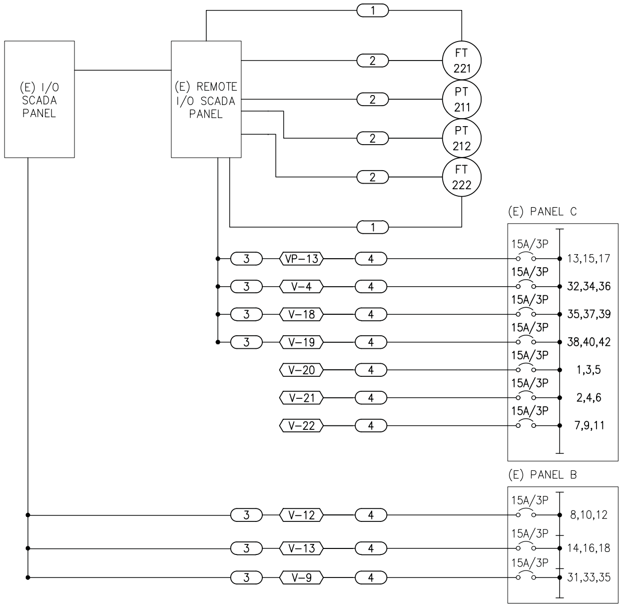
ISSUED FOR CONSTRUCTION

SCALE	DATE	SHEET
AS NOTED	02/10/17	
NO. M4.3		REV. 0



1 E24 PRV STATION 04 CENTENNIAL - NEW

SCALE: 1/4" = 1'-0"



2 E24 PARTIAL RISER DIAGRAM

SCALE: NTS

SHEET NOTES:

1. RELOCATE IDENTIFIED INSTRUMENTATION AS SHOWN ON NEW PLAN. EXISTING RACEWAYS MAY BE REUSED IF THE FILL CAPACITY DOES NOT EXCEED THE NEC OR SPECIFICATION REQUIREMENTS.
2. REMOVE ALL ABANDONED RACEWAYS.
3. SEE SHEETS E25-E27 FOR ADDITIONAL INFORMATION.
4. SEE E28 FOR DETAILS.
5. SEE SHEET E29 FOR PANEL SCHEDULE.

LEADER NOTES:

1. LOCATION OF RELOCATED PRESSURE TRANSMITTER.
2. LOCATION OF RELOCATED TEMPERATURE TRANSMITTER.
3. MOTOR OPERATED VALVE (MOV) CONTROL AND STATUS SIGNALS ARE TRANSMITTED VIA DEVICENET COMMUNICATION NETWORK. PROVIDE DEVICENET CABLE FROM EXISTING SCADA PANEL TO MOV OPERATOR. SEE SHEET E25 FOR MORE INFORMATION.
4. PROVIDE NEW WIRING TO V-13, VP-13, V-9, AND V-12 ACTUATORS FROM THEIR EXISTING CIRCUIT BREAKERS IN PANEL C AND PANEL B. FOR ADDITIONAL INFORMATION SEE PANEL SCHEDULES ON SHEET E30.
5. PROVIDE NEW WIRING TO V-20, V-21, AND 22 TO NEW CIRCUIT BREAKERS IN PANEL C. FOR ADDITIONAL INFORMATION SEE PANEL SCHEDULES ON SHEET E30.

CABLE SCHEDULE

TAG	DESCRIPTION	COMMENTS
1	3/4"C, 2#14 AWG, 1#14 GND	
2	3/4"C, 1PR#18 AWG TS	
3	3/4"C, DEVICENET THIN CABLE	
4	3/4"C, 2#12 AWG, 1#12 GND	

INSTRUMENT SCHEDULE

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V-9	MOTOR OPERATED VALVE	DEVICENET	NEW
V-12	MOTOR OPERATED VALVE	DEVICENET	NEW
VP-13	MOTOR OPERATED VALVE	DEVICENET	NEW
V-13	MOTOR OPERATED VALVE	DEVICENET	NEW
V-18	MOTOR OPERATED VALVE	DEVICENET	NEW
V-19	MOTOR OPERATED VALVE	DEVICENET	NEW
V-20	MOTOR OPERATED VALVE	208VAC	NEW
V-21	MOTOR OPERATED VALVE	208VAC	NEW
V-22	MOTOR OPERATED VALVE	208VAC	NEW

VERIFY SCALE

THIS BAR REPRESENTS ONE INCH ON ORIGINAL DRAWING. 0" 1" IF BAR IS NOT ONE INCH, ADJUST DRAWING SCALE ACCORDINGLY.

FULL SIZE SCALE
HORZ SCALE: N/A
VERT SCALE: N/A

DATA	DRAWN BY	CHECKED BY	DATA	DRAWN BY	CHECKED BY	REV	DATE	DESCRIPTION	BY
BASE	---		TELEPHONE	---					
TOPOGRAPHY	---		ELECTRIC	JPW					
PROFILE	---		CABLE TV	---					
SANITARY SEWER	---		TRAFFIC SIGNAL	---					
STORM SEWER	---		DESIGN	---					
WATER	---		QUANTITIES	---					
GAS	---		MUN. FINAL CHECK	---					
PLAN CHECK						REVISIONS			

RECORD DRAWING Note: To be filled out on original drawings upon project completion.

1. DATA PROVIDED BY: ________
This will serve to certify that these Record Drawings are a true and accurate representation of the project as constructed.
CONTRACTOR: ________
BY: ________ TITLE: ________
DATE: ________
2. DATA TRANSFERRED BY: ________
COMPANY: ________
DATE: ________
3. Based on periodic field observations by the Engineer (or an individual under his/her direct supervision), the Contractor-provided data appears to represent the project as constructed.
DATA TRANSFER CHECKED BY: ________
COMPANY: ________
BY: ________ TITLE: ________
DATE: ________

REUSE OF DOCUMENTS

THIS DOCUMENT AND THE IDEAS INCORPORATED HEREIN, AS AN INSTRUMENT OF PROFESSIONAL SERVICE, IS THE PROPERTY OF AWWU AND IS NOT TO BE USED, IN WHOLE OR IN PART, FOR ANY OTHER PROJECT WITHOUT WRITTEN AUTHORIZATION OF AWWU.

COFFMAN ENGINEERS
800 F Street | Anchorage, Alaska 99501
ph 907.276.6664 | fax 907.276.5042
coffman.com
LASTING creativity | results | relationships

CONSULTANT

SEAL

Attachment 4D
EPS

EPS Statement of Qualifications

Electric Power Systems, Inc. (EPS)

Corporate Headquarters:
3305 Arctic Blvd. Suite 201
Anchorage, Alaska 99503
Tel: (907) 522-1953
Fax: (907) 522-1182
eps@epsinc.com

Point of Contact:
Bill Farrell, P.E., PMP
2213 North Jordan Ave.
Juneau, AK 99801
Tel: (907) 523-3104
Fax: (907) 522-1182

STATEMENT OF QUALIFICATIONS

The City of Unalaska

Pyramid Water Treatment Plant Inline Microturbines Design

DPU Project No 17401

Submitted: January 17, 2019

Electric Power Systems inc.
Consulting Engineers

3305 Arctic Blvd. Suite 201
Anchorage, Alaska 99503
Ph: (907) 522.1953
Fax: (907) 522.1182
Email: eps@epsinc.com

City of Unalaska
Department of Public Works
Attn: Robert Lund, P.E., City Engineer

January 17, 2019

Re: Pyramid Water Treatment Plant Inline Microturbines Design

Electric Power Systems, Inc. (EPS) is pleased to present our qualifications for the *Pyramid Water Treatment Plant Inline Microturbines Design*.

EPS is a full-service, multidisciplinary consulting firm specializing in electrical and mechanical utility engineering with offices in Anchorage and Juneau, as well as several locations in Washington. We assemble highly-qualified multidisciplinary teams, including sub-consultants as needed, to meet the specific needs for our projects. For this project we are proposing personnel from our active mechanical design group, supplemented by Travis/Peterson Environmental Consulting, Inc. as a subcontractor.

Thank you for the opportunity to provide our qualifications for this project. We have delivered a great number of services to the City, and we look forward to working with Unalaska again. The attached pages briefly provide our qualifications in accordance with the Utility's request. We have the right resources available to commit to this project, and look forward to working with and developing a long and successful relationship with the Utility. Please contact me at (907) 646-5119 with any questions you have.

Sincerely,

Electric Power Systems, Inc.
David W. Burlingame, P.E.
Principal, President

Table of Contents

5.1 PROFESSIONAL QUALIFICATIONS

Electric Power Systems, Inc., is pleased to present this statement of qualifications to the City of Unalaska to deliver inline microturbine designs for your Pyramid Water Treatment Plant.

The key personnel assigned to this project are industry experts in their respective fields and will be able to professionally and efficiently accomplish the goals of Phase II, pre-design scoping. We propose approaching this project with a small team of experts, each of whom is supported by qualified professional staff. All members of the project team will participate in developing the conceptual design report and conceptual plans.

We note in Section 4.0, Selection Process, that it is recommended that the statement of qualifications should "focus on the project management and architectural team rather than other disciplines." To clarify, we do not see any reason for an architectural team to be involved at this stage of the project. If building or life/safety changes are identified in the 15% designs, we will recommend the involvement of an architect during Phase III.

Bill Farrell, PE, PMP will be the lead electrical engineer and project coordinator for this project. Mr. Farrell has managed and designed multiple utility projects from electrical controls to medium voltage power distribution. His responsibilities started with project conceptualization and scoping all the way through the project life cycle to final testing and commissioning. His expertise and leadership, combined with experience and ability to prioritize and facilitate, make him an asset on any project. Mr. Farrell works out of EPS' Juneau office.

Jason Rowland, PE will provide mechanical engineering for this project and draft the RFQ package for microturbine procurement. Mr. Rowland has wide-ranging experience designing industrial mechanical systems for Alaska's climate and has become a leading expert in power generation mechanical systems. He is currently the Mechanical Engineering department manager and has served as the lead project manager coordinating complete power plant design and construction projects. Prior to joining EPS, Mr. Rowland spent 4-years working with an environmental engineering firm that specializes in water and wastewater treatment. One of Mr. Rowland's recent accomplishments was resolving control stability problems at the domestic water pressure reducing station at Kodiak Electric's Terror Lake Hydro Plant. Mr. Rowland works out of EPS' Anchorage office.

Mike Travis, PE will review all environmental permits related to this project and provide a comprehensive plan to apply for new permits and update permits during Phase III. Mike's vast education and expertise with State agencies, Federal laws and statutes, and working with local communities enables him to effectively manage projects throughout Alaska. He is a registered civil engineer in Alaska. Mr. Travis works out of Travis/Peterson's Anchorage offices that shares the same building as EPS.

5.2 – EXPERIENCE AND REFERENCES

City of Unalaska - ORC

EPS, working with other members of the Engineered Solutions Group, Inc. (ESG), delivered complete engineering, design, procurement, construction management, and commissioning to the City of Unalaska during a recent $2.35 Million dollar upgrade to their Unalaska Power Plant. This successful project enhanced powerhouse efficiency by adding water jacket heat capture equipment to the existing thermal generation units. Based on an average of data collected over a nearly one year period following project completion, the City can realize an estimated savings of 45-50K gal. of fuel/year. The new systems had 98% operational availability in the first 15,000 hours.

Petro Star Valdez Refinery Waste Water Treatment Plant
Starting in 2013, EPS teamed with Travis/Peterson to design and construct a new stormwater treatment system at the Petro Star Valdez Refinery. The design utilized a 10,000 bbl surge tank, a floating skimmer, and an air stripping tower to remove residual product from storm water collected throughout the facility. The new plant was installed and commissioned in 2015 following extensive and complex permit negotiations with ADEC. The new project was intended to replace an existing failing system and required detailed onsite asbuilting of process piping and equipment to determine routing and tie-in points. Following a mandate from our client, we also reused and repurposed existing installed equipment wherever possible.

Travis/Peterson and EPS are currently in the design and permitting phase for an additional upgrades to the treatment system to expand the intended purpose and functionality of the facility. The expanded facility requires the addition of multi-stage media filters and an automatic filter press in a new process building.

Dutch Harbor Powerhouse Thermal Discharge Modeling and Permitting
The Travis/Peterson team, with assistance from EPS, Modeled and permitted the thermal discharge effluent from the Dutch Harbor Powerhouse. EPS provide a model of plant heat inputs into the seawater cooling system under different electrical loads. Travis/Peterson acquired an Alaska Pollutant Discharge Elimination System (APDES) discharge permit from the ADEC based on the thermal modeling and other site data.

References:
These past and current clients will vouch for the quality and value of EPS' work.

Dan Winters
City of Unalaska, Director of Public Utilities
907-581-1260
dwinters@ci.unalaska.ak.us

JR Pearson
City of Unalaska, Deputy Director of Public Utilities
907-581-1260
jrpearson@ci.unalaska.ak.us

Lloyd Shanley
Kodiak Electric Association, Generation Manager
(907) 654-7763
lshanley@kodiak.coop

Lisa Lewis, Director of Government Compliance and Safety
Petro Star, Inc.
Anchorage, Alaska
(907) 339-6630

5.3 NARRATIVE WORK PLAN

If awarded this project, we will first seek to survey available microturbine vendors and review existing and potential new permits. The goal of the vendor survey will be to establish an initial vendors list and define available technology. The goal of the permit review will be to establish overall permitting requirements for the various directions that this project may take; this will inform scoping decisions during the kickoff meeting.

We will schedule a project kickoff meeting with the City following our survey of vendors and permits. EPS will provide a meeting agenda and take meeting minutes. Our primary goal during the project kickoff meeting will be to further define the scope, especially as it relates to whether the City wishes to pursue a permit to allow higher power generation through excess bypass discharge. We will also present our findings from our initial survey of vendors and permit requirements.

The environmental team at Travis/Peterson will review FERC licensing requirements for small turbine projects, estimate flow requirements and timing for turbine operations, and estimate amount of Icy Creek Reservoir storage. Travis/Peterson will then determine if the discharge to Pyramid Creek would be affected. If the discharge will be significantly lower than normal, Travis/Peterson will coordinate with ADF&G under Title 16.05.871 (anadromous fish habitat) to determine permitting requirements. In addition, Travis/Peterson will coordinate with ADNR to expand water rights for power use. This project should not require an Alaska Pollutant Discharge Elimination System permit as nothing is being added to the water. ADEC Drinking Water Division must review the turbine system to ensure it will not affect drinking parameters.

10% designs will begin following the kickoff meeting. After an interim design review meeting with the City, we will complete the final 15% designs that will include conceptual floor plans, flow schematics, control network topology, and one-line diagrams. We have supplied one possible arrangement of the turbine installation as part of this proposal (attached redline drawing). We believe that this arrangement will have the lowest installation cost, the highest generation efficiency, will be easiest to control, and allow 100% flow control redundancy. This design can also be installed while maintaining 100% uptime at the treatment facility. This arrangement can be modified with an upstream diversion branch and second turbine installation if permit modifications allow excess flow. This plan will also resolve the following scope item listed in the request for qualifications without costly replacements: "It is critical that we reconfigure or replacing the existing in-plant PRVs with automatic flow control valves to repurpose the 30 PSI head loss incurred to operate PRVs to the GPRVs."

We will perform preliminary pressure surge calculation to determine if surge arrestors or fast-opening valves may be needed to stabilize the system during abnormal events. In addition, our controls and mechanical engineers will review an array of possible system stability risks and incorporate mitigation measures into our 15% design. We will work directly with Boreal Controls to develop an integration plan for the new process controls. Regardless of the turbine technology selected, we will attempt to tune the CT Tank level control loop to reduce rapid control valve fluctuations.

Our electric engineering group will review the capacity of the existing 34.5 kVA 3-phase primary and outline a net-metering and protection relay scheme. If needed, the turbine's control valve will be configured to automatically modulate to limit power output to the primary capacity. We will also recommend a feeder voltage study if it appears to be necessary. If significant excess generation is available, we will include a design basis for an energy storage solution.

The microturbine vendor RFQ package will include the 15% plans as a basis of design. The RFQ will be a complete document that includes flow profiles, electrical and mechanical specifications, proposed project schedule, and a clear list of deliverables. Travis/Peterson will provide a list of allowable materials that may be in direct contact with the water supply. One way that we create the best possible vendor RFQs is to provide a list of deliverables for each phase of the project. For example, the RFQ will have a separate list of deliverables required for the bid, pre-production, shipment, commissioning, and post-commissioning phases. Defining the deliverables for each step levels the bid values and circumvents potential conflicts.

We will create a Total Installed Cost (TIC) estimate that will develop as the design progresses. The cost estimate will include materials, construction, and engineering. We will work directly with one of the more promising vendors to define a budgetary estimate for the turbine package.

We will supply the City with a draft review copy of the project deliverables and schedule a final review meeting. Following the review meeting, we will complete and deliver the final documents. We expect that the City will directly issue the RFQ package to GPRV vendors. EPS will be available to assist with proposal reviews and questions during the bid phase as they come up.

A detailed list of our deliverables will include:

- Provide draft meeting agendas and meeting minutes for the kickoff and review meetings.
- 15% design documents to define the scope of the project clearly and to assist in the identification and selection of a suitable GPRV vendor. The 15% designs will include conceptual floor plans, flow schematics, control network topology, and one-line diagrams.
- A design basis narrative with our findings and a detailed engineering scope for Phase III.
- Complete preliminary pressure surge modeling and control dynamic analysis.
- Work with the City to develop a qualified GPRV vendors list.
- Develop a technical specification and related RFQ documents for the City's use in the procurement of a GPRV. The technical specification will identify project requirements and deliverables for the microturbine suppliers.
- Support the City with RFI responses and qualification reviews from GPRV vendors.
- Identify communications infrastructure requirements for Powerhouse control of microturbine.
- Identify of all required permits and estimated timelines for obtaining these permits
- Provide a cost estimate for the remainder of the project, including GPRV procurement, engineering, construction, and commissioning. The estimate will be based on the 15% design and information from the GPRV vendor.

Attachments:
Billing rates of key personnel
Sample floor plan and details
Possible turbine arrangement

William Brown-Farrell, PE, PMP

Professional Electrical Engineer

Contact:

2213 North Jordan Ave.
Juneau, AK 99801
Email: bfarrell@esgrp.net
Ph: (907) 523-3104
Fax: (907) 522-1182

Professional Registrations

Professional Engineer, State of Alaska	**License No. 14082**
Project Management Professional, Project Management Institute	**No. 2436212**

William has designed and managed multiple electric utility projects ranging from generation to distribution. His responsibilities started with project conceptualization and scoping all the way through the project lifecycle to final testing and commissioning. His expertise and leadership, combined with experience and ability to prioritize and facilitate, make him an incredible asset on any project.

Relevant Experience

Flywheel Energy Storage System **ongoing**
City of Unalaska, Unalaska, Alaska
Provide design engineering and project management for the development of the City's Flywheel Energy Storage System (FESS) project. Tasks have included development of a technical RFQ for the FESS equipment supply, research of possible vendors, determination of site plan options and the design of system configuration changes to accommodate the new equipment.

Captain's Bay 35kV Feeder Upgrade **2015**
City of Unalaska, Unalaska, Alaska
Provided electrical design engineering and project management for a new 35 kV underground power line to provide increased utility power capacity to Westward Seafoods. Design deliverables included signed stamped drawings, construction specifications and complete contract documents. The project also included construction engineering support and project management assistance for the City during bidding and construction phases.

Headworks **2016**
City and Borough of Juneau, Juneau, Alaska
Provide design engineering services as a subcontractor to Dowl Engineers for CBJ. Worked with Dowl to develop design to replace existing auger system with new headworks screens. Design required that the plant was to be kept operational throughout the construction project.

KEA Port Lions Standby Generator **2016**
Kodiak Electric Association, Port Lions, Kodiak Island, Alaska
Provide design engineering and project management services for project to install a standby generator to support the remote town of Port Lions in the event of a system outage. Developed generator specifications and worked with manufacturer and client to procure generator and to incorporate KEA owned PLC into generator controls. The new generator is remotely monitored and operated by KEA SCADA.

Arc Flash Relay Upgrades **2016**
Hecla Greens Creek Mine, Juneau, Alaska
Provide installation oversight, inspection and commissioning services for new arc flash protective relays in the Powerhouse 4.16kV switchgear. Develop and test relay programming.

Valdez Diesel Plant Caterpillar Installation **2015/2016**
Copper Valley Electric Association, Valdez, Alaska
Provide design engineering services for Copper Valley Electric Association's project to install two 2.0 MW diesel generators and 4.16 kV switchgear into an existing power plant. Design tasks include incorporating new controls into existing systems and planning project phasing to keep plant online at all times.

Westward Alyeska Plant Utility Tie **2015**
Westward Seafood
Design, installation inspections and commissioning for protective relay replacement and power import/export control devices for new utility tie. Project scheduling and coordination to complete installation work in operating facility.

Install Unit 12 Generator **2014/2015**
City of Unalaska, Unalaska, Alaska
Working for the City of Unalaska, provided on site construction project management and field engineering services for the installation of a new 4.4MW diesel generator in the City's existing power plant.

Electrical Engineering **2009/2014**
Doyon Utilities, Fairbanks, Alaska
Provided engineering and project management on multiple concurrent electric utility projects with a total project load of approximately $30MM. Developed the current utility design and construction standards. Performed service and pole line extension design and inspections. Provided frequent project construction and budget updates to senior management and Government (customer) representatives. Worked with contractors to develop system documentation including one-lines, sectionalizing maps and system maps.

Education

B.S. Electrical Engineering, University of Alaska Fairbanks, 2009

Jason Rowland, P.E.

PROFESSIONAL MECHANICAL ENGINEER

Contact:

3305 Arctic Blvd. Suite 201
Anchorage, AK 99503
Ph: (907) 522-1953
Fax: (907) 522-1182

Professional Registrations

Professional Mechanical Engineer	**State of Alaska, License No. 13143**
Professional Mechanical Engineer	**State of Washington, License No. 52931**

Mr. Rowland has wide-ranging experience designing industrial mechanical systems for Alaska's climate. He has also had the opportunity to see many of his project through to completion and participate in the commissioning phase. Mr. Rowland credits much of his design quality to his background working with his hands as a machinist/welder in industrial fabrications shops.

Relevant Experience

Naknek Electric Association Power Plant Expansion **(in construction)**
Naknek, Alaska
Mr. Rowland directly managed the design team, oversaw mechanical engineering, and provided construction support for a new 6.6MW powerhouse with two EPA Tier IV certified 3.3 MW CAT C280-12 generators. Mr. Rowland's team completed all required civil, structural, mechanical, and electrical designs. Rapid expansion of the fish processing industry required that the Utility purchase and install new generation. Although the technology has been in place for several years, Naknek Electric was one of the first remote Alaska utilities to install EPA Tier IV certified generators requiring Diesel Exhaust Fluid (DEF).

