

**INTERGOVERNMENTAL AGREEMENT BETWEEN THE CITY OF GREELEY AND
THE CITY OF FORT COLLINS REGARDING CERTAIN ASPECTS OF THE
HALLIGAN WATER SUPPLY PROJECT**

(Water Quality Analysis and Mitigation Measures, and
Milton Seaman Reservoir Release Gate Design)

This Intergovernmental Agreement (“Agreement”) is entered into on the date of execution shown on the signature pages, by and between the City of Fort Collins, a home rule municipal corporation, (“Fort Collins”) and the City of Greeley, a home rule municipal corporation, (“Greeley”) (together “Parties,” and individually “Party”).

RECITALS

- A. Through the Halligan Water Supply Project (“Halligan Project”), Fort Collins is pursuing the enlargement of Halligan Reservoir, an existing reservoir located on the North Fork of the Cache la Poudre River (“North Fork”); and,
- B. Greeley owns Milton Seaman Reservoir, an existing reservoir located on the North Fork downstream of Halligan Reservoir; and,
- C. Greeley is in the process of an urgent capital project to replace the reservoir release gate at Milton Seaman Reservoir (“Replacement Gate Design Project”); and,
- D. The Parties have been in discussion regarding potential structural changes at Milton Seaman Reservoir and/or Greeley’s Bellvue Water Treatment Plant necessary to mitigate certain anticipated water quality impacts caused by and operational changes due to the Halligan Project (“Greeley’s Concerns”) and potential operational and reservoir release gate design changes at Milton Seaman Reservoir necessary to accommodate certain environmental mitigation and enhancement commitments on behalf of Fort Collins (“Fort Collins’ Objectives”); and,
- E. The Parties recognize that Greeley’s current Replacement Gate Design Project design may need to be modified to accommodate Fort Collins’ Objectives; and,
- F. The Parties would like to retain a consultant to evaluate Greeley’s Concerns and redesign the Replacement Gate Design Project to meet Greeley’s requirements and accommodate Fort Collins’ Objectives; and,
- G. The Parties’ efforts will comprise of two general phases:
 - Phase 1 – Analysis and Preliminary Design
 - Phase 2 – Implementation
- H. The Parties desire that AECOM, as an existing consultant for both Parties, should perform Phase 1; and,

- I. The Parties have developed the attached scope of work, attached hereto as Exhibit A (“Study”), which includes water quality analysis and an evaluation and comparison of certain water quality mitigation measures, including oxygenation and aeration and a multi-level outlet tower (“Tasks 1-6”) and gate design that would allow for smaller releases to accommodate Fort Collins’ Objectives (“Task 7”); and,
- J. The Parties intend to use the Study as a basis for developing an implementation plan for Phase 2 that will be the subject of a subsequent agreement, including establishing potential future impacts, identifying appropriate mitigation measures, and evaluating preliminary gate designs (“Purpose”); and,
- K. As governmental entities, the Parties are authorized to enter into the following intergovernmental agreement pursuant to C.R.S. §29-1-203.

AGREEMENT

1. **Incorporation of Recitals.** The foregoing recitals are hereby incorporated as if fully restated in their entirety.
2. **Purpose.** The purpose of this Agreement is to establish the Parties’ respective financial and management obligations and their mutual understanding and agreement as to the Purpose for the Study. Nothing in this Agreement addresses Phase 2 – Implementation.
3. **Funding.** Greeley and Fort Collins will split the cost evenly. Greeley will contract with AECOM and will be responsible for making all payments. Greeley will invoice Fort Collins for its share of the cost, with payment due to Greeley thirty (30) days after receipt.
4. **Management Obligations.**
 - 4.1. **Water Quality and Mitigation Analysis—Tasks 1-6.**
 - 4.1.1. Notwithstanding Greeley’s contractual relationship with AECOM, Greeley and Fort Collins will jointly manage AECOM and the development of Tasks 1-6. Each Party will appoint a project manager who will be responsible for conferring with their counterpart before providing any direction to AECOM. For purposes of this Agreement, the project managers (each a “PM”) are as follows:

Fort Collins Project Manager: Halligan Project Manager
Attn: Darren Parkin
Phone: (307) 630-9414
dparkin@fcgov.com

Greeley Project Manager: Water & Sewer Chief Engineer,
Attn: Adam Prior, P.E.

Phone: (970) 350-9875
Adam.Prior@greeleygov.com

- 4.1.2. The Greeley PM will be responsible for ensuring that the Fort Collins PM is provided with copies of all reports, data, drawings, computer programs, or other reproducible, tangible things developed by AECOM in connection with Tasks 1-6 (“Water Quality Work Product”). In addition, Greeley will obtain AECOM’s agreement that Fort Collins may use the Water Quality Work Product for any purpose connected to this Agreement.
- 4.1.3. Each Party will be entitled to review and provide feedback on the Water Quality Work Product via their respective PM. All comments must be provided within a reasonable time to maintain the schedule as identified in the Scope. Once a consensus has been reached, the Greeley PM will be responsible for providing any necessary direction to AECOM and ensuring that the Fort Collins PM is included in all communication with AECOM related to the Study. Greeley may (but is not required to) include the Fort Collins PM on non-substantive communication such as coordinating schedules and/or internal Greeley billing processes and procedures.
- 4.1.4. If the PMs disagree on the direction or feedback to provide AECOM on Tasks 1-6, the Parties’ respective management team will meet to discuss the conflict until a resolution has been reached. If a meeting becomes necessary to resolve a conflict, the PMs shall promptly schedule the meeting so as not to delay the schedule identified in the Scope.

4.2. Replacement Gate Design Project—Task 7

- 4.2.1. Greeley will manage AECOM on all matters related to Task 7 and shall have sole discretion over any design changes or modifications to the reservoir release gate and related facilities.
- 4.2.2. To accommodate Fort Collins’ Objective, the Greeley PM will be responsible for ensuring that the Fort Collins PM is provided with copies of the reports, data, drawings, computer programs, or other reproducible and tangible things developed by AECOM in connection with Task 7 (“Gate Design Work Product”).
- 4.2.3. Fort Collins’ will be entitled to review and provide feedback on the Gate Design Work Product via their PM. All comments must be provided within a reasonable time to maintain the schedule as identified in the Scope. Greeley will consider, and in good faith seek to incorporate Fort Collins’ feedback in order to ensure that the designed reservoir release gate is capable of meeting Fort Collins’ Objectives without compromising Greeley’s needs. Greeley PM will be responsible for, and reserves the right to, direct AECOM regarding all aspects of the Gate Design Work Product.

5. **Term.** This Agreement will be in effect on the last date it is signed by the Parties until final payment of the Study has been submitted to AECOM and Fort Collins has satisfied its obligation to Greeley under Paragraph 3.

6. **Claimed Confidential Information.**

6.1. **CORA.** The Parties acknowledge that the documents and communications created under this Agreement may be subject to the Colorado Open Records Act, C.R.S. §§24-72-101 *et seq.* (“CORA”).