A new fuel system was engineered by Mr. Rowland to supply each generator with fuel cooling, filtration, and temperature-compensated metering based on our extensive past experience with C280 generator installations. The fuel system tied to to an existing bulk tank farm with a new above ground fuel line with redundant safety and control systems connected to the plant's PCMS and new day tanks. EPS was responsible for designing and installing the plant's PCMS controlling the fuel system and will be commissioning the new fuel system and PCMS in early 2019.

Kodiak Electric Association Terror Lake Pressure Reducing Station **2016**
Kodiak, Alaska
A pressure reducing station that supplies domestic and fire water from the Terror Lake penstock had a perpetual occurrence of hammering during operation. The system was intended to reduce pressure from the 570psi penstock to the 80psi water distribution pressure at 80gpm. Mr. Rowland evaluated the system and determined that the root cause was an incorrect pilot configuration and small-diameter elbows immediately upstream and downstream of the first and second stage PRVs. As a solution, Mr. Rowland provided a pre-fabricated piping design to resolve the configuration of the two PRVs and coordinated with the valve manufacturer to reconfigure the control pilots. The utility was able to resolve the issues with minimal field work and avoid replacing the existing control valves.

Homer Electric Association Gerry Willard Generating Station Upgrade
Seldovia, Alaska - 2015 Design, 2016 Completion
Provided a complete design for a new fuel distribution system for a 2.2MW standby generation plant. The project included integrating a new CAT C32 generator package alongside an older 1.2MW unit. A new fuel offloading station and bulk tank controls were installed for an existing tank. A day tank was added for the new generator and the existing tank was refurbished with new controls. As an unmanned plant, the facility required a high level of redundancy in the fuel controls to reduce spill risk during automatic forwarding operations. The fuel control system was integrated with the plant's PCMS with redundant shut off and level controls for the highest level of reliability and remote monitoring capability.

Kodiak Electric Association Swampy Acres Emergency Substation Design-Build
Kodiak, Alaska - 2014 Design, 2015 Completion
Mr. Rowland designed mechanical HVAC, engine cooling, and fuel system, and provided construction support for a new 10 MW standby powerhouse. The project included installing a new 4.4MW CAT C280 diesel generator alongside two older CAT 3516 diesel generators. As a standby plant, this design required a minimalistic approach to develop the highest value for the client; a task that the EPS/EPC design team was able to accomplish while keeping the same level of vertical integration that we provide in prime power installations.

This was a design/build project with EPC, EPS, Mechanical Builders, Inc. (MBI), and other members of Engineered Solutions Group working together from project planning, to final commissioning. Our work on this project included the installation of a new Cat C-280 4.4 MW generator, and relocation of two Cat 3516 generators. MBI installed the generators, including the fuel, exhaust and cooling systems.

Petro Star Valdez Refinery Storm Water Treatment
Valdez, Alaska
Mr. Rowland designed mechanical systems and provided construction support for a new stormwater treatment system at the Petro Star Valdez Refinery. The design utilized a 10,000 bbl surge tank, a floating skimmer, and an air stripping tower to remove residual product from storm water collected throughout the facility.

Education

M.S. Mechanical Engineering, University of Alaska Fairbanks, 2010
B.S. Mechanical Engineering, University of Alaska Fairbanks, 2007

Michael D. Travis, P. E.

Environmental Engineer

Mike has over 38 years of experience in environmental projects in Alaska. He currently is a Principal owner in Travis/Peterson Environmental Consulting, Inc., specializing in site remediation throughout Alaska.

Mike's vast education and expertise with State agencies, Federal laws and statutes, and working with local communities enables him to effectively manage projects throughout Alaska. He is a registered civil engineer in Alaska.

Work Experience

Principal, Travis/Peterson Environmental Consulting, Inc. (1997 to present)

Responsibilities: Co-Owner and Principal of an environmental engineering consulting firm. Provided a wide range of environmental and engineering services for private and governmental agencies. Performed environmental impact analysis for new and expanded highways, airports, mines, and power plants. Impact analysis involved air and noise modeling, storm water planning, public involvement, and social-economic analysis. Designed corrective action plans to respond to hazardous waste spills and assess the area of contamination. Performed Phase I and Phase II environmental site assessments for properties throughout Alaska. Designed soil and groundwater remediation systems.

Chief of Professional Services, Alaska Department of Transportation and Public Facilities (DOT&PF) (1996-1997)

Responsibilities: Supervised the contracting and negotiating of engineering and construction projects within the Central Region of DOT&PF. Assisted in the final design of the Whittier Tunnel Access project. Provided environmental expertise for DOT&PF defense of a lawsuit within the Ninth Circuit Court of Appeals.

Vice President, AGRA Earth and Environmental, Inc. (1991 – 1996)

Responsibilities: Managed geotechnical and environmental engineering offices in Fairbanks and Anchorage, Alaska. Reviewed final work products before submitting them to clients. Designed hazardous waste remediation treatment systems for remote canneries. Headed the Whittier Tunnel Access Environmental Impact Statement project team and lead all public relations. Performed Environmental Assessments to fulfill requirements of the National Environmental Policy Act for construction projects throughout Alaska. Environmental Manager for the Whittier .Tunnel EIS. Supervised 30 employees. Developed corrective action plans for spill sites.

Education

University of Alaska Fairbanks

B.S. Fishery Biology -1981

M.S. Environmental Quality Science - 1986

Certifications

Hazardous Waste Operations and Emergency Response Certification, Supervisors Course

Registered Civil Engineer in Alaska. Registration number CE 8048

Certified Fishery Scientist. American Fishery Society

Travis/Peterson Environmental Consulting, Inc.

Pertinent Experience:
New Unalaska Power Plant: Performed site remediation and received cleanup approval from the Alaska Department of Environmental Conservation (ADEC), developed National Environmental Policy Act (NEPA) documentation, and assisted in acquiring Title V air permit.

Old Dutch Harbor Powerhouse Cooling Water Discharge: Modeled and permitted the thermal discharge effluent from the Dutch Harbor Powerhouse. Coordinated with City engineers and operators to determine plant cooling needs. Acquired an Alaska Discharge Elimination System discharge permit from the ADEC.

Unalaska Electrical Master Plan: Participated in the development of the City of Unalaska Electrical Master Plan. Scoped the various permits required for future projects.

Nome Snake River Powerhouse: Performed site remediation and received cleanup approval from the ADEC, developed NEPA documentation, and assisted in acquiring Title V air permit.

Togiak Seafood Plant Water Treatment System: Designed, permitted, and installed a new reverse osmosis drinking water treatment plant. Negotiated with ADEC for authority to construction and operate.

Red Salmon Cannery Water Treatment Plant: Designed, permitted, and installed a new ozone-disinfectant drinking water treatment plant. Negotiated with ADEC for authority to construction and operate.

Travis/Peterson Environmental Consulting, Inc.

ATTACHMENT B: BILLING RATES

Mike Travis: $195/hr
Jason Rowland: $182/hr
Bill Farrell: $168/hr

Support staff bill between $130 and $160

Electric Power Systems inc.
Consulting Engineers

Electric Power Systems, Inc. Fee Schedule

Valid through 12/31/2019

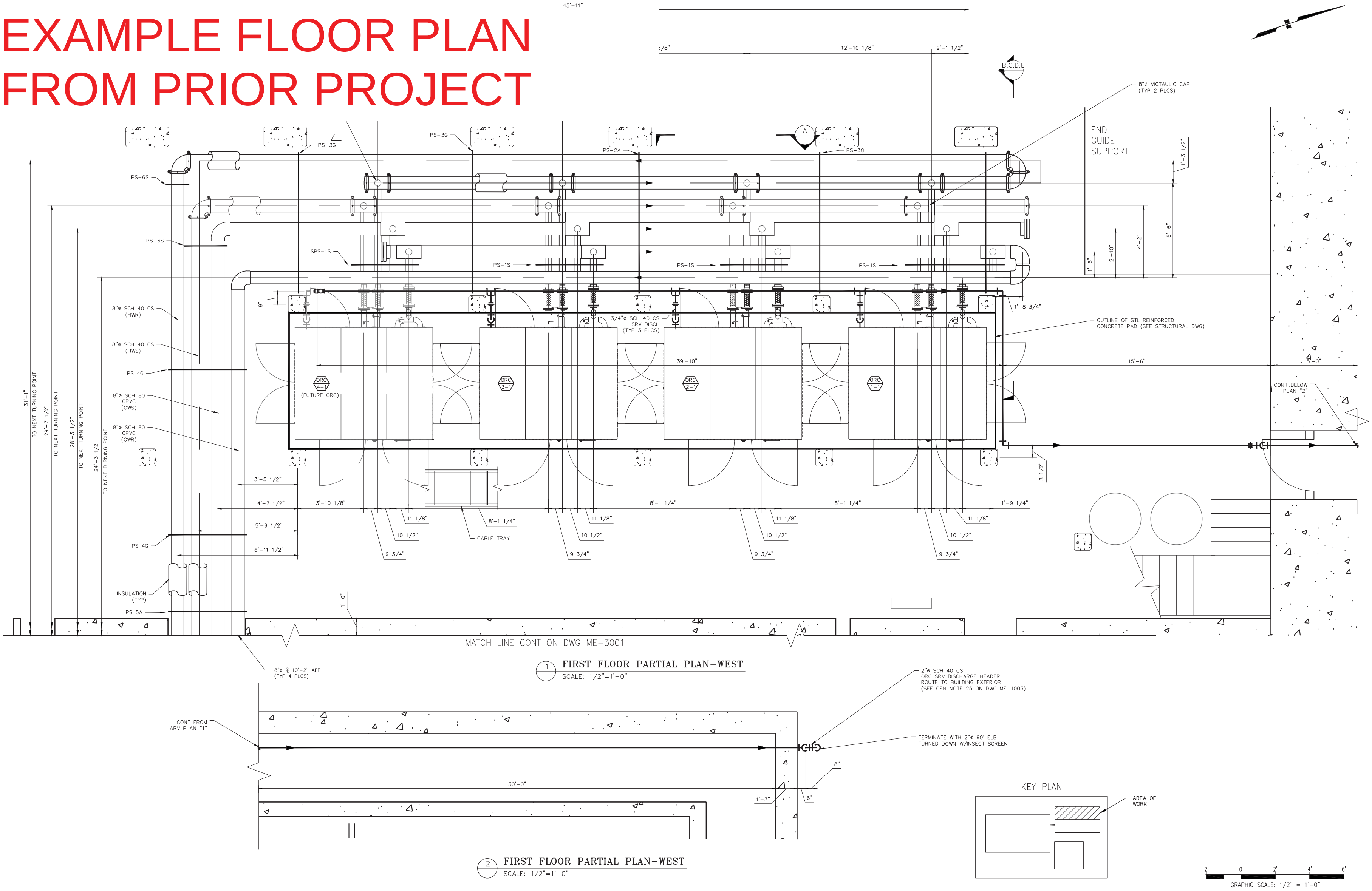
Testimony, deposition/expert witness	$437.00
Engineer XII	$233.00
Engineer XI	$215.00
Engineer X	$200.00
Engineer IX	$182.00
Engineer VIII	$175.00
Engineer VII	$168.00
Engineer VI	$162.00
Engineer V	$156.00
Engineer IV	$146.00
Engineer III	$130.00
Engineer II	$117.00
Engineer I	$109.00
Project Manager VI	$215.00
Project Manager V	$200.00
Project Manager IV	$182.00
Project Manager III	$175.00
Project Manager II	$168.00
Project Manager I	$162.00
Engineer Tech VI	$175.00
Engineer Tech V	$162.00
Engineer Tech IV	$139.00
Engineer Tech III	$121.00
Engineer Tech II	$107.00
Engineer Tech I	$90.00
ROW Manager	$178.00
ROW Senior Agent	$155.00
ROW Agent	$112.00
ROW Assistant	$82.00
Professional Land Surveyor	$167.00
Expeditor	$90.00 ST / $119.00 OT
Clerical	$62.00
Office Manager	$77.00

1. The above listed rates are per hour.
2. The fee schedule is subject to review on January 1, 2020, and on January 1 of each year thereafter.
3. Expenses incurred, as necessary part of engineering services under this contract will be billed at cost plus 10%. Incidental expenses, such as computer usage, local phone service, and copying are included in the above rates. If Per Diem is utilized (vs. expenses and markup), it will be at the Federal Rates.
4. Services and materials purchased by Electric Power Systems, Inc. at the request of the owner will be billed at cost plus 10%.
5. Services and materials provided by other Engineered Solutions Group, Inc. companies will <u>not</u> be subject to intra-company markup, and are subject to the above fee schedule.
6. Interest at the rate of 1.5% per month (less, if restricted by law) may be charged for invoices greater than 60 days past due.

Electric Power Systems, Inc.
A division of Engineered Solutions Group, Inc.
3305 Arctic Blvd., Suite 201, Anchorage, AK 99503
Phone (907) 522-1953, Fax (907) 522-1182, www.esgrp.net

ATTACHMENT C: FLOOR PLAN AND POTENTIAL TURBINE ARRANGEMENTS

EXAMPLE FLOOR PLAN FROM PRIOR PROJECT



① FIRST FLOOR PARTIAL PLAN–WEST
SCALE: 1/2"=1'-0"

② FIRST FLOOR PARTIAL PLAN–WEST
SCALE: 1/2"=1'-0"

GRAPHIC SCALE: 1/2" = 1'-0"

PROJECT: ORC DESIGN SERVICES
DESIGNER/PROJECT ENGINEER: E. GEORGE/M. HAUKE – EPS JOB #: 13–0124

NO.	DESIGN/CONSTRUCTION/ASBUILT REVISION	DWN BY/DATE	REVIEWED BY/DATE
0	ISSUED FOR CONSTRUCTION	TJG/07–17–2014	MJH/07–17–2014
1	AS–BUILT	XJH/11–05–2014	MJH/11–05–2014

ENG. STAMP

Electric Power Systems Inc.
Consulting Engineers
TEL: (907) 522–1953
FAX: (907) 522–1182
WEB: WWW.EPSINC.COM

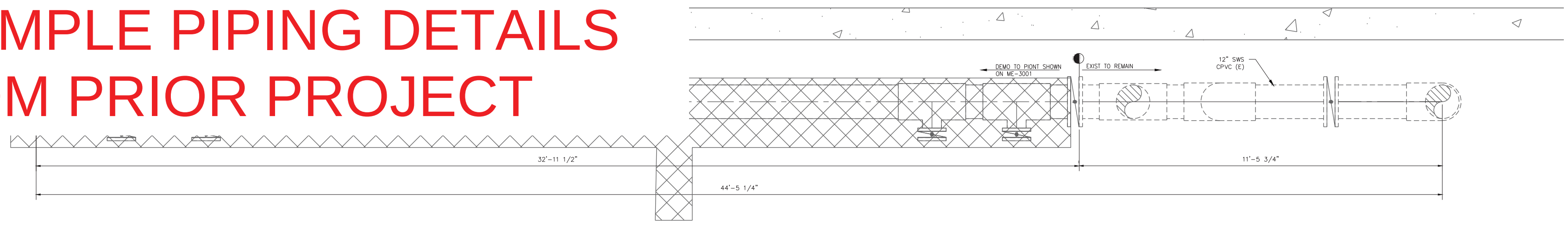
NO.	DRAWING NO./SHEET	REFERENCE DRAWING/DETAIL/PLAN/SECTION DESCRIPTION
A	ORCD–ME–3101	ORC REAR SECTION LOOKING EAST
B	ORCD–ME–3101	ORC HOT WATER SUPPLY LOOKING SOUTH
C	ORCD–ME–3101	ORC HOT WATER RETURN LOOKING SOUTH
D	ORCD–ME–3101	ORC COLD WATER SUPPLY LOOKING SOUTH
E	ORCD–ME–3101	ORC COLD WATER RETURN LOOKING SOUTH

DRAWING NAME:
CITY OF UNALASKA
MECHANICAL
FIRST FLOOR PARTIAL PLAN–WEST
orcd–me–3000_1.dwg

REF DWG(S):

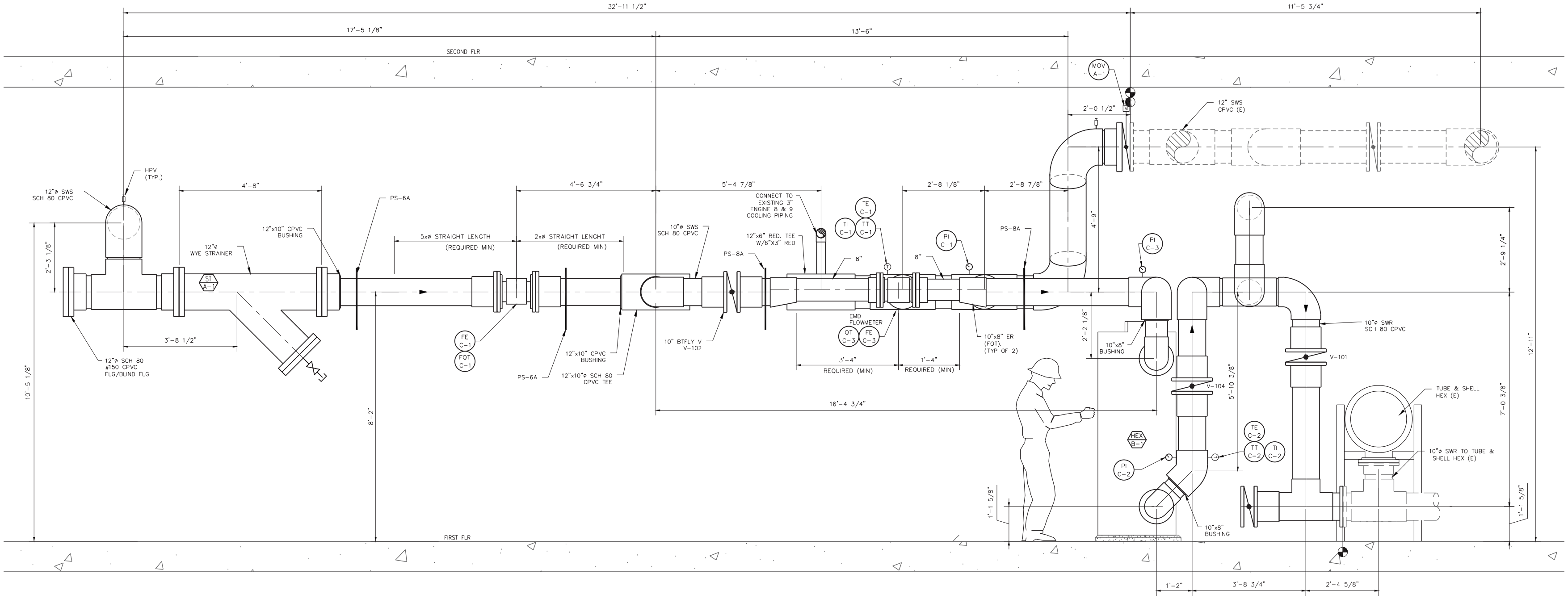
DRAWING NO.: ORCD–ME–3000
SHEET 1 OF 1

EXAMPLE PIPING DETAILS FROM PRIOR PROJECT



Ⓐ SEAWATER SUPPLY LOOKING EAST – DEMO

SCALE: 3/4" = 1'-0"



Ⓑ SEAWATER SUPPLY LOOKING EAST

SCALE: 3/4" = 1'-0"

PROJECT: ORC DESIGN SERVICES
DESIGNER/PROJECT ENGINEER: E. GEORGE/M. HAUKE – EPS
JOB #: 13–0124

NO.	DESIGN/CONSTRUCTION/ASBUILT REVISION	DWN BY/DATE	REVIEWED BY/DATE
0	ISSUED FOR CONSTRUCTION	TJG/07-17-2014	MJH/07-17-2014
1	AS-BUILT	XJH/11-05-2014	MJH/11-05-2014

ENG. STAMP

Electric Power Systems Inc.
Consulting Engineers
TEL: (907) 522–1953
FAX: (907) 522–1182
WEB: WWW.EPSINC.COM

NO.	DRAWING NO./SHEET	REFERENCE DRAWING/DETAIL/PLAN/SECTION DESCRIPTION

DRAWING NAME:
CITY OF UNALASKA
MECHANICAL
SEAWATER PIPING DEMO & NEW
SECTIONS
orcd–me–3102_1.dwg

REF DWG(S):

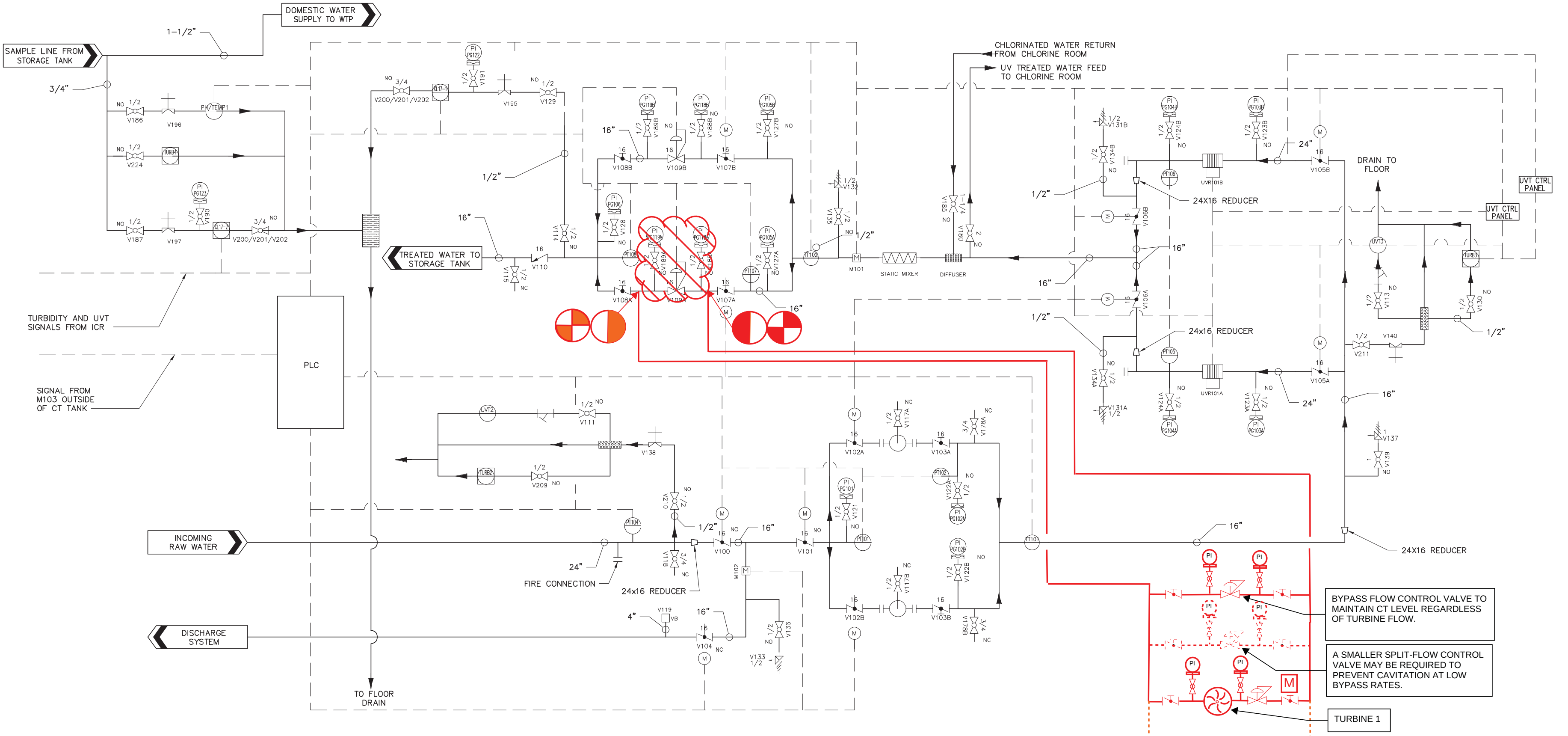
DRAWING NO.: ORCD–ME–3102

SHEET 1 OF 1

CONCEPTUAL TURBINE INSTALLATION P&ID

P&ID LEGEND

SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
━━	PROCESS FLOW	╟	BLIND FLANGE	PT106	PRESSURE TRANSDUCER	CL17-1	HACH CL-17 CHLORINE ANALYZER	M 16 V102B	AUTOMATIC BUTTERFLY VALVE	PH/TEMP1	HACH DPD1P1 PH TEMPERATURE SENSOR
— — —	CONTROL SIGNAL LINE	▥	UV REACTOR	UVT1	UV TRANSMITTANCE MONITOR	16 V108A	MANUAL BUTTERFLY VALVE			┼	DIAPHRAGM VALVE
━►	FLOW DIRECTION		STRAINER	16 V110	CHECK VALVE	V132 1/2	AIR RELIEF VALVE			☐VB	VACUUM BREAKER
◻	PIPE REDUCER	NO 1/2 V129	BALL VALVE NO–NORMALLY OPEN NC–NORMALLY CLOSED	▦	DIFFUSER	PI PG106 1/2 V128	PRESSURE GAUGE WITH ISOLATION VALVE	16 V109A	ALTITUDE FLOW CONTROL VALVE	▦	BUBBLE TRAP
╫╲╱╲╱╫	STATIC MIXER	CL-1	CHEMTRAC CHLORINE MONITOR		STRAINER						
M	MAGNETIC FLOW METER	TURB2	TURBIDIMETER	▥	ACTIVATED CARBON FILTER						



FLOW PROCESS & INSTRUMENTATION DIAGRAM

SCALE: NOT TO SCALE

Plotted By: Curtis
Date/Time: 04 Oct 2016 11:47 am
Layout: P&ID
Filename: P:\800-850\850 unalaska\850.05 pyramid wtp construction support_Civil\dwg\850.01_DSI_Piping_Unalaska.dwg

NO.	DATE	BY	REVISION
3	9/2/16	TR	RECORD DRAWINGS
2	4/7/14	JM	CONFORMED DOCUMENTS
1	12/2/13	JM	ISSUED FOR BID

LCG Lantech Inc
architecture · engineering · surveying
250 H Street
Anchorage, AK 99501
P (907) 243-8985
F (907) 243-5629
www.lcgak.com

CITY OF UNALASKA

PYRAMID WTP
UNALASKA, ALASKA

FLOW PROCESS AND
INSTRUMENTATION DIAGRAM

SCALE:	AS SHOWN
DESIGNED BY:	JM
DRAWN BY:	CRS
CHECKED BY:	GWF
DATE:	12/2/13
FILE NO.	850.01

SHEET NUMBER
P1.3 OF

Attachment 4E
KGS

KGS Statement of Qualifications

KGS
GROUP
International Inc. | USA
CONSULTING
ENGINEERS

CITY OF UNALASKA
DEPARTMENT OF PUBLIC WORKS

PYRAMID WATER TREATMENT PLANT INLINE MICRO TURBINES DESIGN

REQUEST FOR QUALIFICATIONS
DPU Project No. 17401

Proposal for Engineering Services
KGS Group 18-000-1938

January 2019

PREPARED BY:

Bogdanovic

Andi Bogdanovic, M.Sc., P.E., P.Eng.
Regional Director

APPROVED BY:

Stefan Kohnen, MBA, P.Eng.
Regional Manager

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LIST OF APPENDICES

SECTION A PROFESSIONAL QUALIFICATION

KGS Group is a consulting engineering, design, and project management firm with 31 years of experience. We are an employee owned multi-disciplinary engineering firm of 400, with 6 office locations across North America, including our local office in Bellevue, Washington. We are staffed by an experienced team of engineers and scientists, the majority holding advanced degrees. Services are provided to government, public, and private sector Clients in Canada and the United States.

KGS Group has experienced steady growth since its inception by expanding services in the areas where the firm is active. Clients are offered a complete range of services in these areas to ensure a project proceeds successfully from the concept stage through to implementation. This "Total Service" approach also ensures that a Client's budget and time constraints are respected. To maintain a high level of service to Clients, KGS Group has a high ratio of senior level professionals on staff. This philosophy has allowed KGS Group to expand its client base and stay successfully active in numerous project types and major disciplines such as:

- Dams and Hydroelectric Projects
- Hydraulic Design
- Hydroelectric Engineering and Design
- Dam Safety
- Project & Construction Management
- Geotechnical and Foundation Engineering
- Structural Engineering
- Instrumentation and Controls
- Hydrogeology / Geo-Environmental
- Civil / Municipal Engineering
- River Ice Engineering
- Sediment and Erosion Control
- Mechanical Engineering
- Geographical Information Systems (GIS)
- Electrical Engineering
- Industrial Design

For additional information, please refer to the turbine generator supply brochure in Appendix C and KGS Group's web-site at www.kgsgroup.com.

KGS Group proposes a team of senior engineers, experienced in developing and managing a financially viable solution for site layout. This would include the capability to develop solutions for power generation using turbine technologies, securing permits, completing all procurement, and preparing all designs for construction. The key staff identified for this project have been selected for their extensive knowledge, proven expertise, and experience with similar or related projects in providing these identified services.

The KGS Group team members below have worked together on many previous projects across North America including extensive experience in developing and designing hydro sites and water treatment plants. KGS Group's management structure is designed to support effective networking so that each team member within various disciplines can easily get any assistance needed to perform their best work. Our "No boundaries" philosophy for work sharing among our offices is among the best in the industry and supports the most capable design professionals on projects throughout our system. Our team was composed to ensure expedited project delivery using technical expertise and understanding of regulations while executing and delivering projects, similar to those identified in Section B below. The team will ensure the quality and efficient delivery of the project by using proven processes, systems, and resources to maintain a cohesive team that understands expectations and communicates effectively.

During the initial project meeting, we will work with the City to develop a communications plan for the project. This includes weekly status meetings and real-time communication enabled by our customizable web-based collaboration tool "KGS Resources". A project dashboard provides a comprehensive overview of progress and status, so everyone is aware of project expectations at any given time. The dashboard contains multiple modules that allows everyone on the project team, regardless of physical location, to access the latest project information and communicate instantly with the entire project team. Accessible information includes quality, budget, schedule, construction management, document management, and health and safety. By using this technology and working together, we create a high-performance team to meet the City's needs. Past projects have proven our teaming approach not only enables us to deliver a successful project, it enables us to build strong relationships along the way. Additional support from senior, intermediate and junior engineers at KGS Group is available as needed to assist with all assessment activities.

The Key Team Member Resumes listed below are provided in Appendix B. The team members we have assembled are capable of meeting the goals and objectives of the City of Unalaska and are available to perform and lead the project work deliverables throughout each stage. KGS Group team members are committed to the City of Unalaska's schedule and budget cost that has been presented in the RFQ. The table below shows the billing rates for the key personnel identified for this project.

Andi Bogdanovic, M.Sc., P.E., P.Eng.

Project Manager and Structural Engineer – Seattle Office

Mr. Bogdanovic has more than 17 years of combined experience in the project management and structural engineering, inspection, analysis, design, planning, environmental approvals, and retrofit of hydropower, dams/hydraulic structures, water retaining structures, and water conveying facilities. Mr. Bogdanovic's responsibility for this project will be overall project management and tracking of the project's performance metrics (scope, time, schedule, quality). This includes communication with the City of Unalaska Project Manager on all project management items. As the overall project manager, Andi is responsible for making sure the goals of the project are clearly understood between the City and the design team including generating status reports as required. He is also responsible for establishing the communication channels among team members at the outset of the project to ensure that the project moves ahead in a timely and productive manner. Andi believes that one of the greatest assets an engineering consultant can offer is commitment to communication and being responsive to the client's needs. He is an exceptional listener and communicator and will assure that your needs and preferences are well understood and relayed to the team.

Stefan Kohnen, MBA, P.Eng,

Regional Manager – Mechanical/Turbine Lead Engineer – Toronto Office

Stefan Kohnen has over 29 years of experience as a business manager and mechanical engineer in the hydropower and manufacturing industries. He has been involved in all aspects of hydropower development from feasibility to implementation with a focus on the selection, supply and commissioning of equipment both domestically and internationally. In the manufacturing sector he has been involved in the development and implementation of manufacturing processes, maintenance management and management of capital projects with specific experience in machining and metrology. For the reference project listed in Section B, he served as project manager and technical lead for the development of this 3 MW generating station adjacent to Lock 25 on the Trent Severn waterway. The scope of the project includes developing an economically viable solution to this very low head site. The project has identified viable solution, completed the procurement for the turbine/generator solution, the contractor and is developing the final concept using an Early Contractor Involvement approach. Construction is scheduled for 2019. Mr. Kohnen will act as the lead mechanical engineer for this project and the Set Based Design process. He will lead the efforts associated to defining operational constraints, turbine sourcing, coordinate with others to optimize the solution and prepare report and estimate.

Sean Bayer, M.Eng, P.Eng, PMP

Department Head – Municipal Lead Engineer– Regina Office

Mr. Bayer is a Professional Engineer with 20 years of experience in both the private and public sectors. His specializations include design and project management work for clients in water treatment, distribution and collection, wastewater management, subdivision development, environmental water monitoring, regulatory compliance, and environmental reporting. For the reference project listed in Section B, he served as project manager and technical lead for the City of Meadow Lake's Water Treatment and Distribution Pumping Upgrade projects. Mr. Bayer will act as the lead municipal engineer for this project. His historical regulatory experience will allow for strong formal regulatory communication on the project. In addition Mr. Bayer will focus on ensuring positive direction on PRV issues, and there relevant hydraulic impacts as well as the long term control narrative.

Key Personnel Role	Team Member	Hourly Billing Rates
Project Manager and Structural Engineer	Andi Bogdanovic, P.E., P.Eng.	$ 200
Lead Municipal Engineer	Sean Bayer, M.Eng, P.Eng, PMP	$ 200
Lead Mechanical/Turbine Engineer	Stefan Kohnen, MBA, P.Eng,	$ 216

SECTION B EXPERIENCE AND REFERENCES

Two reference projects that demonstrate similar complexity and size, with recent and relevant experience, and successful past performance in the stated provision of services to the Pyramid Water Treatment Plant Inline MicroTurbines Design are provided below.

CITY OF MEADOW LAKE

Distribution System Modeling (2013)

In 2013, KGS Group performed a detailed distribution and pumping system evaluation which included extensive water modeling using Bentley ® WaterCAD © V8i. The modeling work for the water distribution system in Meadow Lake

was undertaken in two phases – preliminary and detailed. Based on both the WaterCAD modeling and engineering analysis, it was recommended that a third distribution pump be installed at the water treatment plant (WTP) and completely replace the two distribution pumps at Reservoir No. 1.

Distribution System Upgrades (2014 - 2015)
Following the distribution system modeling, KGS Group was again retained to provide detailed design services for the installation of the recommended pumping systems at the WTP and Reservoir No. 1. The work also involved the installation new standby generators at two of the City's reservoirs.

Mechanical improvements were also incorporated to improve water circulation within the reservoirs and eliminate short circuiting.

Water Treatment Plant Upgrades (2016 – 2018)
KGS Group provided detail design and engineering services during construction for the recently completed water treatment upgrade for the City of Meadow Lake. The primary focus was to remove organics to lower trihalomethane (THM) levels to below the regulated maximum acceptable concentration (MUL) of 0.1 mg/L.

The upgrades included construction of a new building to house two nanofiltration units, one ultraviolet (UV) unit and a chlorine gas room; conversion of the three clarifiers to a day well, clear well and waste well; installation of a generator; addition of a pump well; and modifications of all associated mechanical, process and instrumentation, and electrical components. Construction Budget $ 4,547,000.00 and Construction Schedule: 14 months.

Relevancy- Similar to the proposed project, KGS Group has previously performed detailed design / engineering and resident inspection for the construction of water treatment plants of similar size.

Reference
Tracey Wolfe- Waterworks Manager
City of Meadow Lake, Saskatchewan
Phone: 1-306-240-9996 / Email: waterworksmanager@meadowlake.ca

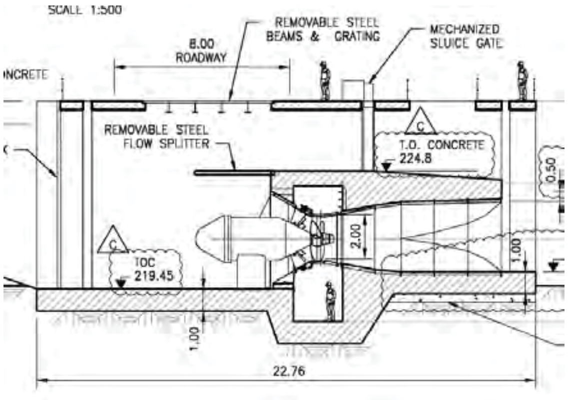
Key KGS Group Personnel
Sean Bayer, P.Eng.

LOCK 25 GENERATING STATION

The Lock 25 GS was a very low head hydroelectric project with a proposed capacity of approximately 3 MW, featuring a net head of 9.84 feet (3.0 m) and a plant flow of 4,590 ft3/s (130 m3/s). The project was situated adjacent with the existing Lock 25 Sawyer dam on the Otonabee River, part of the Trent-Severn Waterway in Ontario which creates a navigational link between Lake Ontario and Lake Huron. The planned project was developed in coordination with a Parks Canada replacement project for Sawyer dam.

KGS Group was retained by Bawitik Power Corporation to develop a financially viable solution for this site, secure permits, complete all procurement and prepare all designs for construction. The following services in a phased release methodology, including:

- Complete the Environmental Assessment of the project and all required public engagement activities. Working with the Owner secure approvals and permits.
- Define and secure interconnection approvals and cost estimates.



- Phase 1 – Review the site conditions and information and prepare a first estimate for energy and development costs for approval to proceed to the next phase.
- Phase 2 - Site concept development, verification of interconnection points, transmission line routing and site design optimization with updated estimates.
- Phase 3 - Complete site hydraulic and geotechnical studies and turbine procurement. Detailed site conceptual design optimization, energy modeling and establishment of the overall project capacity. Using a Set based Design approach identify optimum solutions and update project estimates for approval of the next phase.
- Phase 4 – Coordinate with Parks Canada to reach agreement on the site development approach. Select a contractor and using an Early Contractor Involvement approach develop a construction methodology to further optimize the site design for constructability and to finalize turbine selection. Prepare a final target budget and project schedule for release to detail design and final construction contracts negotiation.

Reference	**Key KGS Group Personnel**
Paul Young- Bawitik Power Corporation	Stefan Kohnen, P.Eng.
Phone: 1-416-999-7877/ Email: pyoung@orilliapower.ca	

SECTION C METHODOLOGY

The proposed methodology has evolved over many years of working with clients to develop solutions for power generation with turbine technologies that must achieve stringent economic results. The two overarching philosophies include:

- Staged approach with updated cost and confirmation of technical compliance with go/no go decision points.
- Use a Set Based Design approach to identify the optimum solution. With set-based design, you can continue weighing all possibilities until you gather enough data to narrow down your options. Set-based design has built-in learning points - places where a piece of data helps you eliminate another option. This enables a process where you actively select options with your desired specifications, rather than constantly adjusting to the situation at hand, creating a less-than-ideal result.

The RFP demonstrates that a significant amount of thought has been put into the development of this project by the project proponents. KGS Group has adapted its methodology to align with the requirements of the RFP.

PHASE II

The objective of this phase is to assess the technical information to date, secure turbine technology details and develop the solution to a level of detail that allows improved cost estimates to validate previous estimates and feasibility. The associated activities are described below:

- Collect data and review studies – The KGS Group team representing the mechanical, electrical, civil and process expertise will collect the existing information and familiarize itself with the project information. This may initiate a round of inquiries with Owner representatives.
- Define Operational Constraints – KGS Group will confirm the operational modes for this facility and define the operational constraints be they technical, administrative or regulatory.
- KGS Group clearly acknowledges that PRV energy loss must be addressed in order for the project to be viable and focus on this issue early will be paramount to the success of the project. Transient analysis in concert with a thorough capacity review of the existing PRV’s (CLA-VAL) will be conducted and a decision matrix utilized to provide decision makers with a clear and defensible assessment of PRV direction at the facility (replace or reconfigure).
- KGS Group has assessed a significant amount of water treatment plants utilizing historical operational data, and understands clearly that no hydrology study is required to quantify impacts/ensure CT compliance as it relates to a full CT tank. Prioritization with regards to the utilization of the facility (water production over power) will be clearly understood throughout the process.
- Turbine Sourcing – KGS Group proposes to prepare and issue a Request for Quotations document to various proponents to secure technical data and equipment cost estimates for the equipment. This package will

include tender documents and forms, specifications and other supporting documents. The specifications may be preliminary and allow for further refinement later in the development stage if acceptable to the City of Unalaska representatives. On receipt of the proposals KGS Group proposes to perform a triage of the bids to eliminate unsuitable solutions. KGS Group proposes an approach developed over many projects to completing the development without committing to a supplier until the final concepts are finalized. It is particularly important where the solutions have materially different total project cost and energy impacts.

- Develop Layouts – Based on technical information of the existing facilities and the turbine solutions, KGS Group would prepare drawings of the possible solutions to prepare estimates for the "Set" of options as per the Set Based Design approach. KGS Group would also prepare basic Single Line Diagrams and Control Architectures for each solution based on detail discussions with Owner representatives and possibly the named suppliers in this RFP. These drawings will define the Bill of Quantities for estimates.
- Issue preliminary documents for review – KGS Group would submit the preliminary layouts for discussion and critique to assess technical and operational concerns. A control narrative will be developed and discussed at this time, with input from operations staff encouraged.
- Prepare Estimates – KGS Group will prepare two estimates for the solutions defined in the "Set". KGS Group will develop an energy model for production estimates. Simultaneously, KGS Group will update the project cost estimates for one or more solutions.
- Prepare Draft Report – A draft report will be prepared comparing and making recommendations on the best solution with associated energy and project cost estimates. The report would naturally address the means for managing the technical constraints identified in the RFP documents and further refine the operations strategy that underpins the energy estimates.
- Presentation – Whether this is done online or in person there is good value in presenting the report recommendations.
- Issue Final Report – Based on feedback from the presentation and other comments on the draft report KGS Group would issue the report in final form.

PHASE III

The purpose of this phase is to prepare all documentation and design for construction while ensuring the financial and commercial constraints are maintained.

It is expected that prior to the start of this phase there will be a period in which the City of Unalaska will consider the recommendations of Phase II and finalize decisions to proceed. KGS Group would prepare estimates for the next phase for negotiation. KGS Group is willing to define target budgets for this phase early in the project once there is a chance to discuss the methodology with the City of Unalaska. KGS Group proposes to lead Phase III with three activities:

- Begin the process for selection of the main contractor(s) using an Early Contractor Involvement approach. If this is not possible then this will occur after the design process.
- Perform any final site measurements or investigations as may be required for designers.
- Initiate the designs on the basis of the Phase II results.

If the City of Unalaska agrees to an Early Contractor Involvement approach, KGS Group proposes a review of the designs with them to improve constructability and address the risks and indirect costs. This optimization will be conducted as a collaborative discussion including the City of Unalaska representatives, the contractors, and suppliers and KGS Group. The discussion will result in freezing the final solution.

Based on any refinements from these discussions KGS Group will finalize the designs. The contractor and suppliers participate in the review of design submittals to ensure continued budget compliance. The contractors will develop the final cost estimates and project schedule that will be incorporated into the contract.

KGS Group will work with the City of Unalaska to negotiate the final terms and specifications to be included in the supply and construction contracts. The final package of negotiated contracts, project prices, drawings and specifications will be submitted to the City of Unalaska to approve the release to construction.

This approach has a proven record of resulting in prompt mobilization and good cost and schedule certainty. However it does not appear to be simple on the surface. Due to this KGS Group strongly recommends a chance to present our methodology during the bid evaluation stage to ensure the assumptions are understood and, for example, why KGS Group proposes Early Contractor Involvement and the approach to selecting a turbine supplier.

APPENDIX A

DRAFT CONSULTING SERVICES AGREEMENT

APPENDIX B

CURRICULUM VITAE

ANDI BOGDANOVIC, P.E., P.ENG
REGIONAL DIRECTOR
SENIOR CIVIL / STRUCTURAL ENGINEER & PROJECT MANAGER

EXPERIENCE & RESPONSIBILITIES

Mr. Bogdanovic has more than 17 years of combined experience in the project management and civil/structural engineering field for hydropower service, dams/hydraulic structures, water retaining structures, water conveying facilities, petrochemical facilities, heavy industrial and marine facilities. His experience involves civil/structural engineering evaluation, licensing support, design, planning, analysis and construction support. This includes overseeing construction and structural site inspections, and coordination of draftspersons, clients and contractors. His experience also includes condition assessments, cost analysis and feasibility studies. With a comprehensive knowledge of design standards/codes, Mr. Bogdanovic has a demonstrated ability to work on complex projects, coordinate with other engineering disciplines, and provide cost effective/constructible designs.

As the Regional Director of the Bellevue office of KGS Group the current responsibilities include the day to day management and performance of the business unit and business development activities in Western United States and Canada.