6.2. **Confidential Information Procedures.** If a Party (“Providing Party”) desires to provide documents or information to the other Party (“Receiving Party”) that the Providing Party claims to be confidential (“Confidential Information”), the Providing Party may invoke the terms and conditions of this Paragraph 6.2.

6.2.1. If the Providing Party intends to claim that certain information is confidential under this Paragraph 6.2 and desires to have the Receiving Party take certain precautions under this Agreement with such claimed Confidential Information, then within three calendar days of when the Providing Party provides the claimed Confidential Information to the Receiving Party, the Providing Party shall provide written notice to the Receiving Party containing the following:

- (i) an identification of each piece of information that is claimed to be Confidential Information;
- (ii) for each piece of such information, an identification of the documents, files, or other forms of communication provided to the Receiving Party in which the claimed Confidential Information is located; and
- (iii) for each piece of such information, a brief statement identifying the basis for which the Providing Party may claim the information to be confidential.

6.2.2. With respect to the claimed Confidential Information identified pursuant to Paragraph 6.2.1, the Receiving Party hereby agrees:

- (i) to hold the claimed Confidential Information in confidence and to take all reasonable precautions to protect such Confidential Information from inadvertent or accidental disclosure; and
- (ii) to not disclose any such claimed Confidential Information to any third person, except pursuant to Paragraph 6.2.4.

In the normal course of business, the Receiving Party may also dispose of any documents containing claimed Confidential Information.

- 6.2.3. The obligations of the Receiving Party with respect to claimed Confidential Information under this Paragraph 6.2 shall not apply to:
- (i) Claimed Confidential Information beginning six months after the termination of this Agreement pursuant to Paragraph 5;
 - (ii) Claimed Confidential Information that the Receiving Party can document:
 - (A) is or has become (through no improper action or inaction by the Receiving Party or any affiliate, agent, consultant, or employee) generally available to the public;
 - (B) was in its possession prior to receipt from the Providing Party under Paragraph 6.2.1, except to the extent that such information was unlawfully appropriated by the Receiving Party;
 - (C) was independently developed by the Receiving Party without use of any claimed Confidential Information of the Providing Party under Paragraph 6.2.1; or
 - (D) was disclosed pursuant to the requirements of law, subject to Paragraph 6.2.4.
- 6.2.4. Nothing herein shall affect the obligations of a Receiving Party to either make disclosures or preserve the confidentiality of claimed Confidential Information to the extent required by law or court order, including, but not limited to, requirements under the Colorado Open Records Act, CRS §24-72-201 *et seq.*, and other Colorado and federal statutes, court rules, and administrative rules and regulations. If a Receiving Party receives a request under law for the Providing Party's claimed Confidential Information, or if a Receiving Party would otherwise be required to disclose the Providing Party's claimed Confidential Information pursuant to law, the Receiving Party shall notify the Providing Party as soon as practicable of the request or pending disclosure, and in such event, upon the request of the Receiving Party, the Providing Party may take such timely action as may be required to obtain a declaratory judgment as to the confidential status of the Confidential Information, and, if the Providing Party elects not to do so, then the Receiving Party's obligation to preserve that Confidential Information shall have been waived hereunder, except as otherwise provided by law.

6.2.5. The Providing Party shall have the right to require the return and destruction of claimed Confidential Information in the possession of a Receiving Party as set forth in this paragraph. Such right shall exist from the effective date of this Agreement through six months after the date of termination of this Agreement pursuant to Paragraph 5. If claimed Confidential Information has been copied or transcribed into another document, such documents will be destroyed, erased, or modified to remove the claimed Confidential Information.

7. **Fiscal Contingency.** Notwithstanding any other provisions of this Agreement to the contrary, the obligations of the Parties in fiscal years after the initial fiscal year of this Agreement shall be subject to appropriation of funds sufficient and intended therefor, with the Party having the sole discretion to determine whether the subject funds are sufficient and intended for use under this Agreement. The failure of a Party to appropriate such funds shall be grounds for termination of this Agreement as to such Party upon written notice pursuant to Paragraph 11.

8. **No Third-Party Beneficiaries.** This Agreement is entered into between the Parties for the purposes set forth herein. It is the intent of the Parties that they are the only beneficiaries of this Agreement and that the Parties are benefitted only to the extent provided under the express terms and conditions of this Agreement.

9. **Governing Law and Enforceability.** This Agreement shall be construed in accordance with the laws of the State of Colorado. The Parties recognize that the constitutions, statutes, and rules and regulations of the State of Colorado and of the United States, as well as the Parties' respective bylaws, city charters and codes, and rules and regulations, impose certain legal constraints on each Party and that the Parties intend to carry out the terms and conditions of this Agreement subject to those constraints. Whenever possible, each provision of this Agreement shall be interpreted in such a manner so as to be effective and valid under applicable law.

10. **Waiver.** A waiver of a breach of any of the provisions of this Agreement shall not constitute a waiver of any subsequent breach of the same or another provision of this Agreement. Nothing in this Agreement shall be construed as any waiver of governmental immunity of the Parties who are governments or any other governmental provisions of State law. Specifically, by entering into this Agreement, no Party waives the monetary limitations on liability or any other rights, immunities, or protections provided by the Colorado Government Immunity Act, C.R.S. § 24-10-101, *et seq.*, or any successor or similar statutes of the State of Colorado.

11. **Notices.** All notices or other communications hereunder shall be sufficiently given and shall be deemed given (i) when personally delivered; (ii) on the date and at the time of delivery or refusal of acceptance of delivery if delivered or attempted to be delivered by an overnight courier service to the party to whom notice is given at the address specified below; (iii) on the date and at the time shown on the electronic mail if sent by electronic transmission at the email addresses set forth below and receipt of such electronic mail is acknowledged by the intended recipient thereof; or (iv) after the lapse of five business days following mailing by certified mail-return receipt requested, postage prepaid, addressed as follows:

To Fort Collins: City Manager
City Hall West
300 LaPorte Avenue; P.O. Box 580
Fort Collins, Colorado 80522-0580

With copy to: Fort Collins City Attorney
300 LaPorte Avenue; P.O. Box 580
Fort Collins, Colorado 80522-0580
epotyondy@fcgov.com

and: Fort Collins Utilities
Attn: Sr. Director of Water Planning and Sciences
4316 LaPorte Ave.
Fort Collins, Colorado 80521

To Greeley: City of Greeley
Attn: Director of Water & Sewer
1001 11th Ave, 2nd Floor,
Greeley, Colorado 80631

With a copy to:
Greeley City Attorney
1100 10th Street, Suite 401
Greeley, Colorado 80631
Jerrae.Swanson@greeleygov.com

12. Construction. This Agreement shall be construed according to its fair meaning as it was prepared by the Parties. Headings in this Agreement are for convenience and reference only and shall in no way define, limit, or prescribe the scope or intent of any provision of this Agreement.

13. Representations. Each Party represents to the other parties that it has the power and authority to enter into this Agreement and the individual signing below on behalf of that Party has the authority to execute this Agreement on its behalf and legally bind that Party.

14. Assignment. No Party may assign any rights or delegate any duties under this Agreement without the written consent of all other Parties.