Mr. Bogdanovic's experience in the design and construction of hydroelectric projects includes serving as project lead civil/structural engineer on a number of projects. Design and analysis services include foundations, battery building, actuator supports, penstock modification, access platforms, powerhouse superstructures, crane upgrades and monorails, intake trash racks, retaining walls, and stability of dams and spillway structures. Also, he has experience with water retaining structures such as intakes, spillways, trash racks, bulkhead gates, and radial gates. He has experience overseeing construction activities to ensure compliance with the design intent, drawings, specifications and permits obtained, and field inspections. Project management responsibilities include development of project scope, schedules and budgets, supervision of multi-disciplinary design teams, preparation of design criteria, coordination of work between the owner, engineer, sub-consultants, contractors and subcontractors, and tracking of project progress and scope changes.

He has been responsible for the design and analysis of steel and concrete structures for process equipment, storage tanks, pipe rack systems, and horizontal and vertical vessels. He has experience serving as a site engineer at a refinery plant for the turnaround of a heater stack and the removal and replacement of several heater units. Mr. Bogdanovic has designed lifting components for rigging procedures, including lifting lugs, spreader beams, monorail beams, lifting frames, and trunnions. He has also completed the design and analysis of marine breasting structures and marine components for ship dock facilities, including field inspection, verification, and measurements.

Mr. Bogdanovic is also experienced in performing Dam Safety Reviews for hydroelectric and water storage projects in Canada and the US.

EDUCATION

- **University of Manitoba**
  Master of Science, Civil / Structural Engineering (2003)
- **University of Manitoba**
  Bachelor of Science, Civil Engineering (2001)

REGISTRATIONS

- **Professional Engineer (USA)**
  California, No. C 80759
  Washington, No. 51840
- **Professional Engineer (Canada)**
  Manitoba, No. 23252
  Alberta, No. 143440
  British Columbia, No. 35400
  Ontario, No. 100180335
  Saskatchewan, No. 28712

SPECIALIZED TRAINING

- Occupational Safety & Health Administration (OSHA) – OSHA 30-Hour Construction Safety: Certification, No. 6745_1124131
- OSHA 510 – Standards for the Construction Industry – Federal OSHA policies, procedures, and standards, as well as construction safety and health principles
- HDR Permit Required Confined Space Training
- HDR Fall Protection Training
- Structural Analysis, Design and Modelling
- Design of Fall Arrest Systems
- Advanced Behaviour and Design of Steel Structures
- Behaviour and Design of Reinforced Concrete Structures
- High Performance Concrete
- Design and Analysis of Composite Materials (FRP) in Civil Engineering
- Finite Element Analysis
- ASCE Manual and Reports on Engineering Practice No. 79 – Steel Penstocks Training
- Pre-Stressed Concrete Cylinder Pipe Seminar – Design, Fabrication, Installation, Operation & Maintenance
- ASCE Design Building with Overhead Cranes
- Bolting and Welding for Design Engineers
- Practical Design of Bolted and Welded Steel Connections
- ASCE 7-10 Wind & Seismic Load Provisions
- Steel Framed Commercial Building Design (Wind & Seismic Loading)
- California Seismic Principles Exam – Fundamental principles, tasks and knowledge underlying those activities involved in the California practice of seismic design, seismic analysis or seismic evaluation of new and existing structures
- Engineering Surveying Exam – Activities involved in the practice and application of surveying principles for the location, design, construction and maintenance and operation of engineered projects
- Software: MicroStation, AutoCAD, Microsoft Office, Mathcad 15
- Structural Finite Element Software: RISA 3D, RISA Foundation, STAAD.Pro, Visual Analysis, SAP2000, ENERCALC

PROFESSIONAL ASSOCIATIONS

- Board for Professional Engineers, Land Surveyors, and Geologists of California & Washington
- ASCE – American Society of Civil Engineers
- AISC – American Institute of Steel Construction
- USSD- United States Society on Dams
- CDA – Canadian Dam Association
- Association of Professional Engineers and Geologists and Geophysicists of Alberta
- Association of Professional Engineers & Geoscientists of the Province of BC
- Professional Engineers and Geoscientists of Saskatchewan

ANDI BOGDANOVIC, P.E., P.ENG.
REGIONAL DIRECTOR
SENIOR CIVIL / STRUCTURAL ENGINEER & PROJECT MANAGER

- Engineers and Geoscientists of Manitoba
- Professional Engineers Ontario

HONORS & AWARDS

- University of Manitoba Graduate Studies in Structural Engineering: Douglas Grimes Fellowship Award (2002)
- HDR Honors - Associate (2011)
- Energy NextGen Class HDR, 2012 (Selected for Business Development and Leadership Internal Program)

EMPLOYMENT HISTORY

2017 – Present	Regional Director, KGS Group International USA
2013 – 2017	Civil/Structural Engineering Manager, HDR Inc.
2009 – 2013	Civil/Structural Engineer, HDR Inc.
2008 – 2009	Civil Structural Engineer, JVIC Industrial
2003 – 2008	Civil Structural Engineer, KGS Group

PROJECT EXPERIENCE

Relevant Project Experience, USA

- **L&S Electric - BC Hydro, Seton Hydroelectric Facility, Seismic Evaluation, British Columbia**
  Project Manager and Structural Engineer of Record performing an analysis and evaluation for structural equipment, and anchorage support of five plant control equipment components (Governor Control Cabinet, HPU, Accumulator Rack, Servomotor, Piping), and qualifying the conformance of the equipment, and support or means of anchorage to withstand seismic event loading, using the IEEE 693-05 *Recommended Practice for Seismic Design of Substations* and British Columbia Building Code (BCBC). In addition, performing an FEA dynamic analysis using SAP2000 Version 20 Advanced, on the HPU and Accumulator Rack assembly. The seismic analysis qualification method that is being used is a dynamic analysis to evaluate whether the equipment can withstand seismic loading. The equipment finite element model is analyzed using modal spectrum analysis. The Seismic Qualification reports provided descriptions of the equipment, mass distribution, spectral acceleration, and structural modeling. Results included modal responses, displacements, shell stresses, and frame forces. The frame forces were coded checked against AISC Manual of Steel Construction and CSA S16-14.
- **Confidential Client, Seismic/Dynamic Assessment Phase 1 for 6 high consequence dams.**
  Project Manager**/**Structural lead responsible in selecting the key sections of the critical components of the dam and appurtenant structures identified for the analyses at each site, based on the review of the background information, and field inspection of the facilities. Assessed the vulnerability of chosen structures to Induced (near field) and Natural Tectonic (far field) earthquakes. Perform a dynamic analyses of the selected critical dam and appurtenant structural components to assess the sensitivity of each structural system under the dynamic loading conditions. Newmark deformation analyses were completed for the earth dams. Performed a 2D stability assessments under dynamic loading conditions using equivalent-linear site response analysis and traditional rigid body / slope stability methods. Also, a nonlinear dynamic time-history analysis for Induced and Natural Tectonic earthquakes using OpenSees and ANSYS software. Prepared a calculation package for the evaluation and a report summarizing the analysis, results and providing recommendations.
- **Imperial Irrigation District, East Highline Reservoir, California**
  New reservoir sites located in close proximity to the All American Canal (AAC) and the East Highline Canal (EHC) to provide greater operational flexibility, meet water deliveries and conserve water. Served as Project manager and Lead Structural Engineer in the analysis and design for several different types of concrete structures for the reservoir site

using Finite Element Analysis software SAP2000. The reservoir site structures include: Concrete Double box culvert, Concrete Inlet Structure, Concrete Outlet Structure, Concrete Meter Vault Structure, Concrete Outfall Structure, Transition upstream and downstream structures, and Steel Stoplogs. Analyzed and generated a 3D model for each of the structures in SAP2000 and defined boundary conditions, different load cases (including seismic, hydrostatic, impulsive and convective dynamic pressure, etc.), and load combinations based on Bureau of Reclamation Water Conveyance Systems Design Standard Chapter 12, and ASCE7-10. The design for different elements such as walls, slabs, decks and bulkhead skin plate and frame members was based on ACI318-14 and AISC 360 14th edition.

- **Ketchikan Public Utilities, Ketchikan Lakes and Beaver Falls FERC Part 12D Independent Consultant Services, Alaska**
  The project involved assessing safety inspections in accordance with FERC Part 12D Guidelines, Dam Safety Performance Monitoring Program. Served as a project manager and civil structural engineer to perform a comprehensive field inspection of the existing Ketchikan Lake and Beaver Falls Dam facilities, which included the reservoir rim, several storage dams (rockfill embankment structure with a wood core wall), spillways, reservoir outlet facilities, power intake facilities, and multiple powerhouses. Work included on-site inspection, document review, and participation as a core team member in the PFMA review session for the development. HDR provided analyses, evaluations and assessments of project facilities, documents, plans, and programs to ascertain compliance with FERC regulations, and prepared a CSIR report and associated documentation for Ketchikan submittal to FERC.

- **USACE Bonneville Powerhouse No. 2 Tailrace Gantry Crane Replacement, Portland, Oregon**
  Structural Lead for the development of plans and specifications for the supply and erection of a new, 65-ton main hoist with a 15-ton auxiliary hoist gantry crane. This work included design for the removal of the existing Powerhouse 2 tailrace gantry crane, which was original, and its replacement with a new gantry crane of the same rated capacity, along with upgrades to the crane electrical bus system and enhancements to improve operations and safety. Deliverables included a Design Documentation Report, development of an interactive 3D model that will be used to assist the client with identifying the most efficient location for the crane cab on the new crane, preparation of the procurement specification package and supporting calculations. This included weight calculations of existing tailrace stoplogs, friction forces associated with the removal of the gates, and analysis of lifting beams and spreader beams using the ASME BTH-1 2014. The standards used for the structural procurement specification preparation were CMAA#70-2014, OSHA, ASCE7-10, AISC 9th Ed., and AWS. Recommendations from the Crane Programmatic VE study will be incorporated into the project.

- **USACE Big Cliff Intake Gantry Crane Replacement, Salem, Oregon**
  Structural Lead for the development of plans and specifications for the supply and erection of a new, 40-ton gantry crane. This work included design for the removal of the existing intake gantry crane, which was original, and its replacement with a new gantry crane, along with upgrades to the crane electrical bus system and enhancements to improve operations and safety. Deliverables included a Design Documentation Report, development of an interactive 3D model that will be used to assist the client with identifying the most efficient location for the crane cab on the new crane, preparation of the procurement specification package, and supporting calculation. This includes weight calculations of existing intake gates and stoplogs, friction forces associated with the removal of the gates, and analysis of lifting beams and spreader beams using the ASME BTH-1 2014. A stability analysis was performed to determine the minimum stability factor against overturning when specified loads were applied in the least favorable manner using the load combinations per CMAA#70 and applied reactions were compared to allowable deck limit constraints. The standards used for the structural procurement specification preparation were CMAA#70-2014, OSHA, ASCE7-10, AISC 9th Ed., and AWS. The project was eligible for the National Register of Historic Places and emphasis was placed on maintaining the original design

features of the gantry crane as feasible. Recommendations from the Crane Programmatic VE study will be incorporated into the project.

- **Cascade Water Alliance, Intake Design, Mud Mountain Dam Fish Passage Facility, King County, Washington**
  Lead Structural Engineer in the analysis and design for a concrete intake structure modification using Finite Element Analysis. A BIM model REVIT to SAP2000 was used and the 3D model was modified into SAP2000 to defined boundary conditions, different load cases (including seismic, hydrostatic, impulsive and convective dynamic pressure), and load combinations based on ASCE7-10. Intake design included intake deck using an HS-20 loading, intake piers, training walls, sluiceway, foundations, bulkhead gate and a review of radial gates design.
- **PacifiCorp, Merwin Dam Spillway Gate Retrofit, Ariel, Washington**
  Assisted in project management and Structural Engineer of Record in retrofitting four 39-foot-wide by 35-foot-high tainter gates at Merwin Dam based on the previous analysis performed in 2016. The deliverables included a design documentation report, structural plans, technical specifications, and an opinion on the probable cost of construction for upgrades to the gates. The retrofit involved: upgrades to the main top strut arms that included adding 1-1/8 inch thick partial-length cover plate to the top flange of the struts; addition of horizontal members (trunnion ties) that tied together the main struts on each side of the gate; upgrade of the main top and bottom strut to trunnion connections by replacing the A307 bolts with A325 bolts and the existing angle sections that splice the strut to the trunnion casting with new splice angles of same size; and replacement of the lowest diagonal brace in the internal vertical frames of the gate.
- **Alabama Power Company, Weiss, Neely-Henry, and Logan Martin Development Draft Tube Working Platform, Coosa River Project, Alabama**
  Part of a team in a structural design of three different draft tube platforms for a turbine aeration enhancement project to install an aeration ring at the draft tube liner. The platform was designed using steel members and bolted/welded connections supported on the draft tube liner. Design of steel pipe supports and steel platforms for the new piping system.
- **Idaho Power Company, Oxbow Development Penstock and Penstock Dresser Coupling Structural Condition Assessment, Adams County, Idaho**
  As Lead Structural Engineer performed a condition assessment and structural evaluation of four 23 foot diameter penstocks and bolted sleeve type couplings. The analysis consisted of evaluating the internal hoop stresses at two sections of the exposed penstocks and dresser couplings in accordance with ASCE MOP79 2nd edition and ASME2010. Prepared a calculation package using Mathcad 15 for the evaluation and a technical memo summarizing the results and providing recommendations.
- **Sutter Butte Flood Control Agency TO 15Basis of Design, Sewer Pipe Cap and Footing Design, California**
  As Lead Structural Engineer performed design and analysis of two sewer line cap structures comprised of a concrete structural slab and footing. Loading requirements were based on HS-20 truck loading and design was based on IBC2015. SAP2000 and RISA Foundation were used to analyse the slab and footing.
- **USACE, The Dalles Lock & Dam & Sam RayBurn Dam, USA**
  Provided structural support for upgrade and design components for a new fish unit breaker replacement project at The Dalles and a transformer upgrade at Sam Rayburn. Some of the tasks were based on analysis and design of existing and new lug plates, anchors design, transformer hold downs, concrete pad, transformer demo, and cable tray and bus duct supports.
- **USACE, Sacramento County, American River Common Features, Basin Reach I, California**
  Structural Engineer responsible for a new concrete vault design for existing water main and storm drainage lines at the top of a levee for the Sacramento Department of the Army Corps of Engineers (USACE). The applicable codes and specifications used for the vault

design were the US Army Corps of Engineers EM1110-2-2104 reinforced-concrete hydraulic structures and ACI 350-06.

- **Chehalis Basin Dam and Fish Passage, Bulkhead and Radial Gate Preliminary Design, State of Washington, Chehalis, Washington**
  Structural Engineer responsible for the preliminary conceptual design of high head fixed wheel gates and radial gates using the USACE manuals for concrete hydraulic structures, spillway tainter gates design, and hydraulic steel structures. Preliminary design consisted of calculating some of the loads on the bulkhead and the gates and refining the thickness and gate member sizes.

- **City of Port Townsend, Big Quilcene Dam & Headwork Rehabilitation Evaluation & Design, Quilcene, Washington**
  As Lead Structural Engineer and assisted as Project manager, Phase 1, performed condition assessment of a timber crib rock fill dam and headwork facility. Headwork facility consisted a concrete sluiceway with a bypass/sluice gate, and concrete intake structure with a trash rack and a control gate. Conducted an alternatives analysis to determine the best approach for repair or replacement of the timber crib dam and associated head work structure. Prepared conceptual layouts of project structures and estimated construction costs for feasibility. Assessment of alternatives, considered both operational and physical constraints, environmental impacts, and addressed the sediment issues currently present at the headwork structure and dam. Also, a project description and construction plan was developed to assist the permitting approval stage with the agencies. The alternative chosen was the in-kind repair of the diversion dam. Phase 2, responsible for the design of the in-kind repairs to the dam, and providing the construction drawings, specifications, and bid package for the dam and apron modifications. Also, assisted with temporary diversion bypass and care of water for the construction repair. The repairs of the dam consisted of replacement of upstream/downstream timber facing boards, selective crib bent face and anchor logs with new logs and mechanically spliced to existing logs, and misc. hardware such as plate connectors and fasteners, rock fill restored, and concrete apron rehabilitation. Phase 3, provided engineering services during construction, including structural observation, review of submittals and RFIs, attended meetings, and answered design and construction questions.

- **Washington Department of Fish & Wildlife, Minter Creek Hatchery Intake and Dam Facility Predesign, Washington**
  Lead Structural Engineer responsible for a condition assessment of two low hazard dams (concrete dam and steel sheet pile dam) and their associated concrete gravity intake structures. Evaluated alternatives per hydraulic structure to rehabilitate or replace the existing structures, intakes, and pipeline. Determine the preferred alternative for the repair or replacement of the intakes including automated cleaning systems, associated controls and pipeline modifications. Prepared conceptual layouts of project structures and estimated construction costs for feasibility. Assessment of alternatives, considered both operational and physical constraints, environmental impacts, and addressed the sediment issues at the intake structure facility.

- **Tazimina Hydroelectric Plant, Trash Rack & Bulkhead for Intake structure, Alaska**
  Design and analysis of the trash rack intake. The trash rack assembly was comprised of fabricated wedge-shaped tubing welded to a square tube frame, with intermediate stiffeners. The trash rack design incorporated hollow steel tubing filled with a recirculating heated glycol mixture to aid in reducing icing. The tube rack design consisted of evaluating static stress, ice impact loads, head loss versus design head loss, and avoiding operating under resonance conditions. The natural frequency of the rack was checked versus the forcing frequency to prevent a resonant condition from developing. Design and analysis of an intake bulkhead using both a steel and aluminum structure.

- **Idaho Power Company, Brownlee Power Plant Parking Ledge Platform, Cambridge, Idaho**
  Project Manager and Lead structural engineer on a parking ledge platform design for maintenance work to the bottom ring of a Francis Unit. The platform was designed in two half sections, using steel members and bolted/welded connections.

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- **USACE, Howard A. Hanson Dam Spillway Gate Analysis, King County, Washington**
  Structural Engineer responsible for the analysis of the trunnion girder, post-tensioned anchorage, and pier evaluation for the respective reaction loads generated by the SAAP 2000 tainter gate model. The evaluation was in accordance with EM 1110-2-2702, EM 1110-2-2105, and ETL 110-2-584.
- **Enel, Lower Valley Powerhouse Stability Analysis, Claremont, New Hampshire**
  Evaluated the stability/overturning of Lower Valley Powerhouse structure in accordance with current industry state-of-the- practice for the analysis of water retaining structures, and in conformance with the current Federal Energy Regulatory Commission’s Engineering Guidelines. The stability analysis load cases and the associated factors of safety were in accordance to Ch. 10, Section 8, and Ch. 3 of the FERC guidelines.
- **Duke Energy, Steam Station Groundwater Assessment Program, North Carolina**
  Site Manager at Cliffside and Marshall for an environmental groundwater assessment program for ash basins located at Duke Energy fossil stations. Responsibilities were to manage the drilling operation of the well, installation of the wells, development of the wells, and sampling and testing of the wells. This included speciation sampling and slug testing. Responsibilities also included overseeing construction to ensure compliance with the design intent, drawings, specifications and permits obtained.
- **PacifiCorp, Merwin Dam Gate Extension Replacement, Ariel, Washington**
  Structural engineer responsible for the design layout of the new gate extensions for the tainter gates, performing the associated design calculations to size members and connections, reviewing production drawings, and developing the technical specifications.
- **Cascade Water Alliance, Fish Barrier Structure Apron Repair, Washington**
  The Lead Structural Engineer for the temporary fix of an apron on the timber crib dam. Assisted in the design of a steel cofferdam and connections for the phase 1 and 2 apron repair.
- **Confidential Client, Due Diligence Engineering Assessment, Ontario, Canada & New York, United States**
  As part of a large team, provided support for a due diligence effort associated with the acquisition of ten project facilities located in New York and Ontario. The activities in support of the due diligence effort were: review of design, construction, operating and maintenance documents; perform site visit; develop a CAPEX and major maintenance expenditure, and a technical memo documenting the findings of the due diligence engineering assessment.
- **PacifiCorp Energy, Prospect No. 1, 2 & 4 Hydroelectric Project North Fork Dam Stress and Stability Analysis, Oregon**
  Evaluated the stress/stability of the North Fork Dam for the concrete Non-overflow, Sluiceways and Intake Structure in accordance with current state-of-the-industry practice for the analysis of dams, and in conformance with the current Federal Energy Regulatory Commission’s Engineering Guidelines. The load cases analyzed included normal, unusual and extreme loading conditions.
- **Cascade Water Alliance, Lake Tapps Headgates Improvement, Washington**
  Structural Engineer for the design of a steel platform for a mechanical actuator used to lift head gates. Existing Head gates were inspected, analyzed and modified for new pick points and to bring them back up to standards by strengthening the gate. Production of gate design drawings, and response to the corresponding fabricator/contractor RFIs and submittals.
- **Puget Sound Energy, Upper Baker Dam, Foundation Drain Cleaning, Whatcom County, Washington**
  This concrete dam had several drain systems in place to reduce uplift pressure with instrumentation in place to monitor the uplift pressures. Developed firm criteria to indicate when drains should be cleaned, and for documenting drain performance, and how it is affected by cleaning activities. Served as Project manager and technical lead in the efforts to develop and prepare a monitoring procedure, drain cleaning plan, and piezometer

maintenance and testing procedure for these foundation drains. Also led the field crew in the inspection of the drains and implemented the actual drain cleaning activities.

- **Elwha Temporary Diversion Pumping Facility, Olympic National Park, Washington**
  Structural Engineer for this project, which included the design of a temporary diversion pumping station as well as the design various concrete and steel structures including HDPE Restraints, HDPE Anchor Blocks, and generator foundations for the pump station.
- **Coleman-Asbury Pipe Project, Pacific Gas and Electric Company, Coleman, California**
  Provided project support and design review of a 36-inch-diameter steel penstock using the ASCE Manual 79 for steel penstocks.
- **Ragsdale Spill Gate Controller Project, Pacific Gas and Electric Company, California**
  This project involved the replacement of actuators on spill gates for a canal with modifications to the support structure and components. Served as the Design and Analysis Lead for support structure beams, and hold down supports and anchors including preparation of the design criteria, scope, schedule and budget.
- **Drum YB-137 Gate Controller & Building/Structure Replacement Project, Pacific Gas and Electric Company, California**
  This project involved replacement of actuators for the existing radial spill gate system and reconstructing the support structures, hoist housing buildings and new foundations with modifications to existing electrical and mechanical components. Served as Lead Structural Engineer in the design of a new support hoist housing structure and foundation. Assisted in the preparation of the scope, schedule and budget on the civil section of this project, as well as in the preparation of the design criteria and response to client needs on constructability issues and constraints. Dynamic response spectrum analysis was performed due to the various irregularities of the structure.
- **Catalyst Energy Development Corporation, Rio Bravo Hydro Electric Project, California**
  Performed a stress analysis of the diversion dam due to the proposed modifications to the dam. These modifications included adding two piers on the crest of the dam to support the access bridge and adding two holes through the dam for sluicing the sediment.
- **Stanislaus Battery Building, Pacific Gas & Electric, California**
  Design of a one level concrete building, concrete shear walls, foundation and roof system for a battery building enclosure.
- **Bucks Creek Intake Valve House Standpipe Replacement, Pacific Gas & Electric, California**
  Assisted in the inspection and evaluation of the existing standpipe and developed various retrofit alternatives in a report. Completed the detailed structural design for the selected retrofit alternative to replace the standpipe, including an access platform design with skillet flange details.
- **Study of Sediment Management Alternative, Rio Bravo Hydroelectric Project, Kern Hydro Partners, Bakersfield, California**
  Assisted in the assessment of alternatives, both operational and physical, to pass sediment through the Rio Bravo Diversion Dam. These alternatives addressed the problems of reduced powerhouse capacity due to flow blockage by the accumulated sand and damage to the turbines due to the entrainment of the sand in the water. Assisted in managing/coordinating with HDR personnel in providing estimates for each alternative of the construction consideration costs and prepared a study report.
- **Study of Sediment Management Alternatives, Kern Diversion Dam, Pacific Gas & Electric, California**
  Assisted in the assessment of alternatives, both operational and physical, to pass sediment through the Kern Diversion Dam. Assisted in managing/coordinating with sub-consultants (Kleinfelder & Syblon Reid) to provide estimates for each alternative on the construction and geotechnical considerations/exploration costs.

- **Balch 1 Powerhouse Seismic Analysis and Support/Anchorage Design, Pacific Gas & Electric, California**
  Assisted in the seismic analysis and structural design requirements for the support system required for cable trays. Also provided assistance in the analysis and evaluation for anchorage of three plant control equipment components (two transformers, and a MCC) using the IBC and ASCE standards in accordance with design guidelines and applicable industry standards to comply with the recommended practice for Seismic Design of electrical/mechanical equipment.
- **Alta Line Breaker Seismic Analysis and Anchorage Design, Pacific Gas & Electric, California**
  Performed an analysis and evaluation for anchorage support of 17.5 kV breaker, for conformance of the structural support and anchorage using the IBC and ASCE standards in accordance with design guidelines and applicable industry standards to comply with the recommended practice for Seismic Design of electrical/mechanical equipment.
- **Pit 3, 4, & 5 Hydroelectric Project Design-Build, Pacific Gas & Electric, Burney, California**
  Full-time Field Site Engineer during construction, reporting to the Engineer of Record and Barnard Construction Company's (BCCI) Project Manager for an $80 million design-build project. Responsibilities included overseeing construction activities to ensure compliance with the design intent, drawings, specifications and permits obtained. Also, performed regular inspections of both concrete and steel platforms, pipe supports, penstock, valve house superstructure/substructure, gate supports, and concrete foundations. Additional responsibilities included overseeing and interacting with site inspectors, reviewing and approving inspection reports, identifying technical support needed by HDR or its sub-consultants URS, Mead & Hunt, or SAGE throughout the construction process. Managed and approved requests for information/changes (RFIs) or design changes (DCNs) required to be prepared by HDR and its sub-consultants. Single-point-of-contact for BCCI and PG&E on all technical matters and staffing issues related to design support during construction. Interaction with agencies having jurisdiction over the project such as FERC, DSOD, USFS, and California Park Service. Designed review of new civil components or modifications to existing/new structures, including design check, Quality Assurance/Quality Control, and drawing review. Lead in managing/coordinating the project closeout as construction was completed. Prepared and finalized the As-Built drawings and FERC exhibit drawings.
- **Confidential Client, Due Diligence Engineering Assessment, Chile**
  As part of a large team, provided support for a due diligence engineering review of two Chilean hydroelectric projects to assess condition, value and life and, therefore, the viability of potential acquisition of two small run-of river hydroelectric plants in Chile, near Linares in Region VII. Design, construction, operating and maintenance documents were reviewed in detail. In addition, review of project cost, O&M costs, remaining useful life, and future capital cost replacement and upgrade costs associated with those life projections. The team identified potential risks and deficiencies, and provided information on the potential future project risks.

Relevant Project Experience, Canada

- **DMS Contractor, Vertical Pressure Vessel & Skirt Evaluation, Saskatchewan.**
  Served as Project manager and technical lead in performing an FEA model using SAP2000 structural software to evaluate and determine the allowable stress levels on the existing vertical pressure vessel and support skirt for the construction rehabilitation work. The construction work required the support skirt sections to be temporarily cut-out in the skirt to allow for replacement of the pipe elbow coming off the bottom of the vessel. The evaluation was to determine the safe stress levels in the opening and to come up with a reinforcing detail modification to allow for the rehabilitation of the vessel. The load case used were ambient empty dead load case with wind pressures on the vessel.

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- **Mosaic, South Thickener Concrete Repair Steel Tank Evaluation, Saskatchewan.** Performed an FEA model using SAP2000 structural software to evaluate and determine the allowable stress levels on the existing steel tank wall and floor plate for the different construction demo constraints using the same operational loading conditions. The FEA model started with a 10ft long demo concrete ring wall section (tank wall being unsupported by removal of the concrete ring wall below) and was run iteratively by incrementally increasing the length of demolition section until a reasonable stress limit in the tank was reached. Provided a sketch and limits to the extent of the repair of the concrete tank ring wall foundation.
- **L&S Electric, BC Hydro Bridge River Hydroelectric Facility, Seismic Evaluation, British Columbia.** Served as Project manager and technical lead. Performed an analysis and evaluation for structural support and anchorage of five plant control equipment components (a governor control cabinet, a Hydraulic Pump Unit, an accumulator bank, and two servomotors), and qualify the conformance of the support or means of anchorage to withstand seismic event loading, using the British Columbia Building Code (BCBC), IEEE 693-2005 Recommended Practice for Seismic Design of Substations (IEEE).
- **SaskPower, Coteau Creek Life Assessment Inspection, Saskatchewan** Part of the team inspecting, assessing, and providing a condition assessment report for the turbine pit, discharge ring, runner, stay vanes, wicket gates, bottom ring, head cover, servomotor, operating ring, wicket gates links and levers, intake service gate and bulkhead gate, and hoist machinery equipment.
- **BC Hydro, GM Shrum Hydroelectric Facility, Seismic Evaluation, British Columbia** Served as Project manager and technical lead. Performed an analysis and evaluation for structural support and anchorage of four plant control equipment components (sump tank, Governor Actuator Cabinet, and two accumulator tanks), and qualified the conformance of the support or means of anchorage to withstand seismic event loading, using the British Columbia Building Code (BCBC), National Building Code (NBC), and IEEE 693-2005 Recommended Practice for Seismic Design of Substations (IEEE). Also, performed a FEA dynamic analysis using ANSYS on a new governor control cabinet and distribution valve assembly. The seismic analysis qualification method used was a dynamic analysis to evaluate whether the equipment can withstand seismic loading capacity and conform to industry standards.
- **SaskPower, Head Gate & Trashrack Technical Specification, Saskatchewan** Part of a team that contributed to the technical specifications for a single leaf, fixed wheel, vertical lift head gate and intake trash rack. The intent of the Technical Specifications was to describe certain materials, features, and design requirements of the Work. The specification would provide the basis of the design, supply, install, and commission of the head gate and trash rack. The goal was to have a new trash rack with reduced losses, an improved cleaning provision, a new trash rack follower; new head gates with reduced maintenance, better sealing capacity, and new or refurbished embedded parts. The team also coordinated with mechanical engineers concerning the gate seals, hydraulic hoists, and gate assembly.
- **Pine Falls Generating Station Thrust Bearing High Lift Modifications, Winnipeg River, Manitoba** As part of Manitoba Hydro’s upgrades to their Pine Falls Generating Station, high lift systems were added to each of the 15 MW Kaplan units. As a subcontractor to Wartsila Hydro & Industrial services, HDR assisted with the design of the thrust bearing high pressure lift shoe modifications, addition of RTDs, and hydraulic piping. Reviewed and approved the thrust bearing calculations, thrust bearing machining details, pump and orifice sizing, hydraulic piping design, component selection, and design drawings.

- **Fortis Generation, Fortis Generation East Dam Structures, Three Developments, Ontario**
  HDR provided analyses, evaluations and assessments of project facilities, documents, plans, and programs to ascertain compliance with Canadian Dam Association (CDA), Ontario Ministry of Natural Resources Regulation, and FERC regulations. Served as the project engineer, engineer of record and assisted with the evaluation of the Dam Condition Assessment Report based on the site reconnaissance of the facilities, provided stability analysis, and hazard classification assessment of the three dams/control structures (Marble Rock, Hart Lake and Devil Lake) located in the Gananoque and Cataraqui watersheds. Based on the engineering stability analysis and design, provided modifications and repairs to the dam structure to meet current standards.

- **Three Sisters and Canyon Dam Hydropower Development Dam Safety Review, TransAlta, Alberta**
  Served as Project Manager and Project Engineer/Engineer of Record for the Safety Review Inspection and Potential Failure Modes Analysis (PFMA) review at Three Sisters and Canyon Hydropower developments. The review was to demonstrate compliance with the *Water Act* and accompanying Ministerial Regulations, the *Dam and Canal Safety Regulation*, and general conformity to the requirements of the *Canadian Dam Association (CDA) Dam Safety Guidelines*. Work included on-site inspection, document review, and participation in the PFMA review session for the development. The project included the review of existing geotechnical information and the performance of screening level pseudo-static slope stability and liquefaction analyses for each dam (Three Sisters & Canyon). The DSR was conducted in three phases, beginning with reconnaissance and document review, continuing with a site visit and detailed DSR activities, and ending with preparation of a draft and final report. Specific dam safety categories evaluated included the dam safety management system, operation, maintenance, surveillance, emergency planning/preparedness and dam design and capability.

- **Life Extension and Upgrade Program, Spray Hydroelectric Station, TransAlta, Alberta**
  HDR served as Owner’s Engineer for TransAlta’s multi-year hydro redevelopment program for the Spray (103 MW) hydroelectric facility, which was intended to extend the service life of the facility to the year 2050 and beyond. HDR’s approach to the programmatic life extension program assessed the maintenance and rehabilitation needs of the facility and its components. HDR conducted detailed condition assessments of civil works such as powerhouse superstructure/substructure, overhead crane, intakes, penstocks, and discharge structures. Served as lead technical civil structural engineer for conducting the condition assessment and estimating the powerhouse crane, head gate, tailrace gate, penstock, and turbine inlet valve upgrade alternatives at the Spray Hydroelectric Station. Coordinated development of the final balance of plant, civil, electrical, and mechanical scopes of work based on TransAlta’s desired objectives. Led the civil structural portion of the site evaluation, reviewed existing operational data and drawings, and prepared a work plan specification report to assist in the inspection of the Powerhouse 145/10 Ton Crane Condition Assessment for an uprate capacity. The project included the rebuild of Units 1 and 2 scheduled to begin in the year 2014 and required replacing the existing power house crane to achieve larger lifting capacities. Led and supported the structural evaluation of the Powerhouse frame superstructure, roof structure, crane runway support structure as well as any proposed modifications to meet loading requirements. This analysis included FEM modeling to existing steel superstructure, runway and roof framing, and generation of all existing and new loads, analysis of existing members, connections, base plates, anchor rods, as well as new member design and details. Also, Rock anchors were determined to be necessary to stabilize the powerhouse superstructure for the design lateral loads (side thrust) imposed during the crane operation. Led the design of new modifications to the balance of plant overhaul in the powerhouse, which included design and analysis of cable tray supports, pipe supports, concrete foundation for mechanical and electrical equipment, and modification to the control room. Also, provided construction engineering services during construction related to all modifications of the superstructure, runway, and new rock anchors/connection support, including structural observation,

review of submittals and RFIs, attended meeting, and answered design construction questions. In addition, assisted in acceptance testing of the new crane and the modification of the powerhouse superstructure. This included review and support in the load test requirements for the capacity within the hook approach.

- **Spray and Rundle Hydropower Development Dam Safety Review, TransAlta, Alberta**
  Served as Project Manager and Lead Engineer/Engineer of Record and assisted in the support of a Dam Safety Review Inspection and Potential Failure Modes Analysis (PFMA) review at Spray and Rundle Hydropower Developments. Work included on-site inspection, document review, and participation as a core team member in the PFMA review session for the development. HDR provided analyses, evaluations and assessments of project facilities, documents, plans, and programs to ascertain compliance with the CDA, Alberta Provincial Regulation, and FERC regulations, and prepared a Dam Safety Review Report and associated documentation for TransAlta. The activities included the following: conducted a DSR in three phases, beginning with reconnaissance and document review, continuing with a site visit and detailed DSR activities, and ending with preparation of a draft and final report. Specific dam safety categories that were evaluated included a dam safety management system, operation, maintenance, and surveillance, emergency planning/preparedness and dam design and capability.
- **Dam Safety Review, Albany River Sites, Three Developments, Ontario Power Generation, Ontario**
  A safety assessment of the Cedars Dams (Albany River) and associated structures was completed in accordance with the accepted engineering standards of Ontario Power Generation's Dam Safety Program, Ontario Ministry of Natural Resources Regulation, and the *Canadian Dam Association Dam Safety Guidelines*. Served as a Project Engineer, Engineer of Record and assisted with the evaluation of the hydrotechnical, stability analysis, and flow control study for the dam safety review of Ontario Power Generation-owned dams and associated structures located on the Albany River System. The sites reviewed included the Root River (Lake St. Joseph) Dam, the Rat Rapids Dams, and the Cedars Dams and associated structures. Structural Engineer for the analysis of the log lifters capacity rating and condition assessment.
- **BC Hydro, Ruskin Hydroelectric Facility, Seismic Evaluation, British Columbia**
  Performed an analysis and evaluation for structural support and anchorage of two plant control equipment components (an accumulator, and a hydraulic power unit), and qualified the conformance of the support or means of anchorage to withstand seismic event loading, using the British Columbia Building Code (BCBC), IEEE 693-2005 Recommended Practice for Seismic Design of Substations (IEEE).
- **Dam Safety Review of Ladore Dam, Sugar Lake & Wilsey Dam, Three Developments, BC Hydro, British Columbia**
  As Dam Safety Engineer, was responsible for reviewing and sealing the repoquarts in accordance with the requirements of the British Columbia professional engineering code. The project consisted of a Dam Safety Review to identify possible hazards and the associated failure modes of the dam. HDR conducted the DSR in three phases, beginning with reconnaissance and document review, continuing with a site visit and detailed DSR activities, and ending with preparation of a draft and final report.
- **Corra Linn - Trash Rack for Intake Structure, FortisBC, British Columbia**
  Structural Engineer for the design and analysis of the trash rack Unit 3 intake. The bar design consisted of evaluating static stress, head loss versus design head loss, and avoidance of operating under resonance conditions. The natural frequency of the bar was checked versus the forcing frequency to prevent a resonant condition from developing. Designed trashrack support steel beams and connections to replace deteriorated steel framing.
- **Lac la Ronge Control Structure, Saskatchewan**
  Completed detailed design of walkways, monorail hoist beams, support frames, stoplogs, stoplog follower, and stoplog storage cart.

- **Wuskwatim Generating Station Powerhouse, MB Hydro, Manitoba**
  Performed detailed analysis and design of new spillway hoist housing structure including the design of moment and bolted connections, and new stoplogs, service bay, gravity structural sections, retaining walls, and powerhouse. The analysis and design included concrete and steel components, such as two way slabs, columns, walls, foundation etc.
- **Alexander Dock, City of Winnipeg, Manitoba**
  Responsible for design and analysis of new timber piles and the rehabilitation of the old wooden dock with new wooden and steel construction. Also performed structural site inspections and was a part time project manager.
- **Sewer Culverts, Pump House & Flap/Sluice Gate & Concrete/Steel Structures Inspections, City of Winnipeg, Manitoba**
  Field inspection to assess the existing conditions of the sewer system facilities. Inspection included pumps, gates, concrete foundation, buildings, mechanical components, and sewer culverts (concrete lined, steel pipe, corrugated metal) and weirs. The inspections included thickness measurement to evaluate shell corrosion, pitting and visual inspection of rust blisters, plate joints, and rivet heads. Evaluated, assessed and provided recommendations for each component and foundation conditions.
- **Town of The Pas, Manitoba**
  Assisted in residential basement inspections for the Town of The Pas, which were required due to flooding of the domestic sewage system.
- **Cost Estimate and Feasibility Study, Pointe du Bois Spillway, Manitoba Hydro, Manitoba**
  Prepared a detailed cost estimate of various options for increasing the spillway capacity, which included upgrading and repairing existing systems and building new.
- **Pembina Highway Flood Protection Works, City of Winnipeg, Manitoba**
  Construction Inspector for all aspects of the project, including regular site meetings with the contractors. This included site preparation, excavation, concrete wall dike, clay backfill, internal drainage and site restoration.
- **Oil & Gas Industry Refinery Projects, JV Industrial Companies – Engineering Division, Corpus Christi, Texas (2008-2010)**
  Involved in petrochemical facilities-design and analysis of steel and concrete structures to provide sound but economical support systems for process equipment, storage tanks, pipe rack systems, and horizontal and vertical vessels. Inspection and conditions assessment of existing platforms, support structures, frame systems (heavy industrial buildings) to evaluate and analysis new loading conditions and to determine if the structure is fit for purpose. Experienced in supervising and checking construction drawing packages prepared by draftspersons and attending regular progress meetings, as well as field inspection for the civil/structural engineering scope of the project. Experienced in design and analysis for marine breasting structures and marine components of ship dock facilities including field inspection, verification, and measurements. Performed an analysis check for monopile and tripod type breasting dolphin structures consisting of either straight or battered piles used for docking large ships. Unified Facilities Criteria Standards were used to calculate wind loads, currents, and passing vessel forces for large ships and applied to mooring bollards and to the marina structures. Site Engineer in Illinois, where he provided assistance at a refinery plant for the turnaround of a heater stack and the removal and replacement of several heater units. Worked closely with several parties to meet deadlines for the shutdown of these units and with the crane contractor on the critical lifts needed to remove the units, resulting in the use of his design of lifting components for the different rigging procedures. This included design and analysis of existing and new lifting lugs, spreader beams, monorail beams, lifting frames, and trunnions.

ANDI BOGDANOVIC, P.E., P.ENG.
REGIONAL DIRECTOR
SENIOR CIVIL / STRUCTURAL ENGINEER & PROJECT MANAGER

Industrial Experience

- **Fall Protection Life Safety, Manitoba Hydro, Manitoba**
  Project Manager, Main Structural Site Inspector, and Design Engineer. The fall protection life safety program included many sites in the Manitoba Hydro fleet of generating stations and associated spillway structures. Some of the sites included: Slave Falls, Seven Sisters, Pointe du bois, Pine Falls, Brandon. Design and analysis of life lines, anchor points, handrails, platforms and support structures.
- **Mill Building, Manitoba Rolling Mills, Manitoba**
  Completed inspection, analysis, design, and planning for several mezzanine steel platforms and steel superstructures to evaluate the adequacy of new loading conditions due to the new/relocated units. Assisted with the design and detailing requirements for structural steel and reinforced concrete structures using appropriate combinations of design loads.
- **Empire Iron, Winnipeg, Manitoba**
  Assisted with the analysis and design of a new top running bridge multiple girder overhead crane.
- **Maintenance, Stores & Garage Building, Manitoba Rolling Mills, Selkirk, Manitoba**
  Completed structural modifications to existing steel trusses and purlins to support additional snow load from drifting and ventilation system.
- **Pork Pretreatment Building, Maple Leaf, Winnipeg, Manitoba**
  Work included structural modifications to an existing pre-engineered building to support additional equipment. Also, a detailed inspection, analysis and design was required for existing beams and support structure.
- **Melt Shop Facility, Manitoba Rolling Mills, Selkirk, Manitoba**
  Work included analysis and design modifications of several existing monorails to support higher loading.
- **Manitoba Hydro Generating Stations, Manitoba**
  Completed design of fall arrest and fall protection systems for various different applications required on site. Included was extensive use of CSA Standard Z259.16-04 for Design of Active Fall-Protection Systems, Z259.13-04 for Flexible Horizontal Lifeline Systems and CSA Z259.2.1-98 for the Design Of Fall Arresters, Vertical Lifelines and Rails. This also included a complete design of fall prevention systems such as platforms, handrails, ladders, cages and stairs.

STEFAN KOHNEN, MBA, P.ENG.

REGIONAL MANAGER/MECHANICAL/ELECTRICAL DEPARTMENT HEAD

EXPERIENCE & RESPONSIBILITIES

Stefan Kohnen has over 29 years of experience as a business manager and mechanical engineer in the hydropower and manufacturing industries. He has been involved in all aspects of hydropower development from feasibility to implementation with a focus on the selection, supply and commissioning of equipment both domestically and internationally. In the manufacturing sector he has been involved in the development and implementation of manufacturing processes, maintenance management and management of capital projects with specific experience in machining and metrology.

As the Regional Manager of the Mississauga office of KGS Group the current responsibilities include the day to day management and performance of the business unit and business development activities in Ontario and Eastern Canada.

EDUCATION

- **Queens University**
  Masters of Business Administration (Year)
- **APICS The Association for Operations Management**
  Completion of certification in Production and Inventory Control Management (1999)
- **McGill University**
  Bachelor of Mechanical Engineering (1988)
- **Dawson College(**
  Diploma of Mechanical Engineering Technology (1984)

PROFESSIONAL ASSOCIATIONS

- PEO – Professional Engineers Ontario
- APEGS – Association of Professional Engineers & Geoscientists of Saskatchewan
- Ontario Waterpower Association
    - Volunteer Public Outreach Committee
    - Volunteer Power of Water Conference Committee

EMPLOYMENT HISTORY

2010 to Present	Regional Manager and Mechanical/Electrical Department Head, KGS Group
2008 – 2010	Operations Manager, Andritz Hydro Canada
2006 – 2008	Project Manager, Andritz Hydro Canada
2004 – 2006	Manager Toronto Service Center, WEIR Canada
2003 – 2004	General Manager, Elimetal Inc.
1992 – 2003	Manufacturing Engineering Manager, Sybron Dental Specialties
1988 – 1992	Production Manager, Elimetal Inc.

STEFAN KOHNEN, MBA, P.ENG.