15. Severability. If any provision of this Agreement shall prove to be illegal, invalid, unenforceable, or impossible of performance, the remainder of this Agreement shall remain in full force and effect.

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CITY OF FORT COLLINS, a municipal corporation

By: _____
Kelly DiMartino, City Manager

Date: _____

ATTEST:

By: _____
City Clerk

APPROVED AS TO FORM:

By: _____
City Attorney's Office

CITY OF GREELEY, a municipal corporation

APPROVED AS TO SUBSTANCE:

By: _____ Date: _____
City Manager

AVAILABILITY OF FUNDS:

By: _____ Date: _____
Director of Finance

APPROVED AS TO LEGAL FORM

By: _____ Date: _____
City Attorney's Office

**EXHIBIT A TO INTERGOVERNMENTAL AGREEMENT BETWEEN THE CITY OF
GREELEY AND THE CITY OF FORT COLLINS REGARDING CERTAIN ASPECTS
OF THE HALLIGAN WATER SUPPLY PROJECT**

(See attached Scope of Work)



AECOM 303-694 2770 tel
7595 Technology Way
Denver, CO 80237
aecom.com

October 13, 2023

***** Sent via Email *****

Mr. Adam Prior, PE
Chief Engineer
Greeley Water and Sewer
1001 11th Avenue, 2nd Floor
Greeley, CO 80631

**Subject: Water Quality Analysis and Outlet Tower Feasibility Study,
Milton Seaman Reservoir**

Dear Mr. Prior,

Enclosed as requested is AECOM Technical Services, Inc. (AECOM)'s proposed scope, schedule, and fee for the following:

1. Water quality analysis of the City of Greeley's (Greeley) Milton Seaman Reservoir with changes due to the planned Halligan Water Supply Project (HWSP) and enlargement of Halligan Reservoir located upstream.
2. Management and infrastructure recommendations for water quality issues on the North Fork of the Poudre River and in Milton Seaman Reservoir, including a comparison of options, such as a multi-level outlet tower and supporting systems and an oxygenation/aeration system.
3. If deemed to be the best option, continuation of the engineering feasibility study of a multi-level outlet tower and supporting systems that would allow Greeley to better manage water quality of releases from Milton Seaman Reservoir.
4. Progress preliminary design of Milton Seaman slide gates from 30 to 60%, and re-select the jet flow gate valve equipment. The design should include a range of smaller releases that includes flows in the 1 to 5 cfs range.

AECOM assumes all project-related documentation will be submitted to Greeley (emails, deliverables, invoices, etc.). Greeley should coordinate with Fort Collins for any input or reviews. If directed and approved by Greeley, AECOM's HWSP team can request data or other inputs from Fort Collins on an individual basis. AECOM's HWSP team will not overlap with this project team, and no information will be shared with AECOM's HWSP team without Greeley's direction and consent. A detailed description of this work is provided in the following sections.

STATEMENT OF QUALIFICATIONS

AECOM is uniquely qualified to complete this work based on our familiarity with the project conditions and technical capabilities. AECOM's proposal is conditioned on mutually acceptable contract terms and conditions similar to current and previous AECOM-Greeley work. Key AECOM team members include:

- **Nathan Walker, PE** will serve as Project Manager and has worked successfully with you to complete past projects. Mr. Walker has 23 years of experience including slide gate and similar improvements associated with dams and reservoirs.
- **Tammy Karst-Riddoch, Ph.D.** will serve as Senior Limnologist on the water quality analysis portions of the project. Dr. Karst-Riddoch is an accomplished senior aquatic scientist, bringing more than 25 years of research and consulting experience to the AECOM team. She manages, leads, and advises on complex surface water and watershed management projects for government, industry, and private stakeholders across North America.
- **Lorin Hatch, Ph.D.** will serve as Independent Technical Reviewer on the water quality analysis portions of the project. Dr. Hatch is a federal program/project manager and water quality expert with over 30 years of experience in water resources and ecosystem management.

Resumes for the key AECOM team members are attached.

PROJECT UNDERSTANDING

Water quality at the Milton Seaman Reservoir outlet will be evaluated for current conditions and for potential changes due to the HWSP. Along with this evaluation, a feasibility analysis and evaluation/comparison for water quality mitigation alternatives will be performed for oxygenation and reservoir aeration systems. Additionally, an engineer's opinion of probable costs, generally consistent with an AACE Class 4, for the selected aeration and/or oxygenation system option will be prepared. AECOM understands Greeley is willing and able to inject permanganate at the treatment plant to supplement the selected option.

AECOM understands Greeley's desire to continue the engineering feasibility study of the development of a multi-level outlet tower and associated system components. A conceptual design analysis will be prepared summarizing the details of construction along with criteria and resulting ability to meet some or all of Greeley's needs. Additionally, an engineer's opinion of probable costs, generally consistent with an AACE Class 4, for the proposed outlet tower and supporting systems will be prepared.

AECOM understands that a comparative analysis of the two water quality options and their combination should be included to understand the pros and cons of these systems.

AECOM understands Greeley's desire to continue the design of the slide gates at Milton Seaman Reservoir. This work was previously completed by AECOM to a 30% design level. AECOM will advance to a 60% design level and also re-select the jet flow gate valve equipment. The design will include a range of smaller releases that includes flows in the 1 to 5 cubic feet per second (cfs) range, be it part of the main gates or separate release gates and/or valve structure.

1. SCOPE OF WORK

Task 1: Project Management

AECOM will coordinate project management and meetings with Greeley. Under this Task a project work plan, schedule, and general administration tasks will be prepared and carried out. A site visit is included in the scope for this task.

PHASE 1

Phase 1 represents the analysis of a water quality mitigation plan for Milton Seaman Reservoir due to the HWSP.

Task 2: Water Quality Data Review and Analysis

AECOM will complete a limnological assessment of the Milton Seaman Reservoir and the North Fork of the Poudre River to characterize seasonal water quality with the changes in inflow/outflow, water levels and water quality for current conditions and potential changes anticipated due to the HWSP. The assessment will consider key water quality concerns that may impact treatment at the Bellvue Water Treatment Plant as well as recreational activities and aquatic ecology of the reservoir. AECOM's analysis will consider relevant information provided by both Fort Collins and Greeley.

It is understood that an oxygenation/aeration system could be needed to address issues with anoxia, which presently drives high concentrations of manganese and iron in the reservoir. Anoxia also contributes to an enhanced flux of nutrients from the sediments that promote algal activity, increasing the potential production of algal metabolites such as taste and odor compounds (2-Methylisoborneol (MIB), Geosmin) and cyanotoxins, as well as organic matter that leads to additional oxygen demand.

The purpose of this assessment is to identify patterns and drivers of water quality concerns to inform the selection and design of effective and feasible mitigation options to address them. This includes input for the proposed oxygenation/aeration system and the Outlet Tower Feasibility Analysis (i.e., to establish depths of the outlets to optimize the quality of water discharged downstream).

To perform the assessment, AECOM will collect and review available relevant physical, chemical, and biological data for the Milton Seaman Reservoir and for the inflow from the Halligan Reservoir under existing conditions and with the HWSP. Data that would support the assessment include, but are not limited to:

- Bathymetry
- Water levels
- Inlet/Outlet flows
- Field water quality parameters (depth profiles of temperature, dissolved oxygen, pH, conductivity, oxygen reduction potential)
- General water chemistry (alkalinity, hardness, metals, nutrients [phosphorus and nitrogen], total suspended solids, total and dissolved organic carbon, and chemical and biochemical oxygen demand)
- Chlorophyll-a (or other indicators of algal biomass and community composition)
- Taste and Odor compounds (MIB, Geosmin)
- Cyanotoxins
- Sediment quality (to assess oxygen demand, and metals and nutrient flux)

Additional information on past water quality events causing treatment or operational issues at the water treatment plant would also be beneficial to support the assessment.

AECOM recognizes that there may be missing data to fully characterize mixing and stratification patterns and water quality of the reservoir, and as input to design the aeration/oxygenation system. Where feasible, limnological theory and methods will be used to fill data gaps to inform the assessment. AECOM will notify Greeley of critical data gaps and provide recommendations to collect the missing information.

AECOM will request oxygenation/aeration designs, technical specifications, and cost estimates from up to three (3) technology suppliers. These suppliers will be given relevant data from the

limnological assessment to support their proposals for meeting the oxygen transfer requirements necessary to maintain the reservoir's water quality. Key information may include:

- Reservoir water quality (oxygen concentrations, oxygen demand)
- Area and depth of the reservoir
- Stratification depth
- Atmospheric and water temperature
- Water cycling in and out of the reservoir
- Locations and elevations of inlets and outlets

The design proposals will be compared and evaluated in Task 3. As a result from this analysis, any other mitigation options that may be suitable will be identified. Greeley could consider if adding any additional options to the scope, beyond those presented in Tasks 2 and 4, is needed.

DELIVERABLES

- Draft Water Quality Tech Memo, including:
 - Identification and assessment of key water quality concerns that may impact treatment at the Bellvue Water Treatment Plant as well as recreational activities and aquatic ecology of the reservoir.
 - Analysis required by vendors to complete their design proposals, as noted above.
 - Identification of any mitigation alternatives other than aeration system and multi-level outlet tower.
- Final Water Quality Tech Memo including same items noted above in the Draft Report.

ASSUMPTIONS

- Expected list of information required to complete this review as listed above. AECOM collection of data is limited to coordination with Greeley and Fort Collins to obtain available water quality data relevant to this effort and in a format suitable for use.
- Data review will be limited to the level of effort shown for this task.
- Detailed water quality modeling will not be performed as part of this task. Qualitative analysis will be used to anticipate potential changes in water quality due to the HWSP.
- No hydrologic or hydraulic model will be required at this time for analysis.
- Extent of analysis will be limited by data availability. Gap analysis may need to be performed if insufficient data is available. The AECOM team will require data through the water column to show temperature change through the water column in order to size aeration technology properly.
- Only the analysis of the aeration option and the multi-level outlet tower are included in the scope under Tasks 3 through 6. If additional mitigation options are identified during this task, additional selected option(s) could be added to the scope at Greeley's direction.

Task 3: Feasibility 15% Design for Oxygenation and Aeration Systems

AECOM will evaluate design plans received from up to three (3) aeration system vendors requested in Task 2. In the review of equipment options, oxygenation systems will be considered. A technical specialist in oxygenation systems with demonstrated experience in designing well-functioning hypolimnetic oxygenation systems will be utilized in this review. An overview description will be provided for each technology, and the technologies will be compared with respect to several evaluation criteria that may include:

- Equipment Cost
- Operational Cost
- Maintenance Burden
- Ease of Operation
- Ease of Construction
- Oxygen Transfer Efficiency
- Vendor Proof of Experience

Based on the evaluation, and in consultation with Greeley, the preferred technology will be selected.

This preferred system will be used to develop a Basis of Design Report and 15% design drawings which will include process-mechanical designs and layout, structural and electrical designs. Process Mechanical will size the compressed air system, inclusive of the compressor, dryer, air receivers, and associated line piping. A layout for all Process Mechanical equipment will be provided to the building layout team. One plan and no more than seven section views are anticipated. Total anticipated drawing generation will be four. Structural designs will include a Floor Plan sheet, a Roof Plan sheet, a section of the building, and at least one Detail sheet showing pipe encasement. Electrical will include design of lighting, receptacles, power to equipment, electrical service, grounding, lightning protection system, and associated systems. In addition, feasibility level, conceptual design will provide connections for the control system as needed. The electrical feasibility level, conceptual design anticipates site power, telemetry plan, and preliminary one-line diagram and network diagrams. Total 15% design package is expected not to exceed 20 sheets. Cost estimating will be part of Task 5.

DELIVERABLES

- Draft Oxygenation and Aeration Systems Feasibility Design Report, including:
 - Technology descriptions and evaluations
 - Comparison and selection of preferred technology
 - Basis of design for the preferred technology
 - Sections from Process-Mechanical, Structural, and Electrical design disciplines describing basis of design.
- 15% Design Package for the preferred technology:
 - Process-Mechanical: up to four drawing sheets including one plan, and no more than seven section views.
 - Structural: up to two plan sheets, one building section, one detail sheet, and one shaft elevation view.
 - Electrical: up to eight sheets including site plan, power plan, one-line and schedules, details, lightning protection system, and control schematics.
- Final Oxygenation and Aeration Systems Feasibility Design Report and 15% Design Drawings Package including same items noted above in the Draft Report.

Task 4: Feasibility Design and Engineering of Multi-Level Outlet Tower

Task 4A Data Review and Development of Study Approach

AECOM will review available and pertinent information relative to the design, construction, operation and previous analyses of the dam and associated structures. This information will include as-built drawings, construction records, previous AECOM design reports, and additional information available from Greeley.

Task 4B Civil and Structural Analysis for Alternatives

Slide Gate Analysis

In 2019, AECOM presented to the City of Greeley a Basis of Design and Preliminary Engineering Report for the rehabilitation of the five leaking slide gates located at the outlet works of the Milton Seaman Reservoir. As part of the 30% design, AECOM proposed the construction of a new tunnel bulkhead and gate structure located immediately downstream of the existing slide gates. A reinforced concrete and steel trashrack structure is located at the reservoir intake upstream of the slide gates.

With the inclusion of an outlet tower, Greeley and AECOM will evaluate the potential of replacing the existing guard gates located at the tunnel inlet along with installation of new slide gates located at multiple levels on the new outlet tower. The new tower gates would allow Greeley to better manage water quality of reservoir releases by selectively withdrawing water from one or more levels within the reservoir. Development of a concept for measuring reservoir releases and automating gate operation will also be provided.

Planned Bulkhead Considerations

A new outlet tunnel bulkhead was proposed as part of the 2019 30% Basis of Design. The concrete bulkhead structure, or plug, would be located immediately downstream of the existing slide gates. The conceptual design of the new outlet tower will consider structural, hydraulic, and operational compatibility with the planned bulkhead. The team will also evaluate whether the bulkhead would still be required with the construction of the outlet tower.