REGIONAL MANAGER/MECHANICAL/ELECTRICAL DEPARTMENT HEAD

PROJECT EXPERIENCE

- **Calabogie GS Re-development**
  Client: Ontario Power Generation (2017 – present)

- Project Engineer for the assignment as Owner's Engineer for the re-development of the 6MW generating station that has reached end of life. Duties include the development of viable options, support the election of the Design Build Contractor, support for the development of specificatons, budgets, the environmental assessment and all aspects of the development and executions phase.

- **Lock 25 Generating Station**
  Client: Bawitik Power Corporation (2016 to present)
  Project Manager for the development of this 3 MW generating station adjacent to Lock 25 on the Trent Severn waterway. The scope of the project includes developing an economically viable solution to this very low head site. The project has identified viable solution, completed the procurement for the turbine/generator solution, the contractor and is developing the final concept using an Early Contractor Involvement approach. Construction is scheduled for 2019.

- **North Bala Falls Generating Station**
  Client: Swift River Energy Limited (2016 to present)
  Project Manager for providing Owner's Engineer services for the construction of this 4MW generating station. Led the re-procurement fo the project to reduce cost and ahceive an economically viable solution. Managing weekly and monthly progress, providing support for permitting and regulatory approvals, managing claims and interfaces among the various vendors. The facility os scheduled to be in service in 2019.

- **Smooth Rock Falls Generating Station**
  Client: Gemini SRF Power (2015-2018)
  Project Manager for the refurbishment and upgrading of this 100 year old facility from 7.4 to 9.2 MW. The services including developing specifications and procure contracts for the replacement of two generators, the refurbishment of the turbines, the replacement of the reunners, the upgrading of the protection and controls system and modifications ot eh electrical and station service system.

- **Chaudiere Falls Generating Station Lender's Engineer**
  Client: Chaudiere Hydro Limited Partnership (2015 – 2018)
  Project Manager for the provision of independent engineer services for the lenders for this 30MW hydropower development. The services included performing regular inspections of the progress of the construction activities and issuing the requisite certificates at specific milesotnes.

- **Due Diligence Services**
  Client: Oakville Hydro (2014)
  Project Manager for the evaluation of hydropower projects identified for acquisition.

- **Okikendawt Hydropower Project – Mechanical Site Inspection**
  Client: Okikendawt Hydro L.P. (2014-2016)
  Project Manager for the supervision of mechanical erection of 2 X 5MW ECOBULB units.

- **Okikendawt Hydropower Project – Manufacturing Inspection**
  Client: Okikendawt Hydro L.P. (2013-2015)
  Project Manager for factory inspection of main components of the 2 X 5MW ECOBULB turbine generators in China and Europe

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Tazi Twe Hydropower Project – Early Contractor Involvement Phase
Client: SaskPower (2013-2017)

- Lead for turbine generator selection and procurement for the planned 50 MW
- greenfield hydropower development
- Responsibilities include the preparation of specifications, tender support and bid evaluation
- Also provided support in preparation of final layouts, budgets and project schedules
- Negotiations of final specifications and contract terms with turbine supplier.

Chenaux Periodic Facility Condition Assessment
Client: Ontario Power Generation (2013)

- Project Manager for the periodic condition assessment of the 144 MW Chenaux generating station.
- The project scope included inspections activities and consolidation of findings from all inspectors from the client, KGS, and other participants in to a final report.

Peter Sutherland Sr. Generating Station
Client: Ontario Power Generation/Coral Rapids Power (2011-Present)

- Project Manager for the Definition Phase of the 28MW greenfield development Owner’s Representative contract
- Project Engineer for the Execution Phase
- Support for development of commercial agreements
- Prepare development of site optimal site concepts
- Support development of contracting strategies and cost estimating
- Development of specifications and procurement of Contractors
- Support business case development and approvals
- Support to Environmental Assessment

Kapuskasing Hydropower Project QA/QC Program, Ontario
Client: AMIK/NIPIY HYDROKAP L.P. (2012-2014)

- Program Manager for the inspection program of installation activities
- Coordinated inspection activities and performed final review of reports
- Provided support in resolution of site issues and technical concerns
- Providing ongoing support in post commissioning resolution of deficiencies.

Kapuskasing Hydropower Project QA/QC Program, Ontario
Client: AMIK/NIPIY HYDROKAP L.P. (2011-2012)

- Program Manager for the inspection program for manufacturing of eight turbine and generators to be delivered in stages until 2012 from Chinese suppliers
- Reviewed and finalized inspection programs with suppliers
- Management of inspection teams and execution of inspection events

Kabinakagami Hydropower Project, Ontario
Client: Northland Power (2012)

- Project Manager for the development of construction specification for this multi site hydropower project
- Assisted the client in the evaluation and selection of Water to Wire proposals
- Assisted the client in the development of performance guarantees

Saunders GS, Des Joachims Station Service Upgrade Projects, Ontario
Client: Ontario Power Generation (2011-2013)

- Project Manager for several large and medium sized replacement projects of station service systems at different OPG facilities
- Projects include the development of concepts, specifications and monitoring installation

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ENGINEERS

- **Mayo B Water to Wire Supply QA/QC Program, Mayo, Yukon**
  Client: Yukon Energy (2010 - 2011)
  - Program Manager for manufacturing monitoring and inspection program for equipment supply from China and North America
  - Development of independent Inspection & Test Plan for the complete supply
  - Development and execution of factory inspections until release for shipping
  - Planning and execution of inspections
  - Monitoring and evaluation of schedule progress
  - Resolution of quality and schedule issues with all parties

- **Lac Seul Generating Station, Ear Falls, Ontario**
  Client: SNC Lavalin (2008 – 2010)
  - Assumed Project Manager responsibilities during the commissioning phase of the work.
  - Managed the team to achieve plant acceptance by Ontario Power Generation
  - Established, maintained and resolved outstanding deficiencies through engineering activities and execution of site outages
  - Closed out project documentation and commercial conflicts with clients and suppliers

- **Ashlu Creek Generating Station, Squamish, British Columbia**
  Client: Ashlu Creek Limited Partnership (Innergex) (2007 – 2010)
  - As Project Manager led an international team of staff and suppliers for the design, supply and installation of a 54MW plant comprised of three horizontal Francis units, an energy dissipation system and all balance of plant supply.
  - Coordinated the design process with multiple domestic and international participants and successfully commissioned a solution for dissipating 60MW of plant bypass water in a site with limited space. This was considered a first in Canada and is now a reference plant as a successful solution for energy dissipation.

- **Trent Rapids Generating Station, Peterborough, Ontario**
  Client: Trent Rapids Power Corporation (Peterborough Utilities) (2006 – 2009)
  - As Project Manager led an international team of staff and suppliers for the design, supply and installation of two horizontal ECOBULB type Kaplan turbines and all balance of plant with a capacity of 8MW.

- **Umbata Falls Generating Station, Marathon, Ontario**
  Client: Umbata Falls Limited Partnership (Innergex) (2006 – 2008)
  - As Project Manager led an international team of staff and suppliers for the design, supply and installation of two high head (34m) horizontal S-type Kaplan units with a combined output of 23MW with all balance of plant supply

- **Magueyal, Brazo Derecho and Hatillo Generating Station, Dominican Republic**
  Client: Corporación Dominicana de Empresas Electricas Estatales (2006 – 2008)
  - As Project Manager developed an international consortium of suppliers for the development of water to wire packages of three hydro power plants.
  - Led the team of staff and suppliers for the design, supply and installation of a total of four units including both Francis and Kaplan units.
  - Completed the installation and commissioning of one plant and the supply for the other two plants.

- **Healey Falls Generating Station, Campbellford, Ontario**
  Client: Ontario Power Generation (2007-2010)
  - As Project Manager and Program Manager led an international team of staff and suppliers for the design, supply and installation of one vertical Kaplan unit with an output of 7MW with all balance of plant supply.

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  - The work involved installation in an operating plant considered a heritage site.

- **Aberfeldie Generating Station, Cranbrook, British Columbia**
  Client: BC Hydro (2009-2010)
  - Assumed Project Manager responsibilities after the units were placed in service.
  - Developing and implemented solutions to plant deficiencies
  - Negotiating closure of outstanding commercial issues with client and suppliers
  - Negotiated technical solutions and achieved client approval of unit bearings that were not conforming to specifications.

SIGNIFICANT PROJECTS IN MANUFACTURING

- **Manufacturing Plant Layout Design & Construction Monitoring, Sybron Dental Specialties**
  - As Project Manager led a team consisting of internal staff, consulting engineers and a general contractor for the expansion of the manufacturing space in a high volume manufacturing facility
  - Performed flow analysis and developed a floor plan for the expansion of the manufacturing facility solution to suit product flow and inter-departmental relationships.
  - Developed the construction plan details with engineers and architects
  - Monitored construction progress
  - Planned and executed the moving of processes and equipment including re-validation of manufacturing processes.

- **Packaging Process Development, Sybron Dental Specialties**
  - Researched packaging technologies and developed new packaging concepts with marketing staff
  - Developed the packaging system concepts including equipment, data handling, mix and capacity plans to determine the layout and capital needs
  - Sourced and installed the equipment
  - With the assistance of consultants and an internal team developed the integrated algorithms and automation solution used to develop packaging production schedules integrated into the packaging line data flow.
  - Selection and implementation of printing technologies to adapt to changing package information in process.

- **Development of High Volume CNC Grinding Equipment, Sybron Dental Specialties**
  - As Program Manager, developed and implemented a series of projects to develop the necessary technology to perform high volume grinding with a goal to replace aging technologies and improve output rates and quality.
  - The program involved the development of mechanical solutions to withstand the rigours of 24 hour per day operation in highly abrasive environments and control and software solutions to achieve product variety and motion control.
  - The units were highly successful and improved output and product range by 30 to 80% depending on product line with very low capital cost to construct.

- **Oil Mist Capturing and Filtering, Sybron Dental Specialties**
  - The operations included a department with over 250 units generating oil mist in grinding operations. The scale of the situation made the problem intractable.
  - As Program Manager managed a team of engineers and suppliers to improve air quality and reduce oil loss in a series of parallel projects
  - Developed the capital plan and implemented the necessary HVAC equipment and process changes.
  - Achieved a tenfold improvement in air quality and a 30% reduction in oil loss

STEFAN KOHNEN, MBA, P.ENG.

REGIONAL MANAGER/MECHANICAL/ELECTRICAL DEPARTMENT HEAD

- **Product Washing and Waste Treatment, Sybron Dental Specialties**
  - As Program Manager led a series of project teams to eliminate the use of solvents in a high volume production with no impact on product cleanliness or impact on product cost or production leadtimes.
  - Selected technologies and implemented aqueous washing solutions while accommodating product flow and material handling requirements
  - Selected and implemented waste reduction technologies to reduce waste

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SEAN BAYER, M.Eng., P.Eng., PMP

DEPARTMENT HEAD - MUNICIPAL

EXPERIENCE & RESPONSIBILITIES

Mr. Bayer is a Professional Engineer with 20 years of experience in both the private and public sectors. His specializations include design and project management work for clients in water treatment, distribution and collection, wastewater management, subdivision development, environmental water monitoring, regulatory compliance, and environmental reporting.

EDUCATION

- **Project Management Professional (2014)**
- **University of Regina**
  Master of Engineering, Environmental (2009)
- **University of Regina**
  Bachelor of Applied Science, Environmental Systems Engineering (1995)
- **University of Regina**
  Bachelor of Mathematics (1995)

PROFESSIONAL ASSOCIATIONS

- Association of Professional Engineers and Geoscientists of Saskatchewan Member of K to 12 Committee
- Western Canada Water and Wastewater Association – Editorial Committee Member
- American Water Works Association
- Consulting Engineers of Saskatchewan - Water Resources Chairperson

EMPLOYMENT HISTORY

2016 - Present	Department Head – Municipal, KGS Group
2012 - 2016	Assistant Department Head – Municipal Group, KGS Group
2011 - 2012	Canadian Environmental Manager, EVRAZ NA INC (key KGS client)
2009 - 2011	Project Manager, KGS-MR2 Group, Regina
2006 - 2009	Project Manager, M•R•2 - McDonald & Associates
2004 - 2006	Approvals Engineer, Saskatchewan Environment
2001 - 2004	Environmental Project Officer, Saskatchewan Environment

PROJECT EXPERIENCE

Department Experience

- **Waste Management Centre**
  Project Manager for the Civil Servicing at the City of Regina Waste Management Centre. Supervision of flow modeling, coordination of design staff and communication with Owner.
- **College Avenue Campus Revitalization Project**
  Project Manager for the College Avenue Campus Revitalization. Coordination of design staff which included engineering services during construction. Oversight to design and flow modeling phases.
- **Conexus Building Communities Project**
  Project Manager for the Conexus Building Communities Project. Communication with Owner and design staff. Coordination of engineering services during construction. Supervision of design and flow modeling stages.

- **White City**
  Project Manager of the White City development project. Supervision of flow modeling, communication with Owner and their representatives.
- **Meadow Lake Water Distribution**
  Project Manager for the upgrades to the City of Meadow Lake distribution system. Supervision of modeling work along with design coordination and client communication.
- **Meadow Lake Water Treatment**
  Project Manager for the upgrades to the City of Meadow Lake water treatment plant including the addition of a pump well and membrane treatment system
- **EVRAZ NA INC**
  Project Manager of various indoor air quality projects as well as ensured environmental compliance for four sites in Canada. Reviewed NPRI and GHG submissions and reviewed various Provincial regulatory submissions.
- **Island Lake Manitoba Water Treatment Plant, 2014**
  Project managed and conducted design work related to the process design portion of the design build.
- **City of Moose Jaw Sanitary Landfill**
  Did various sampling, monitoring and reporting.
- **City of Lloydminster Landfill**
  Provided project management oversight on the civil, structural, and electrical components for the project to date, presently the project is on hold
- **Northwest Regional Landfill**
  Provided project management and design assistance on the leachate management review and detailed design of cell number 2.
- **City of Moose Jaw**
  Annual monitoring, analysis and reporting of the city's wastewater effluent discharge program. Provided detailed engineering and project management services, specifications assistance on the high service and north east reservoir booster chlorination projects.
- Assisted in the detailed design of the booster chlorination at Buffalo Pound Provincial Park and also assisted with the wastewater facility review at Moose Mountain Provincial Park.
- Authoring Numerous Waterworks System Assessment s (730) including providing authoring assistance with the City of Melville, City of Regina and City of North Battleford.
- Predesign, detailed design work and project management with the **City of Moose Jaw Booster Chlorination projects.**
- Predesign, detailed design and project management at the **Village of Frontier water treatment plant.**
- Predesign, detailed design and project management at the **Town of Kipling wastewater treatment plant.**
- Predesign, detailed design and project management assistance at the **Town of Regina Beach water treatment plant.**
- Predesign, detailed design and project management assistance at **Thomson Lake Regional Park wastewater treatment plant.**
- Detailed design and project management assistance for water treatment and wastewater system at **Golden Band Resources mine sites**.
- Reviewed alternative coagulants and disinfection regimes for multitude of clients (for THM reduction) as well as authored a revised powdered chlorine dioxide as part of a masters project.

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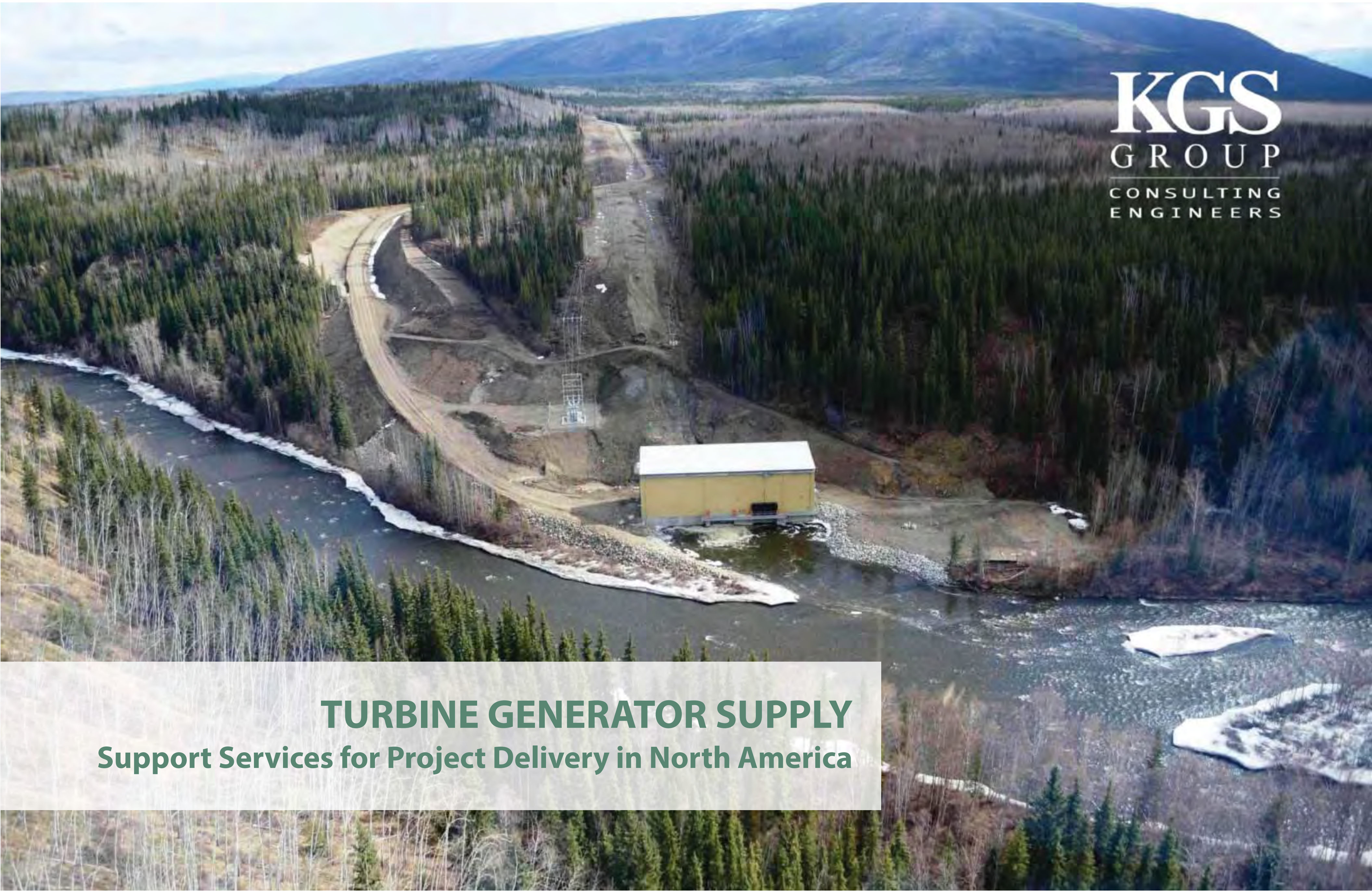
- Involved with reviews of modified slow sand both at regulatory and consultant level.
- Detailed design and project management of **Village of North Portal water treatment plant**.
- Project management assistance during construction phase at **Town of Broadview water treatment plant.**
- Project Management lead work on Electro coagulation wastewater treatment trial at Evraz.
- **RM of Lac Pelletier Lagoon Expansion**
  Provided project management services related to pre-design, detailed design and Engineering services during construction.
- **Mainprize Regional Park Lagoon Expansion**
  Provided project management services related to pre-design, detailed design and Engineering services during construction.
- **Town of Kipling Lagoon Expansion**
  Provided project management services related to pre-design, detailed design and Engineering services during construction.
- **White City Development Servicing Investigation Work**
  Project Manager of the White City development project. Supervision of flow modeling, communication with Owner and their representatives.
- **White City, Sewage Pumping Station #3**
  Project Manager for the Sewage Pumping Station upgrades that involved pumping capacity flow and operational upgrades, including the addition of backup power.
- **White City, Phase 1 Waterline Upgrades**
  Project Manager for the addition of a 400 mm line leaving the water treatment plant, the first phase in a long term servicing approach for growing population at the Town of White City.
- **SaskWater, White City Mechanical/Electrical Water Plant Upgrades**
  Project Manager for Water Treatment Upgrades including the Addition of new filtration, distribution and appurtenances.

APPENDIX C

BROCHURE - TURBINE GENERATOR SUPPLY



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CONSULTING
ENGINEERS

TURBINE GENERATOR SUPPLY

Support Services for Project Delivery in North America

We are a well-established engineering firm with a history of leading the planning, design and management of significant public and private hydropower projects across Canada and internationally.

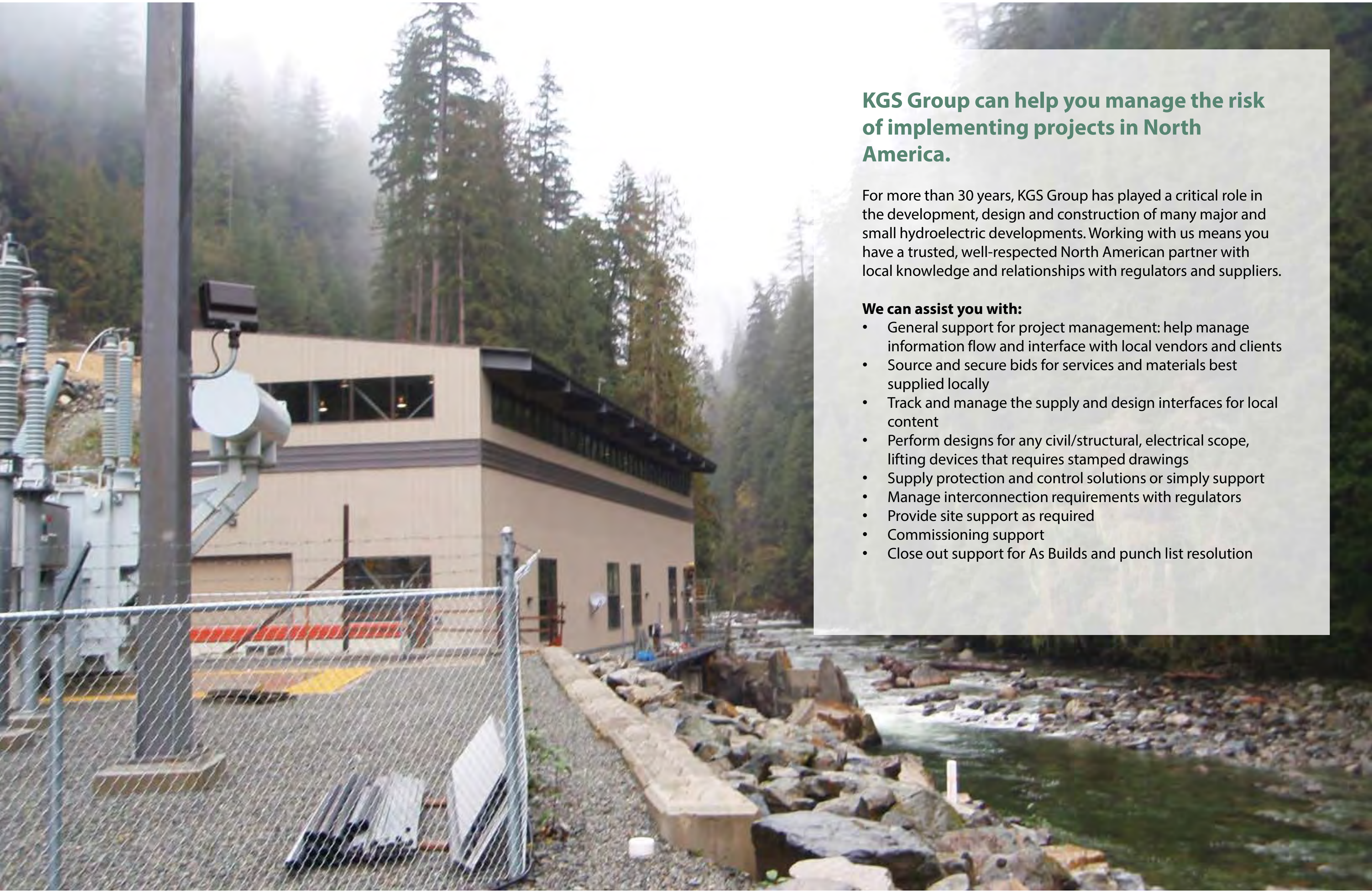
Our highly experienced team of engineers, scientists and technologists, provide a complete range of engineering services.