Fish Exclusion Analysis

The Feasibility Study (Study) will review alternatives to prevent fish passage through the outlet tower. The design will consider intake screen options, preliminary backwash equipment sizing, design flows, screen bar spacing, and head loss considerations.

Tower Layout Alternatives

Two Outlet Intake Tower location alternatives will be developed and evaluated as part of this Study.

Option 1: Locate tower near upstream of the tunnel intel at the existing trashrack

This alternative assumes that the existing trashrack and supporting structure will be demolished and removed, and a new outlet tower would be constructed near the upstream face of the tunnel inlet. The tower should be founded on rock and this location is anticipated to minimize foundation excavation. However, a temporary cofferdam and bypass system will be needed to convey flows around the work area and discharge over the spillway or through the existing outlet tunnel during tower construction.

Option 2: Locate tower east of the existing trashrack

This tower location alternative assumes removal of the existing trashrack and construction of a new outlet tower at a location adjacent to the existing trashrack structure. This could allow for conveyance of reservoir flows through the existing outlet tunnel during tower construction and could minimize the need for temporary cofferdam and bypass piping. Excavation for the intake tower foundation is expected to increase compared to Option 1 and will be evaluated based on estimated depth to bedrock. Results from this option will be used to evaluate constructability, risk, and whether the additional cost of tower excavation is less than the Option 1 costs for the temporary cofferdam and bypass piping.

Cofferdam and Reservoir Bypass Analysis

The use of a cofferdam and bypass system would allow for the construction of the outlet tower at the existing trashrack location. The system will need sized to divert flows from the reservoir and protect the work area. Conceptual capacity and sizing of the cofferdam and bypass system will be developed.

Foundation Excavation Analysis

AECOM will review previous geologic and seismic hazard studies performed as well as geotechnical data for the potential tower locations. Under this Task, required excavation depths to a suitable foundation for each tower location alternative will be estimated to support the alternative's development and evaluation.

Reservoir Dredging Analysis

The City of Greeley has expressed interest in the potential of dredging sediment from the Reservoir as part of the Tower Study. AECOM will evaluate alternatives for disposal and placement of the dredged material in accordance with United States Army Corps of Engineers (USACE) requirements. AECOM will also consider material properties and quantities associated with restoring the reservoir bathymetry to as-built grades based on available information and explore possible interest by others in use of this material in planned reservoir construction that could occur near the site in the near future.

Water Quality Analysis and Management Plan

Water quality management of reservoir releases is a desirable component for the proposed outlet tower design. AECOM will review available water quality data, project goals and requirements to inform recommendations for development of a reservoir water quality monitoring and management plan. Considerations for water quality during construction will also be provided. However, the development of detailed monitoring and management activities is beyond the scope of this study.

Task 4C Mechanical and Electrical Analysis for Alternatives

New Control House Analysis

The existing control house is located east of the reservoir outlet works and currently houses the hydraulic pump and fluid reservoir and is served with a 240-volt, single-phase electrical service.

A new control house is proposed to supply power and house equipment for the outlet tower system components. A preliminary location, layout, and power source of the new control house will be developed as part of this Study.

Gate Operator, Screen Backwash, and Aeration System Mechanical Equipment Analysis

As part of the new outlet tower concepts, AECOM will evaluate the feasibility of installing oxygenation, air compressor, and accumulator equipment that will be housed within the new control house for a new reservoir aeration system. Evaluation of hydraulic or electric operator options for the new gates will be developed to recommend basis of design for gate operators.

AECOM will evaluate preliminary sizing and placement of a screen backwash system as part of the outlet tower construction. The backwash equipment will be housed within the new control house. Backwash equipment sizing will consider fish exclusion requirements.

Outlet Tower Site Power System Requirements

New site power will be evaluated by connecting the proposed outlet tower and control house to the existing three-phase electrical located at the site access road. This will include correspondence with the power provider, along with review of assumed or estimated connected loads, to review feasibility and basis of cost.

DELIVERABLES

- Draft Feasibility Study Report, including:
 - Descriptions of conceptual design elements
 - Discussion of detailed design considerations
 - Conceptual drawings of outlet tower options
- Final Feasibility Report including same items noted above in the Draft Report.

Task 5: Evaluation and Cost Estimating of Water Quality Mitigation Options

AECOM will evaluate the aeration system and multi-level outlet tower mitigation options. The criteria for this evaluation may include:

- Cost
- Environmental Impact
- Resilience to extreme weather or seasonal changes in water quality
- Regulatory Compliance
- Energy Consumption
- System Reliability
- Operational Flexibility

AECOM will develop preliminary design material and equipment quantities for the construction of the proposed outlet tower and aeration system alternatives and associated work. These quantities will be used to develop a cost estimate that is generally consistent with an AACE Class 4 estimate. AECOM will develop the engineer's estimate of construction cost utilizing industry accepted methods including budgetary costs provided from manufacturers or vendors of major equipment when available.

DELIVERABLES

- Draft Water Quality Mitigation Tech Memo, including:
 - Memo summarizing mitigation evaluation methods and results, and their benefits
 - AACE Class 4 cost estimates for a single aeration system and single multi-level outlet tower mitigation options presented in Tasks 3 and 4
- Final Water Quality Mitigation Tech Memo including same items noted above in the Draft Report.

Task 6: Water Quality Mitigation Plan Recommendations and Reporting

Based on stakeholder reviews of the deliverables above, AECOM will provide a final mitigation plan. This will include a compiled report containing the conclusions from Tasks 2 through 5, summary of cost estimate provided in Task 5, and an implementation schedule.

DELIVERABLES

- Draft Water Quality Mitigation Plan Recommendations Report, including:
 - Summary of conclusions/design considerations from Tasks 2 through 5
 - Summary of cost estimate provided in Task 5
- Draft Water Quality Mitigation Plan Recommendations Report including same items noted above in the Draft Report.

PHASE 2

Phase 2 represents advancing the Tunnel Bulkhead and Gate Replacement from 30 to 60% design and incorporating the HWSP minimum release requirement of 1 cfs. Phase 2 is not anticipated to begin until Phase 1 is complete, so that any conclusions from Phase 1 can be incorporated into Phase 2.

Task 7: Outlet Gates 60% Design

AECOM will progress the Tunnel Bulkhead and Gate Replacement, Option 4 from 30% to an approximately 60% level of design, and revise the design to accommodate a 1 to 5 cfs streamflow release range requirement for the HWSP, be it part of the main gates or separate release gates and/or valve structure. The work under this task will include development of 60% design drawings, draft technical specifications, Preliminary Engineering Report (PER), and 60% cost estimate.

AECOM anticipates approximately 15 design drawings including title sheet and location map, site plan, existing outlet works plan and profile, existing slide gate sections, hydraulic conduit plans and sections, hydraulic conduit details, standard reinforcement details, bulkhead structure plan and sections, and typical reinforcement sections. AECOM does not anticipate and has not included primary power site electrical improvements in this scope of work.

Draft technical specifications will be developed for major equipment, key work activities and dam safety related activities that involve State Engineering Office (SEO) approval to provide design-build teams information to use as the basis of their proposal. The draft specifications are anticipated to follow Division 16 MasterFormat 1995 format and include Summary of Work, Environmental Standards, State Engineer Requirements, Reservoir Control, Stream Diversion, and Slide Gates. Additional technical specifications, such as Cast-In-Place Concrete, will be identified in the Specifications Table of Contents but will not be drafted in this scope and will need developed during final design by the selected design-builder.

A PER will be developed documenting the basis of design for the proposed improvements. This will include the SEO required plan approval submittal schedule, and supporting calculations and equipment catalog cut sheets. The PER can be included in the design-build solicitation and will not include the 60% cost estimate.

An AACE Class 3 cost estimate will be developed based on the 60% design drawings and draft technical specifications. However, this cost estimate will typically not be included in Greeley's design-build solicitation, and therefore, will be submitted to Greeley separately from the design drawings, specifications and PER.

AECOM anticipates that a draft 60% design submittal should be reviewed for comments by the SEO in addition to Greeley's review and comments. This will be confirmed during the Task 1 SEO consultation, and SEO comments along with Greeley comments will be incorporated into a final 60% design submittal for Greeley's use in solicitation of design-build proposals.

Water quality management of reservoir releases is a desirable component for the proposed outlet tower design. AECOM will review available water quality data and project goals and requirements to inform recommendations for development of a reservoir water quality monitoring and management plan. Considerations for water quality during construction will also be provided. However, the development of detailed monitoring and management activities is beyond the scope of this study. This will be completed as part of Task 5, and updated as needed for consideration of this task.

DELIVERABLES

- 60% Design Drawings
- 60% Technical Specifications
- Preliminary Engineering Report
- AACE Class III Cost Estimate
- Greeley procurement documents review comments.

ASSUMPTIONS

- Electrical improvements are not required.
- Greeley will identify list of local permits for inclusion in preliminary specifications.
- State permits including SEO review and approval and SWMP will be obtained by design-builder.
- National permits such as USACE 404 Nationwide Permit for Maintenance are not required.
- Greeley will provide notification to the United States Forest Service under the Special Use Agreement or obtain a permit Amendment, if required.
- No intrusive investigations such as rock coring are required to develop the 60% design.

2. SCHEDULE

The total project duration is estimated to be approximately 17 months based on the number of conceptual design elements and the various subject matter expertise needed. Notice to Proceed (NTP) is estimated to be January 15, 2024 and project milestones and anticipated durations have been estimated as follows, and subject to verification as part of the fee estimate level of effort:

- Anticipated NTP: January 15, 2024
- Task 2 Draft Completion: February 15, 2024
- Task 2 Final Completion: March 15, 2024 (allowing 2 weeks for stakeholders to comment, 2 weeks for AECOM to finalize)
- Tasks 3 & 4 Start and Draft Completion: March 15 – June 15, 2024
- Tasks 3 & 4 Final Completion: August 5, 2024
- Task 5 Start and Draft Completion: August 5, 2024 – October 15, 2024
- Task 5 Final Completion: November 15, 2024
- Task 6 Start and Draft Completion: November 15, 2024 – January 30, 2025
- Task 6 Final Report Completion (End of Phase 1): March 1, 2025
- Phase 2 (Task 7) Completion: March 1, 2025 – July 31, 2024

3. ENGINEERING FEES

A summary of task costs is presented in Table 1. AECOM's 2023 billing rates are based on AECOM's attached proposed rates for Greeley's As Needed Services/Design and Engineering for Water & Sewer.

Table 1. Time & Materials Not To Exceed Fee

Task	Description	Fee Estimate
Task 1	Project Management	\$43,304
Task 2	Water Quality Data Review and Analysis	\$24,746
Task 3	Feasibility 15% Design for Oxygenation and Aeration Systems	\$76,780
Task 4	Feasibility Design and Engineering of Multi-Level Outlet Tower	\$204,069
Task 5	Evaluation and Cost Estimating of Water Quality Mitigation Options	\$27,986
Task 6	Water Quality Mitigation Plan Recommendations and Reporting	\$13,764
	PHASE 1 SUBTOTAL	\$390,649
Task 7	Outlet Gates 60% Design	\$162,841
	TOTAL	\$553,490

We look forward to the opportunity to provide engineering support to the City of Greeley for successful completion of this project. Please contact me at 303-740-2622 or nathan.walker@aecom.com if you have questions or require additional information.

Sincerely,

AECOM Technical Services, Inc.



Nathan Walker, PE
Project Manager



Kathy Schlosser, PE
Associate Vice President

enclosures: : Nathan Walker Resume
Tammy Karst-Riddoch Resume
Lorin Hatch Resume
Detailed Fee Estimate
2023 Fee Schedule

cc: :

Nathan Walker, PE

Project Manager

Education	Years of Experience	Areas of Expertise	Professional Registration
BS, Civil Engineering, University of Akron, 2001	With AECOM: 13 With Other Firms: 10	Dams & Reservoirs Civil Infrastructure Utility Engineering	Professional Engineer: Colorado, New Mexico, Washington

Summary

Mr. Walker has 22 years of planning, design, construction, and management experience as the Engineer of Record involving the preparation of studies, construction drawings, cost estimates, and technical specifications associated with site civil and utility engineering including improvements associated with more than a dozen dams and water storage reservoirs.

Project Experience

Arapahoe County Water and Wastewater Authority, Chamber Reservoir Phase II Remediation Reservoir Liner, Centennial CO. Principal Engineer and Engineer of Record for design of reservoir liner including coordination of approval with the State Engineer's Office associated with remediation of a Jurisdictional Dam including development of liner material alternatives analysis and final construction drawings and specifications. Reservoir liner involves 1.7M SF of geosynthetic liner, geotextile, anchor trenches and mechanical connections to seven dam structures.

United States Air Force Academy, Kettle Creek Dry Dam Modifications, Colorado. Principal Engineer and Engineer of Record for design of dam modifications including coordination of approval with the State Engineer's Office associated with conversion of a High Hazard Dam to an Exempt Structure involving dam breach analysis, dam hazard classification, development and evaluation of alternatives, and development of final construction drawings and specifications. Dam modifications involve removal of earthen embankment dam, coordination with CDOT, protection of utilities, drainage improvements and modifications to detention features within the dam.

United States Air Force Academy, Non-Potable Reservoir 1 Dam Repairs, Colorado. Principal Engineer and Engineer of Record for design of dam repairs including coordination of approval with the State Engineer's Office and development of final construction drawings and specifications for repair of a Significant Hazard Dam. Repairs involve two (2) 18-inch diameter CMP inlet conduits, one 18-inch diameter steel outlet conduit, reinforced concrete outlet tower, emergency spillway, toe drain, earthen embankment, and including the demolition of existing work and structures. Conduit repairs involved cured-in-place pipe (CIPP) for the two (2) inlet conduits and grouted steel pipe slip-lining of the outlet conduit.