400+
staff across
Canada/US

6
cities with
KGS Group
offices

PROJECT & CONSTRUCTION MANAGEMENT
HYDRAULICS/WATER RESOURCES
STRUCTURAL
GEOTECHNICAL
MECHANICAL
ELECTRICAL
ENVIRONMENTAL
CIVIL/MUNICIPAL
INDUSTRIAL
SURVEYING/GIS

KGS Group is certified to ISO 9001 and our health and safety program is registered with several certification agencies.



KGS Group can help you manage the risk of implementing projects in North America.

For more than 30 years, KGS Group has played a critical role in the development, design and construction of many major and small hydroelectric developments. Working with us means you have a trusted, well-respected North American partner with local knowledge and relationships with regulators and suppliers.

We can assist you with:

- General support for project management: help manage information flow and interface with local vendors and clients
- Source and secure bids for services and materials best supplied locally
- Track and manage the supply and design interfaces for local content
- Perform designs for any civil/structural, electrical scope, lifting devices that requires stamped drawings
- Supply protection and control solutions or simply support
- Manage interconnection requirements with regulators
- Provide site support as required
- Commissioning support
- Close out support for As Builds and punch list resolution

OUR EXPERTISE

Turbines & Generators

- Equipment selection, specification and technical review
- Condition assessments and rehabilitation
- Technical and economic evaluation of equipment up-rating options including re-runnering, generator rewind and unit replacement
- Site supervision during installation, overhauls and commissioning
- Performance evaluation, index testing
- Failure analysis

Mechanical & Electrical

- Protection and control
- Interconnection approvals
- Hydropower and balance of plant
- Process piping & equipment
- Cranes and hoists
- HVAC/water/sewage systems
- AC and DC station service
- Emergency/backup power
- Grounding systems
- Power systems and distribution
- Substations and transmission lines

Flow Control Facilities, Gates & Gates Handling

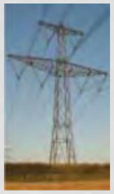
- Detailed design of new spillway and intake gates, stoplogs, hoists and guides
- Inspection, testing, condition assessment of spillway and intake gates
- Failure mode and effect analysis
- Life extension measures
- Risk analysis

Manufacturing & Commissioning

- Manufacturing QA/QC services
- Commissioning

Hydraulics/Hydrology

- Design of hydraulic structures
- Energy production optimization
- Reservoir simulation & operation optimization
- Transient analysis
- Flood control, water supply, drainage & irrigation
- Ice jam remediation
- Dam safety and FMEA evaluations
- Fishery and fish passage design



We have close to 100 people in our hydropower group

Our industry-leading hydro team brings dams and generating stations online across Canada and in the United States.

Key staff from the former Andritz Hydro Compact office in Toronto (below):

- Implemented Francis, Pelton and Kaplan projects in Canada, the US and the Caribbean
- Executed projects from complete water to wire including gates and substation to simpler supply and commissioning of turbines, generators and auxiliaries
- Are familiar with implementing energy dissipation solutions for flow bypass frequently encountered in high head projects

Stefan Kohnen
Regional Manager &
Head of Mechanical/
Electrical Department

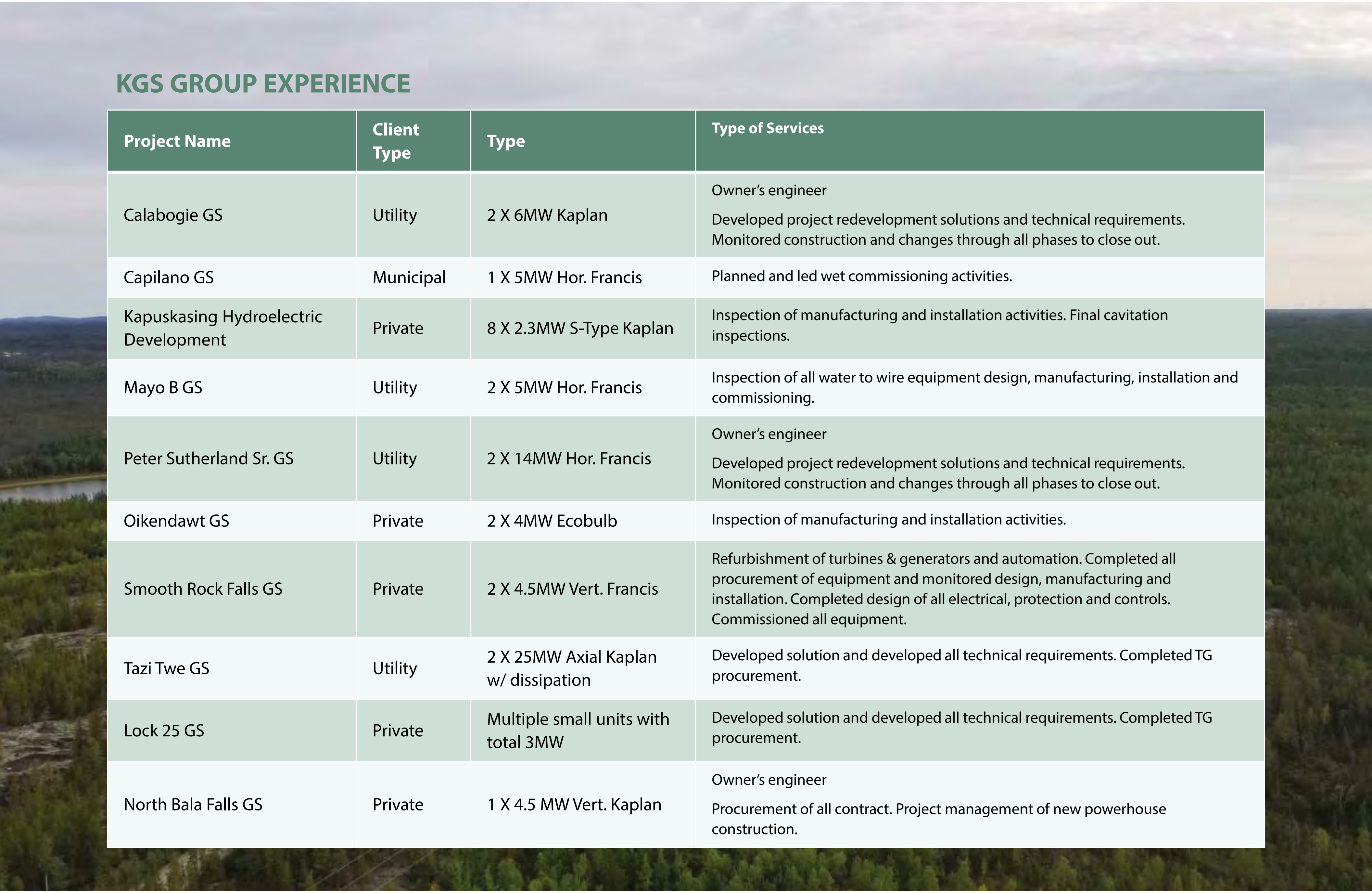
Michael Vance
Senior Mechanical
Project Manager

Monish Bhowmik
Senior Electrical Engineer
& Project Manager

Ken Besser
Senior Mechanical
Engineer

EXPERIENCE OF THE PROPOSED TEAM (ANDRITZ HYDRO COMPACT PROJECTS)

Project Name	Client Type	Type	Location
Aberfeldie GS	Utility	3 X 8MW Hor Francis	British Columbia, Canada
Abiquiu GS	Private	1 X 3MW Hor Francis	New Mexico, USA
Ashlu Creek GS	Private	3 X 18MW Hor Francis with 60MW Dissipation	British Columbia, Canada
Brazo Derecho GS	Utility	1 X 3MW Vert CAT Kaplan	Dominican Republic
Fitzsimmons Creek GS	Private	1 X 7MW Pelton	British Columbia, Canada
Hatillo GS	Utility	1 X 12 MW Hor S-type Kaplan	Dominican Republic
Healey Falls GS	Utility	1 X 7MW Hor CAT Kaplan	Ontario, Canada
Kwalsa GS	Private	8 X 7MW Hor Francis/ Pelton w/ Energy Dissipation	British Columbia, Canada
Lac Seul GS	Utility	1 X 12MW Pit Kaplan	Ontario, Canada
Magueyal GS	Utility	2 X 1.5MW Hor Francis	Dominican Republic
Trent Rapids GS	Private	2 X 4MW Ecobulb	Ontario, Canada
Umbata Falls GS	Private	2 X 12MW Hor S-type Kaplan	Ontario, Canada
Upper Stave GS	Private	6X 7MW Hor Francis/ Pelton w/ Energy Dissipation	British Columbia, Canada



KGS GROUP EXPERIENCE

Project Name	Client Type	Type	Type of Services
Calabogie GS	Utility	2 X 6MW Kaplan	Owner's engineer Developed project redevelopment solutions and technical requirements. Monitored construction and changes through all phases to close out.
Capilano GS	Municipal	1 X 5MW Hor. Francis	Planned and led wet commissioning activities.
Kapuskasing Hydroelectric Development	Private	8 X 2.3MW S-Type Kaplan	Inspection of manufacturing and installation activities. Final cavitation inspections.
Mayo B GS	Utility	2 X 5MW Hor. Francis	Inspection of all water to wire equipment design, manufacturing, installation and commissioning.
Peter Sutherland Sr. GS	Utility	2 X 14MW Hor. Francis	Owner's engineer Developed project redevelopment solutions and technical requirements. Monitored construction and changes through all phases to close out.
Oikendawt GS	Private	2 X 4MW Ecobulb	Inspection of manufacturing and installation activities.
Smooth Rock Falls GS	Private	2 X 4.5MW Vert. Francis	Refurbishment of turbines & generators and automation. Completed all procurement of equipment and monitored design, manufacturing and installation. Completed design of all electrical, protection and controls. Commissioned all equipment.
Tazi Twe GS	Utility	2 X 25MW Axial Kaplan w/ dissipation	Developed solution and developed all technical requirements. Completed TG procurement.
Lock 25 GS	Private	Multiple small units with total 3MW	Developed solution and developed all technical requirements. Completed TG procurement.
North Bala Falls GS	Private	1 X 4.5 MW Vert. Kaplan	Owner's engineer Procurement of all contract. Project management of new powerhouse construction.

Project Highlight –

ABERFELDIE GENERATING STATION, BC HYDRO, BRITISH COLUMBIA, CANADA

- Redevelopment of existing facility
- New 24MW powerhouse and penstock
- 3 Unit Horizontal Francis turbine layout
- Transmission connected
- Utility client

Responsible for supply, installation and commissioning of:

- Turbines, generators and auxiliaries with turbine inlet valves
- Protection and control system



Project Highlight –

ASHLU CREEK GENERATING STATION, INNERGEX, BRITISH COLUMBIA, CANADA

- New 56 MW greenfield site
- 3 Unit Horizontal Francis turbine layout
- 60MW energy dissipation solution
- Transmission connected
- Private client

Responsible for supply, installation and commissioning of:

- Turbines, generators and auxiliaries with turbine inlet valves
- Energy dissipation solution

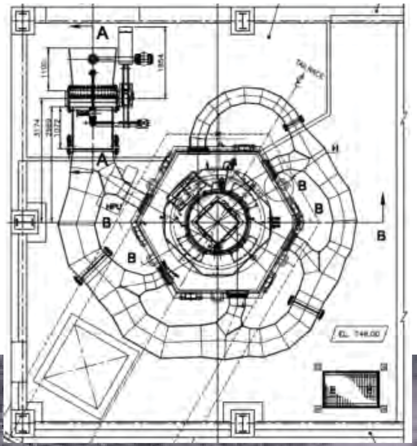
Project Highlight –

FITZSIMMONS CREEK GS, LEDCOR, BRITISH COLUMBIA, CANADA

- New 7 MW greenfield site
- Single 6 nozzle vertical Pelton turbine layout
- Distribution connected
- Private client

Responsible for supply, installation and commissioning of:

- Turbines, generators and auxiliaries with turbine inlet valves



KGS
GROUP
CONSULTING
ENGINEERS

Contact

Email: skohnen@kgsgroup.com
Phone: 1 (905) 848-7876
Mobile: 1 (905) 484-3880

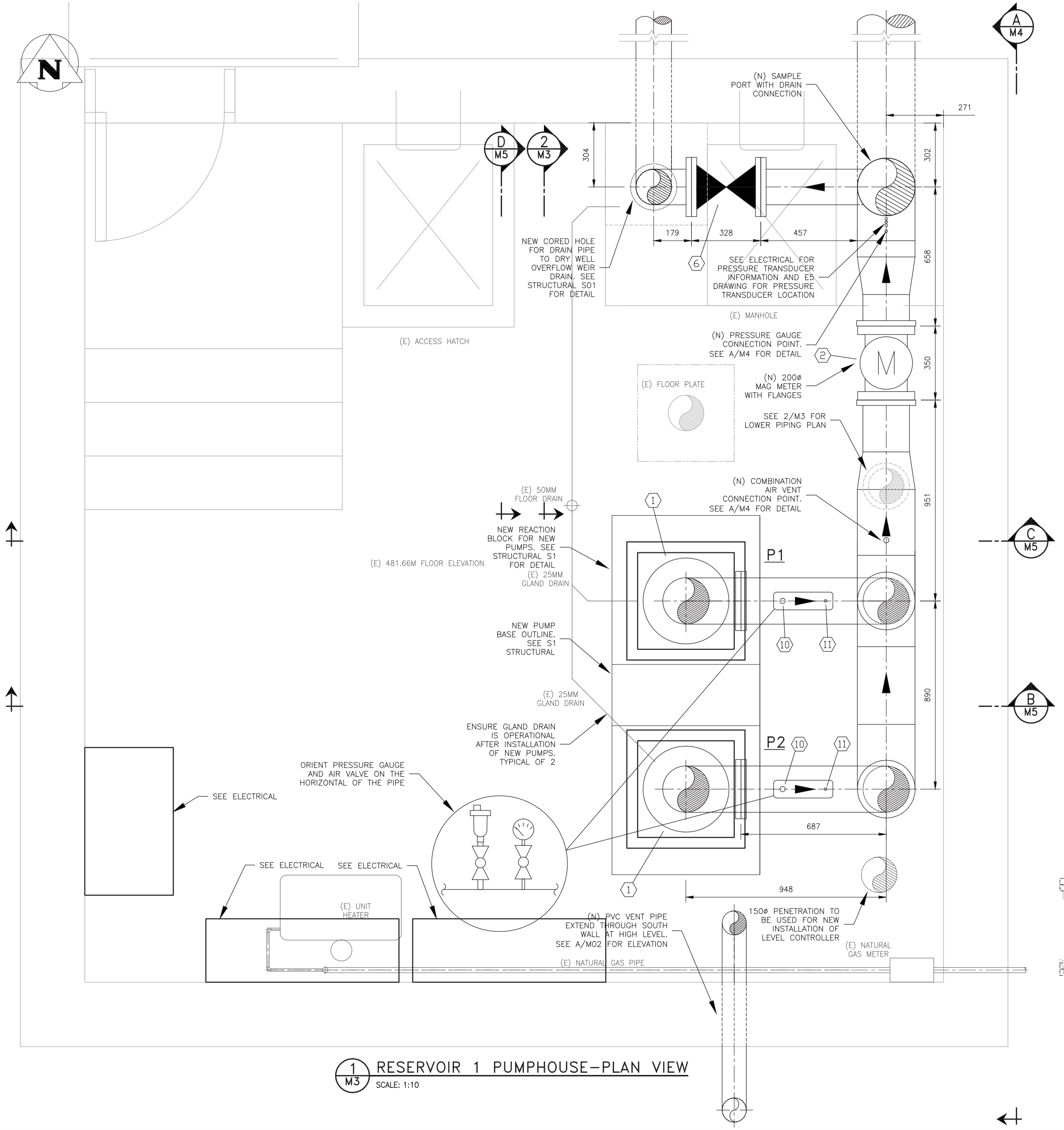
www.kgsgroup.com

APPENDIX D

FLOOR PLANS AND DETAIL SHEET EXAMPLES

KGS24x36B

FileName: P:\Projects\2013\13-1784-001\Dwg\Mech\13-1784-001_M01_Pumphouse_ASBUILT.dwg -- Tab: M3 Plotted By: bwelta 07/17/2017 [Mon 10:12am]
24"x36"/PLOT SCALE: 1:1

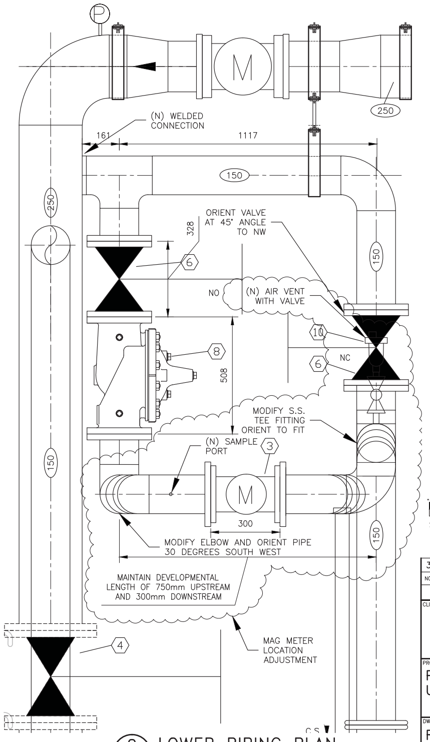


1 RESERVOIR 1 PUMPHOUSE-PLAN VIEW
M3

SCALE: 1:10

DESIGNATED MATERIALS AND EQUIPMENT LIST			
	SIZE	MATERIAL	DESCRIPTION
1	150		2 - VERTICAL TURBINE PUMPS MOTOR 575V 3PH 60HZ, 40 HP/29.82 KW 1770
2	200		RPM MAG WATER METER, 200MM
3	150		1 - MAG WATER METER 150MM
4	250		1 - CLASS 150 IRON BODY GATE VALVE, FLANGED, NON-RISING STEM WITH HANDWHEEL
5	200		2 - CLASS 150 IRON BODY GATE VALVE, FLANGED, NON-RISING STEM WITH HANDWHEEL
6	150		3 - CLASS 150 IRON BODY GATE VALVE, FLANGED, NON-RISING STEM WITH HANDWHEEL
7	200		1 - SILENT CHECK VALVE, CLASS 125, CAST IRON VALVE BODY.
8	150		1 - PRESSURE REDUCING VALVE, CLASS 150, FLANGED, STAINLESS STEEL PILOT 0-75 PSI WITH ELECTRIC SOLENOID ACTUATION.
9	12,25		1 - 25 TWO-PIECE STAINLESS STEEL BALL VALVE - FULL PORT, 3 - 12 TWO-PIECE STAINLESS STEEL BALL VALVE - FULL PORT
10	25		4 - AIR RELEASE VALVE
11	12.5		3 - PRESSURE GAUGES, 75MM DIAL WITH SNUBBER
12	250	C.S.	SCHEDULE 40 PIPE & FITTINGS
13	200	C.S.	SCHEDULE 40 PIPE & FITTINGS
14	150	C.S.	SCHEDULE 40 PIPE & FITTINGS
15	150	PVC	SCHEDULE 80 PIPE & FITTINGS

NOTE: QUANTITIES TO BE FIELD VERIFIED ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE NOTED



2 LOWER PIPING PLAN
M3

SCALE: 1:10

GENERAL NOTES:

1. DRAWINGS WERE CREATED USING UMA RECORD DRAWINGS DATED 1971.
2. LOCATIONS OF UTILITIES ARE SHOWN AS APPROXIMATE ONLY AND MUST BE FIELD VERIFIED PRIOR TO WORK COMMENCING.
3. CONTRACTOR TO FOLLOW ALL CEC REQUIREMENTS FOR PUMP CONNECTIONS.

NOTES:

1. CONFIRM ALL DIMENSIONS BEFORE CONSTRUCTION.
2. ELEVATIONS (EL.) PROVIDED IN METRES.
3. TOP OF EXISTING FLOOR ELEVATION IS 481.66.
4. SUPPLY AND INSTALL DISMANTLING JOINTS FOR PUMPS IF NECESSARY FOR PLACEMENT OR FUTURE REMOVAL.
5. ALL NEW PIPE TO BE SCH. 80 PVC OR SCH. 40 C.S. UNLESS NOTED OTHERWISE.
6. SUPPORT PIPING AS REQUIRED.
7. PROVIDE FLANGED SPOOL PIPE FOR ALL MAG METERS.
8. SEE ELECTRICAL FOR PRESSURE TRANSDUCER INFORMATION.
9. REFER TO STRUCTURAL DRAWING S1 FOR NEW CORING PENETRATIONS.