Colorado Springs Utilities, Woodland Park, Northfield Dam Modifications Project, Colorado. Project Manager during construction management services involving improvements of a small, Significant Hazard Dam in El Paso County including the rehabilitation of the dam outlet works, new concrete spillway chute, new toe drain system, and an 8-foot raise of the earthen dam embankment in coordination with State Engineer approval. Conduit rehabilitation involved grouted steel pipe slip-lining of the outlet conduit.

City of Aurora, Box Creek Reservoir Forebay and Diversion Structure Project, Kobe, CO. Project Manager for development and evaluation of alternatives analysis and identification of recommendations for water supply diversion options and forebay storage options including a zoned earthen embankment dam to provide reservoir storage for up to 15,000 acre-feet of capacity, geotechnical site investigation along with development of design documents for a replacement diversion structure.

City of Santa Fe, Nichols and McClure Dam Rehabilitation, Santa Fe, New Mexico. Lead Engineer, Non-Dam Safety. Led a team that completed design of the non-dam safety aspects of the Nichols Reservoir Rehabilitation project. Design elements included raw water pipeline improvements at the Nichols site and the Canyon Road WTP site along with a below grade flow control and future hydropower valve vault, a below grade Nichols reservoir outlet valve vault, and an above grade mechanical equipment building. The multi-discipline design team involved site civil, structural, process, mechanical, electrical, power distribution, instrumentation, and controls engineering coordinated closely with the City team.

Bradner Dam and Peterson Dam Alternatives Analyses, Las Vegas, New Mexico. Hydraulic Engineer. Developed and completed analysis of hydraulic transient pressures for raw water supply pipeline from Bradner reservoir to the City's water treatment plant.

Upper Yampa Water Conservancy District, Yamcolo Reservoir Outlet Control Valve Replacement, Yampa, Colorado.

Project Manager for replacement of the existing American Water Works Association (AWWA) C504, Class 150B, 36-inch cast iron butterfly valve addressing a fracture that developed on the valve leaf/disc suspected to have resulted from the effects of frazil ice buildup or other wear and tear, such as harmonics from vortex shedding. Included evaluation of valve replacement options including AWWA C529 high performance butterfly valves involving single, double, and triple offset along with salvage and reuse of the existing hydraulic valve operator.

Colorado Parks and Wildlife, Beaver Park Reservoir Flow Control Optimization, South Fork, Colorado. Technical Lead to conduct flow testing of the reservoir outlet works, evaluate hydraulic conditions and equipment performance, and develop improvements to maximize the operational capacity of the structure. AECOM determined the removal of the 42-inch butterfly valve (BFV) was necessary to provide full operating capacity at full reservoir levels. AECOM developed design drawings to allow for removal of the BFV in order to maximize the flow releases provided by the 42-inch cone valve and evaluated equipment options to replace the existing valve with a full port isolation valve including a bonneted knife gate, stainless steel ball valve, and plug valve suitable for these high velocity and low pressure conditions

United States Air Force Academy, Non-Potable Reservoir 2 Hazard Classification, Colorado. Principal Engineer for dam hazard classification of a High Hazard Dam in accordance with Colorado Division of Water Resources Rules and Regulations for Dam Safety and Dam Construction. Hazard classification included dam breach analysis, dam hazard classification, and development of an emergency response plan.

United States Air Force Academy, Non-Potable Reservoir 3 Hazard Classification, Colorado. Principal Engineer for dam hazard classification of a Significant Hazard Dam in accordance with Colorado Division of Water Resources Rules and Regulations for Dam Safety and Dam Construction. Hazard classification included dam breach analysis, dam hazard classification, and development of an emergency response plan.

Integrated Utility Master Plan, City of Thornton, Thornton, Colorado. Project Manager. Developed utility wide master plan for water supply, treatment, distribution and wastewater collection systems following an integrated planning approach and including evaluation of facilities performance, operations, water quality, redundancy, reliability, resiliency and development of a prioritized capital improvement program including rehabilitation and replacement costs for all pipelines based on prioritized evaluation of risk and consequence of failure associated with each asset. System modeling involves water balance and water quality mitigation alternatives and limnologic analysis for water supply reservoir water quality.

Private Client, Water Supply Projects, Weld County, CO: Design and construction of multiple water supply projects including development of water supply systems, water storage reservoirs, and water pumping, distribution and delivery systems.

Private Client, Water Supply and Utilities Planning, Western Slope, CO: Lead Utility Engineer for engineering, master planning and permitting services for new public water system, wastewater utility and utility systems including alternative development and analysis of multiple water supply diversions, water storage reservoirs, water treatment facilities, water distribution system components including pipelines, pump stations, and multiple pressure zones.

Pandora Water Supply Project, Town of Telluride, CO: Principal Engineer provided design and construction engineering services for completion of new water supply sources, raw water transmission system, water treatment facility, hydroelectric generation plant, treated water transmission system, booster pump station, support facility, and related infrastructure.

Topock Marsh Infrastructure Improvements, U.S. Fish and Wildlife Service, Needles, CA: Provided design of 60 CFS raw water pump station and associated piping, valving and electrical systems. Floating pump system was part of improvements to intake and canal structures.

Santa Ana National Wildlife Refuge, U.S. Fish and Wildlife Service, Hidalgo and Cameron Counties, TX: Provided design of 3,000 gpm raw water pump stations and associated piping, valving and electrical systems including floating barge-pump system at five (5) separate sites within the NWR.

City of Aurora, Aurora Rampart Raw Water Lines Relocation at US 85 and Titan Road, Aurora, Colorado. Design and relocation of two critical raw water transmission lines in Aurora to accommodate Highway 85 re-construction by CDOT. The work involved extensive coordination with Aurora's water department, CDOT, and adjacent utilities to ensure continuous water supply.

Xcel Shoshone Hydroelectric Penstock Repair, Glenwood Springs, Colorado. Provided design engineering services to rehabilitate the twin 108-inch diameter penstocks at the Shoshone Hydroelectric Plant due to a catastrophic rupture of one of the existing penstocks just above the turbine building. Evaluated hydraulic transient pressures of repair and replacement options and recommended installing new 100-inch diameter welded steel pipe lining inserts inside each of the existing penstocks.

Tammy Karst-Riddoch, Ph.D.

Senior Aquatic Scientist/Limnologist and Paleolimnologist

Education	Years of Experience	Professional History	Training and Certifications
BSc (honours), Biology, Laurentian University, 1994	With AECOM: 8 With Other Firms: 12	07/2017 - Present, AECOM Senior Aquatic Scientist/Limnologist	AECOM Certified Project Manager (2019)
MSc, Aquatic Ecology and Paleolimnology, Queen's University, 1997	Professional Affiliations North American Lake Management Society (NALMS)	01/2010 - 06/2017, Hutchinson Environmental Sciences Ltd. Senior Aquatic Scientist, Manager, Director	Low Impact Development Treatment Train Tool Workshop (2017)
PhD, Aquatic Ecology and Paleolimnology, Queen's University, 2004		07/2006 - 01/2010, AECOM Senior Aquatic Scientist 06/2005 - 04/2006, Ontario Ministry of the Environment and University of Toronto Postdoctoral Research Fellow 06/2001 - 05/2005, University of Waterloo Postdoctoral Research Fellow	Project Management Institute (PMI) Training (2015) Lake and Pond Phosphorus Inactivation and Interception Workshop (NALMS, 2013)

Summary

Dr. Tammy Karst-Riddoch is an accomplished senior aquatic scientist, bringing more than 25 years of research and consulting experience to the AECOM team. She manages, leads and advises on complex surface water and watershed management projects for government, industry, and private stakeholders across North America.