LEGEND:

⋈	GATE VALVE
⋈●	GLOBE VALVE
|⌒|	BUTTERFLY VALVE
◿	CHECK VALVE
⋈○	BALL VALVE
⍒	AIR RELEASE VALVE
⊸	PRESSURE GAUGE
Ⓟ	PRESSURE TRANSDUCER
⊣⋈	SAMPLE COCK
M	FLOW METER
◁	REDUCER
(300)	PIPE DIAMETER
NO	NORMALLY OPEN
NC	NORMALLY CLOSED
(N)	NEW
(E)	EXISTING

.2 0 .2 .4 .6 .8m

SCALE: 1:10 METRIC 24"x36"
1:20 METRIC 11"x17"

NO.	YY/MM/DD	DESCRIPTION	BY
3	17/07/11	ISSUED FOR AS-BUILT	RAM

REVISIONS / ISSUE

CLIENT:
CITY OF MEADOW LAKE

PROJECT:
POTABLE WATER DISTRIBUTION UPGRADES

DWG. DESCRIPTION:
RESERVOIR 1 PUMPHOUSE
PLAN VIEW AND LOWER PIPING PLAN

AS-BUILT

AS-BUILT DRAWING REVISIONS ARE BASED SOLELY ON DRAWING MARKUPS OR OTHER FIELD DOCUMENTATION PROVIDED BY:

CONTRACTOR

THESE CHANGES HAVE NOT BEEN VERIFIED IN THE FIELD BY KGS GROUP.

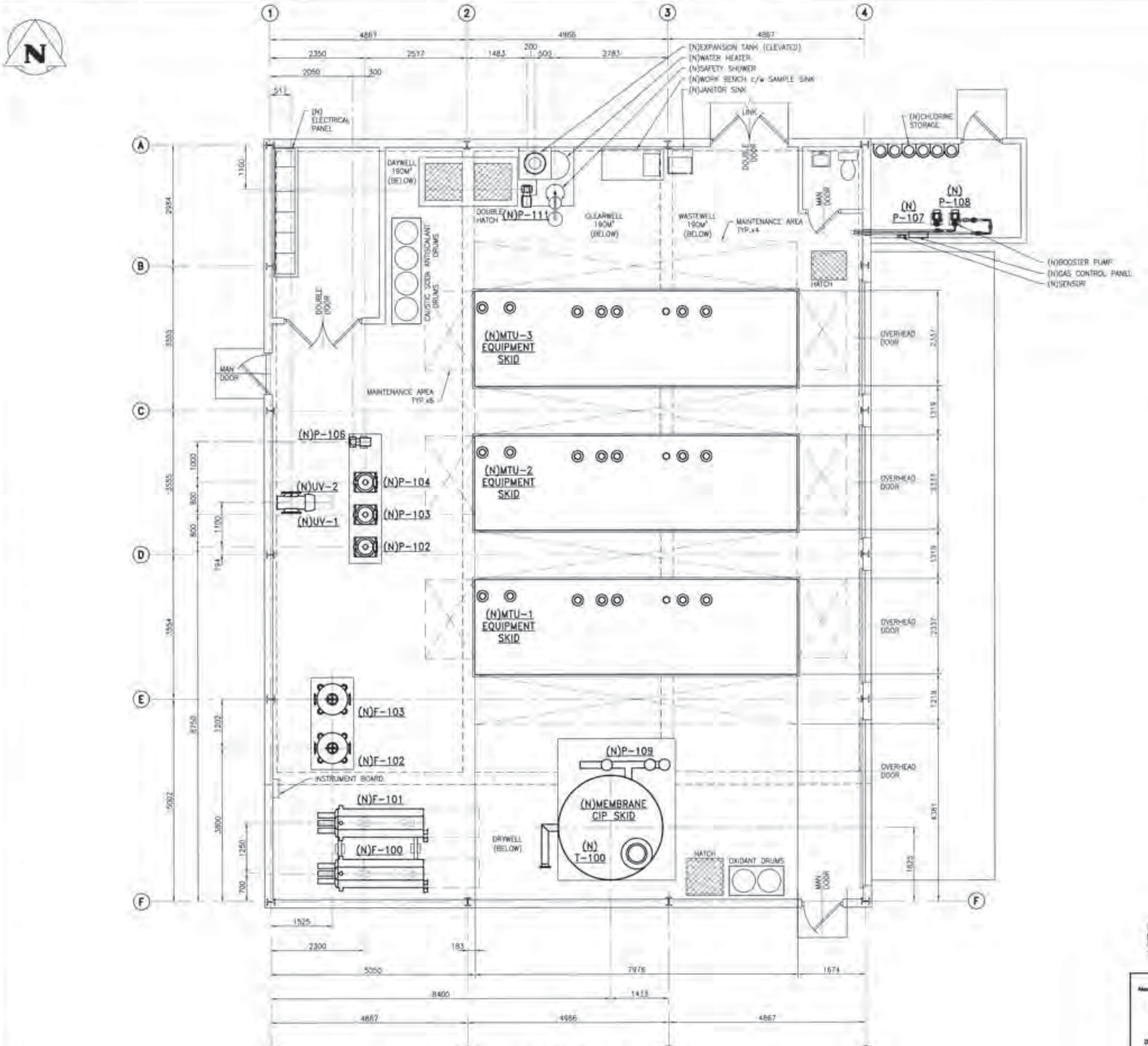
ENG. STAMP

ORIGINAL DRAWING
SEALED BY:
R.A. MCDONALD
2014/12/01

KGS GROUP
CONSULTING ENGINEERS

DESIGN BY: DMN	DATE (YY/MM/DD): 14/11/20
DESIGN CHECK: AMD	DATE: 14/11/21
DRAWN BY: DMN	DATE: 14/11/21
DWG CHECK: RAM	DATE: 14/11/21

DWG. NO. 13-1784-001 M3
REV: 3



FLOOR PLAN
SCALE 1:50

LEGEND

———	EQUIPMENT
(N)	NEW
(E)	EXISTING

GENERAL NOTES:

1. THE CONTRACTOR SHALL REVIEW ALL PROJECT DRAWINGS AND DOCUMENTS PRIOR TO ANY CONSTRUCTION ON SITE. ANY DISCREPANCIES, MISSING DIMENSIONS AND/OR REQUIRED DETAILS SHALL BE BROUGHT TO THE ATTENTION OF THE CONSULTANT BEFORE ANY WORK AFFECTED IS COMMENCED.
2. THE CONTRACTOR SHALL CO-ORDINATE WITH THE OWNER TO ENSURE THAT THE WORK DOES NOT DISRUPT NORMAL PLANT OPERATIONS.

EQUIPMENT INSTALLATION NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE NOTED.
2. UNLESS OTHERWISE NOTED, ALL HORIZONTAL PUMPS ARE LOCATED BY CENTRE LINE OF SUCTION FLANGES.
3. UNLESS OTHERWISE NOTED, ALL TANKS AND VESSELS SHALL BE INSTALLED WITH 0 DEGREES (FROM SHOP DRAWING) ORIENTED TO "BUILDING NORTH".
4. INSTALL ALL EQUIPMENT AS PER MANUFACTURER'S INSTALLATION MANUALS AND RECOMMENDATIONS.
5. REFER TO EQUIPMENT VENDOR DRAWING FOR ANCHOR BOLT DETAILS.
6. ALL EQUIPMENT SHALL BE INSTALLED WITHIN ± 3mm OF ELEVATION SPECIFIED ON DRAWINGS.
7. THE EQUIPMENT SHALL BE INSTALLED WITHIN ± 3mm OF COLUMN CENTRE LINE NORTH-SOUTH AND EAST-WEST AS MARKED ON PILE CAPS.
8. SHIM PLATES TO BE USED FOR LEVELLING EQUIPMENT SHALL BE CUT FROM STANDARD SHIM STOCK MATERIAL (ASTM A36).
9. ALL SHIMS SHALL BE A MINIMUM OF 75x75. SHIMS SHALL BE LARGER OR IN MULTIPLE STACKS FOR LARGER EQUIPMENT.
10. VERTICAL VESSELS SHALL BE INSTALLED TO A TOLERANCE OF 1/1000 OF VERTICAL, TO A MAXIMUM DEVIATION OF 25mm AND WITHIN ± 3mm WITH RESPECT TO COORDINATES.
11. HORIZONTAL VESSELS SHALL BE INSTALLED TO THE TOLERANCE AS FOLLOWS:
    ELEVATION: ± 3mm
    CO-ORDINATES: ± 3mm
    TILT: ± 3mm

EQUIPMENT INSTALLATION TABLE

EQUIPMENT		ELEVATIONS		
TAG	DESCRIPTION	ELEV.(M)	REMARKS	GROUT(mm)
F-100	SELF CLEANING FILTER	481.225	INLET FLANGE	
F-101	SELF CLEANING FILTER	481.225	INLET FLANGE	
F-102	CARTRIDGE FILTER	479.915	U/S OF BASE	40
F-103	CARTRIDGE FILTER	479.915	U/S OF BASE	40
P-102	VERTICAL TURBINE PUMP	479.915	U/S OF SOLE PLATE	40
P-103	VERTICAL TURBINE PUMP	479.915	U/S OF SOLE PLATE	40
P-104	VERTICAL TURBINE PUMP	479.915	U/S OF SOLE PLATE	40
P-106	BLEND PUMP	479.965	U/S OF BASE	40
P-111	DOMESTIC WATER PUMP	479.915	U/S OF BASE	40
MTU-1	MEMBRANE TREATMENT UNIT	479.915	U/S OF SKID	40
MTU-2	MEMBRANE TREATMENT UNIT	479.915	U/S OF SKID	40
MTU-3	MEMBRANE TREATMENT UNIT	479.915	U/S OF SKID	40
CIP SKID	FILTER, HEATER, TANK, PUMP	479.915	U/S OF SKID	40
UV-1	ULTRAVIOLET UNIT	481.219	INLET CENTERLINE	
UV-2	ULTRAVIOLET UNIT	480.219	INLET CENTERLINE	

NO.	YY/MM/DD	DESCRIPTION	DESIGN BY	DESIGN CHECK
0	17/05/30	ISSUED FOR TENDER	AMB	AMD

REVISIONS / ISSUE

CLIENT:
Meadow Lake
Gateway to Pure Air & Water

PROJECT:
WATER TREATMENT PLANT EXPANSION
HWY 55
MEADOW LAKE, SASKATCHEWAN

1 0 1 2 3 4m
SCALE: 1:50 mm (24"x36")

DWG. DESCRIPTION:
MECHANICAL – MEMBRANE PLANT
EQUIPMENT
GENERAL ARRANGMENT

Association of Professional Engineers & Geoscientists of Saskatchewan
CERTIFICATE OF AUTHORIZATION
KGS Group
Number C0620
Permission to Consult held by:

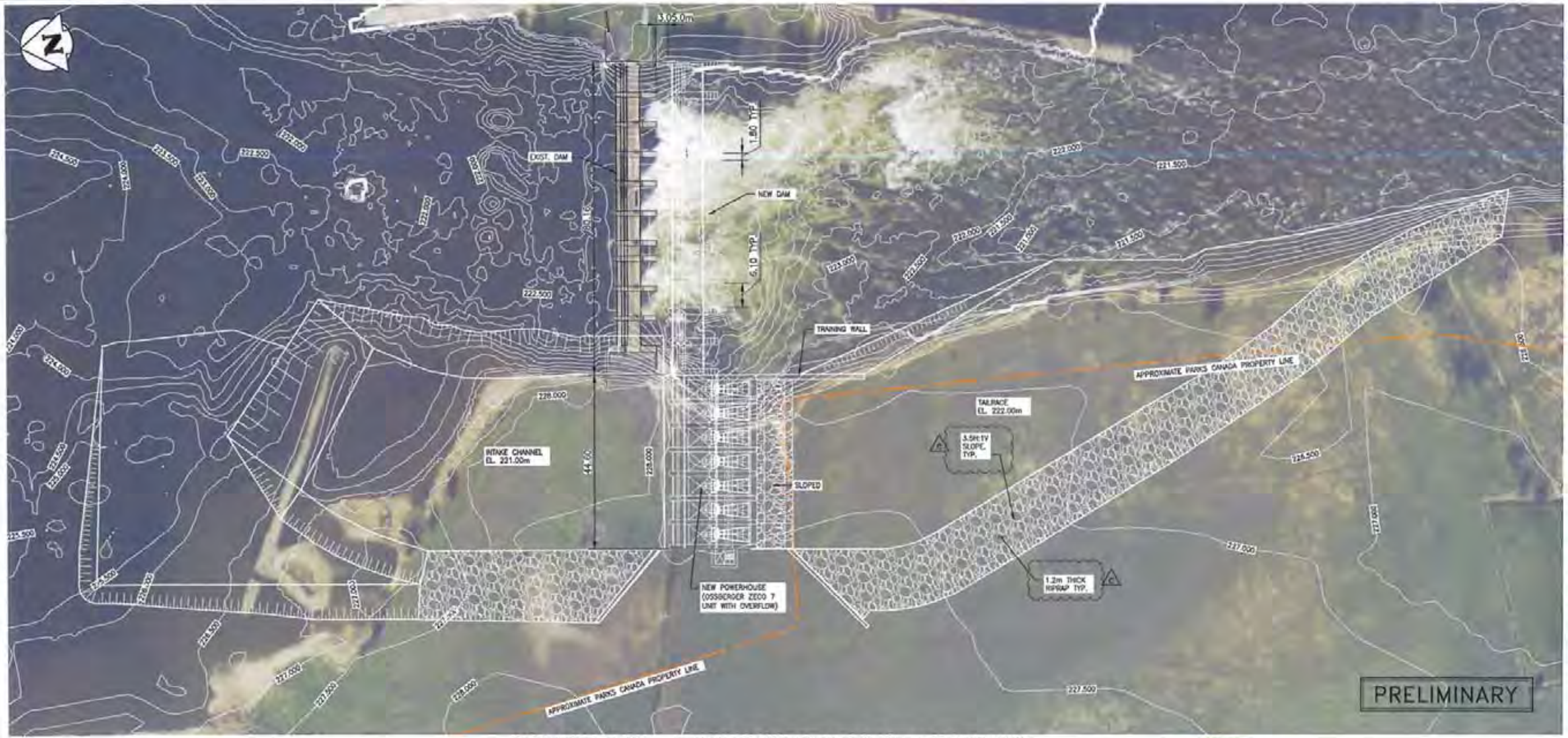
Discipline	Sk. Reg. No.	Signature
Mechanical	20402	

AUTHENTICATION FOR CURRENT REVISION
ENG. STAMP
PROFESSIONAL ENGINEER
A.K.S. BORN
MEMBER 20402
17 05 30
SASKATCHEWAN

KGS
GROUP
CONSULTING ENGINEERS

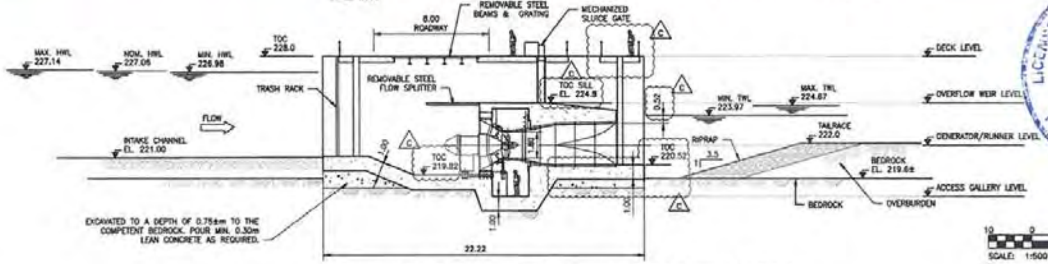
DESIGN BY: AMB	DATE (YY/MM/DD): 17/03/18
DESIGN CHECK: AMD	DATE: 17/05/30
DRAWN BY: BJB	DATE: 17/03/18
DWG. CHECK: ADR	DATE: 17/05/30

DWG. NO.: 15-1784-002 M01
REV.: 0



OSSBERGER ZECO – 7 UNIT POWERHOUSE GENERAL ARRANGEMENT

SCALE 1:500



OSSBERGER ZECO – 7 UNIT WITH OVERFLOW SECTION

SCALE 1:150

10 0 10 20 30 40m
SCALE: 1:500 METRIC 24"x36"
5 0 5 10m
SCALE: 1:150 METRIC 24"x36"

LICENSED PROFESSIONAL ENGINEER
G. S. KOHASH
PROVINCE OF ONTARIO

NO.	YY/MM/DD	DESCRIPTION
C	18/07/11	REVISIONS AS NOTED
B	18/06/25	ISSUED FOR INFORMATION
A	18/06/21	ISSUED FOR INFORMATION

REVISIONS / ISSUE

KGS
GROUP
CONSULTING
ENGINEERS

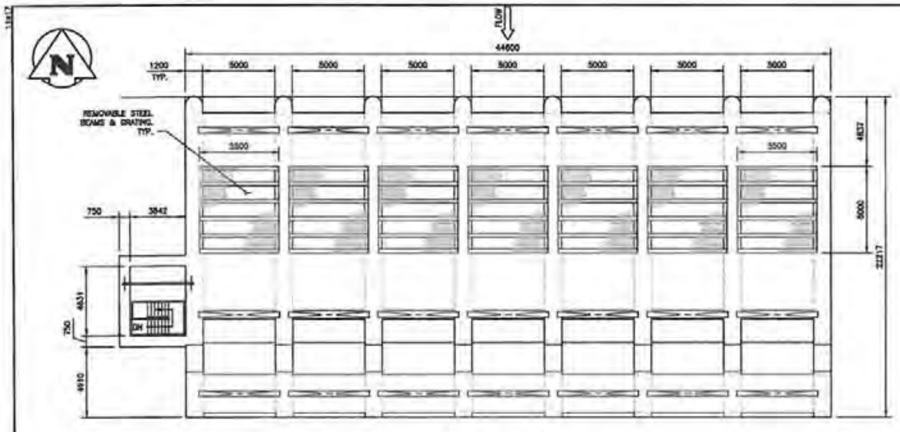
BAWITIK POWER
CORPORATION

LOCK 25 GENERATING STATION

OSSBERGER ZECO – 7 UNIT WITH OVERFLOW
GENERAL ARRANGEMENT PLAN &
POWERHOUSE CROSS SECTION

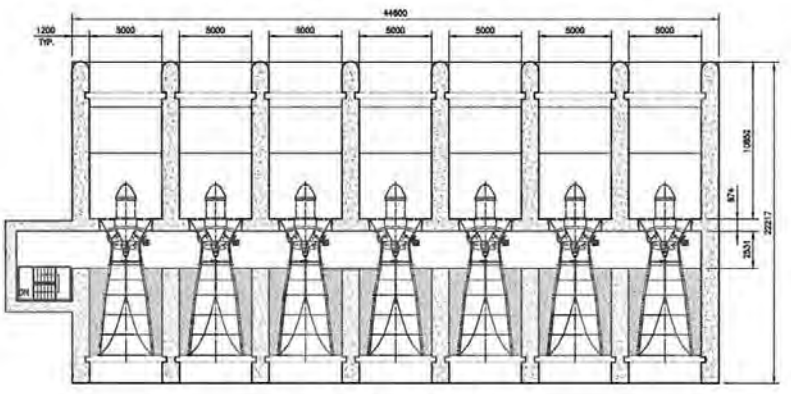
JUNE 2018
FIG 2A
REV. C

11x17



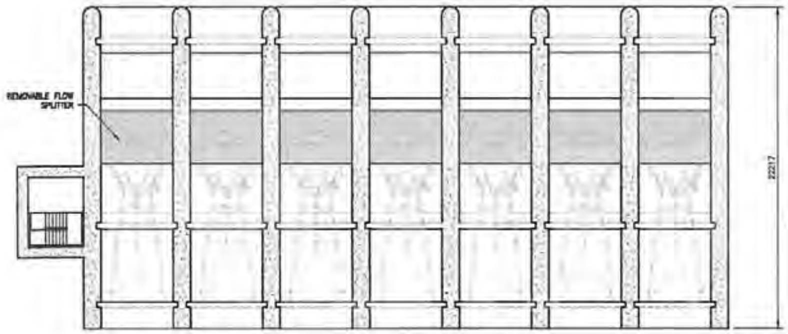
DECK LEVEL PLAN

SCALE 1:150



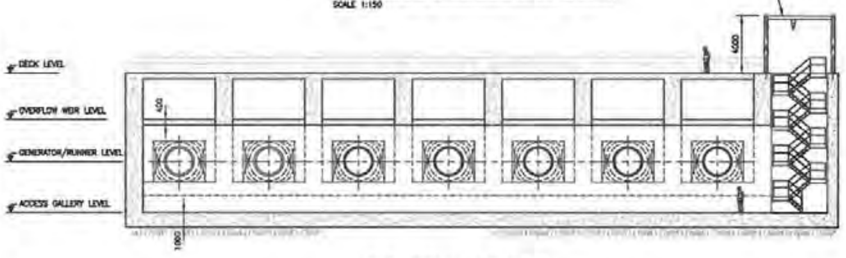
GENERATOR/RUNNER LEVEL PLAN

SCALE 1:150



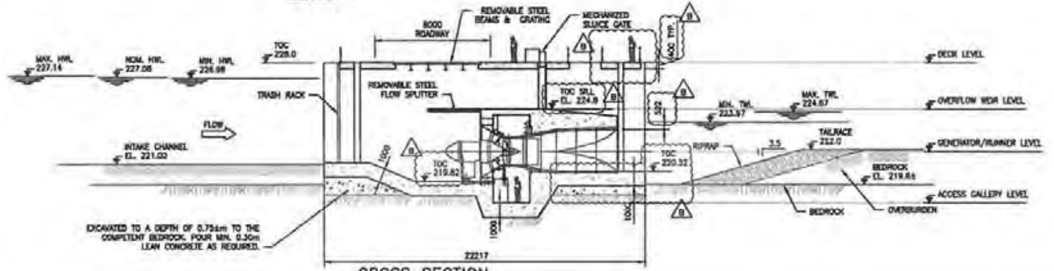
OVERFLOW WEIR LEVEL PLAN

SCALE 1:150



LONGITUDINAL SECTION

SCALE: 1:150



CROSS SECTION

SCALE 1:150

5 0 5 10m

SCALE: 1:150 METRIC 24"x36"

LICENSED PROFESSIONAL ENGINEER
G. S. KOHNEN
PROVINCE OF ONTARIO

PRELIMINARY

B	18/07/11	REVISIONS AS NOTED	
A	18/06/26	ISSUED FOR INFORMATION	
NO.	YY/MM/DD	DESCRIPTION	

REVISIONS / ISSUE

KGS GROUP
CONSULTING ENGINEERS

BAWITIK POWER CORPORATION

LOCK 25 GENERATING STATION

OSSBERGER ZECO – 7 UNIT WITH OVERFLOW
PLANS AND SECTIONS

JUNE 2018

FIGURE 2B

REV. B

Filename: U:\PMS\16-3077-001\06 20 - OSSBERGER ZECO 7 UNIT PLAN & SECTION.dwg - Tab: LAYOUT Plotted By: JCarlos 18/07/11 [Wed 11:22am]
11"x17" PLOT SCALE: 1"=2"

KGS
GROUP
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SEATTLE | WINNIPEG | REGINA | MISSISSAUGA | THUNDER BAY