Tammy specializes in the use of physical, biological, chemical and geochemical information to assess the responses of aquatic systems to natural (e.g., climate change and variability, hydrological changes, vegetation dynamics, fire, etc.) and human disturbances (e.g., effluent discharge, mining, land-clearance, agriculture, watershed development, river regulation, flooding, etc.). She has expert knowledge of approaches to improve the health of natural and built aquatic systems, including in-lake technologies, best management practices, and low impact development to control sources of nutrients and solids. She has used this knowledge to develop mitigation and management plans that address site-specific issues while considering social, political, and economic concerns. Tammy is a technical lead for the development and application of AECOM's innovative algae harvesting technology for nutrient reduction and the mitigation of harmful algal blooms.

Tammy is well respected in the scientific community; she has published 14 papers on limnology, hydrology, and ecology of lakes and wetlands, and has acted as a peer reviewer of original research (Journal of Lake and Reservoir Management, Journal of Paleolimnology).

Tammy's key skills and areas of expertise are: surface water and watershed management; limnology and paleolimnology; algal bloom dynamics, aquatic plant and nutrient management; scientific synthesis, peer review, and expert testimony; advanced statistical analysis; effluent receiving water and assimilative capacity assessment; and aquatic monitoring program design and implementation.

Project Experience

West Columbia, City of, Drinking Water Source Quality Assessment, West Columbia, South Carolina, US. Technical lead investigating sources of taste and odour events due to Geosmin and 2-methylisoborneol in Lake Murray to inform source water protection planning and treatment plant upgrade needs. [2019-ongoing]

West Kelowna, City of, Roseville Reservoir Water Quality Assessment and Management Recommendations, British Columbia. Technical Lead for the assessment of water quality and factors promoting cyanobacteria blooms in a large drinking water reservoir. Evaluating existing management strategies including dam operations, algaecide applications and aeration on water quality, with the goal to enhance management for improved water quality at the drinking water intake. [2019-ongoing]

Irvine Ranch Water District, Reservoir Water Quality Management System Design, Orange County, CA. Technical Lead for the assessment of source water quality and evaluation of oxygenation and aeration technologies in support of the Syphon Reservoir Improvement Project. [2021]

Peel, Region of, Lorne Park Water Treatment Plant Review of Algae and Water Quality Monitoring Technology, Ontario. Technical Lead for the assessment of source water quality and the evaluation of innovative technologies to monitor changes in raw water quality sourced from Lake Ontario related to algae blooms that have caused damages to the traveling screens and plant water production interruptions. Providing oversight of the installation of the monitoring equipment and data analysis. [2020-ongoing]

Northwest Florida Water Management District NFWMD), Intact Cellular Algae Harvesting with Simultaneous Nutrient Export Demonstration Project, Lake Munson, FL. Technical lead on NFWMD's demonstration research project that will use of a 1 MGD Hydronucleation Flotation Technology (HFT) as a sustainable and environmentally safe lake management solution to address eutrophication and HABs in Lake Munson, Leon County, FL. Responsible for senior technical input including for the preparation of the Quality Assurance Protection Plan, design of water quality monitoring and modeling programs, monitoring and evaluation of HFT, and development of a long-term HFS treatment plan to mitigate HABs in Lake Munson and alleviate nutrient enrichment concerns downstream of the lake in Munson Slough and the Floridan Aquifer. [2021-ongoing]

US Army Corps of Engineers (USACE), HABITATS Phase 2, Lake Chautauqua, NY and Saddle Creek, FL. Technical lead for the award winning Harmful Algal Bloom Interception, Treatment and Transformation System (HABITATS) research program, providing input to program design and responsible for performance data collection and analysis, AECOM project reporting, and technical review of the USACE ERDC report. The success of HABITATS was recognized by USACE, which received the 2020 USACE Innovation of the Year Award and the 2020 National Environmental Business Journal Award. [2019-2021]

Various clients, Drinking Water Source Protection (DWSP) Technical Studies. Completed surface water studies (intake characterization, vulnerability and threats assessments) in support of the provincial DWSP initiative for municipal intakes in North Bay, Callander and South River and peer reviewed studies for surface water intakes in Sydenham and the Trent Source Protection Area. Developed and completed pilot technical studies for the District of Muskoka and Town of Cobden.

City of Markham, Swan Lake Chemical Treatment to Reduce Nutrients and Control Cyanobacteria Blooms, Markham, ON. Developed a chemical treatment plan for the application of polyaluminum chloride in Swan Lake to strip phosphorus from the water column and inactivate sediment phosphorus. Provided field oversight during the application. Initial results of the treatment showed significant decreases in lake water total phosphorus concentration and improvements in water clarity, without evidence of harmful side effects of the product. [2021]

New York State Department of Environmental Conservation and Office of General Services, NY, Lake Agawam Cyanobacteria and Microcystin Removal Demonstration. Technical lead for overseeing monitoring activities, evaluating efficiencies and reporting on novel algae harvesting treatment technology (dissolved air flotation and ozonation) to remove cyanobacteria and associated toxins and nutrients from Lake Agawam. The treatment achieved greater than 95% removal of algae and reduced microcystin concentrations in effluent to below the US EPA drinking water standard. [2019-2021]

Town of Richmond Hill, Lake Wilcox Management Plan Update, Richmond Hill, Ontario. Technical Lead for a comprehensive management plan to address impacts of urbanization on water quality, cyanobacteria blooms and aquatic habitat in a large kettle lake on the Oak Ridges Moraine. Project work included detailed limnological assessment (water quality, aquatic biota, internal phosphorus loading), and modeling of phosphorus and chloride loading and lake response to those loads. Effective and feasible management options were recommended to address existing and emerging concerns identified from the study, and in consideration of socioeconomic and planning constraints. [2017-2019]

City of Hamilton, Bayfront Beach Water Quality Investigation and Implementation Strategy, Hamilton, Ontario. Senior Aquatic Scientist. Evaluated the effectiveness of measures implemented to reduce bacteria contamination (source controls) and elevated cyanobacteria toxins (ultrasound technology) that have caused an increasing number of closures of two beaches in Hamilton Harbour. Project work included assessment of bird population and scat counts, water quality, algal community composition and biomass, zooplankton vitality and fish presence at control and impact sites. [2017-2018]

Various Clients, Lake Water Quality Modeling Technical lead on Lakeshore Capacity phosphorus modeling projects for numerous lakes in central and northern Ontario including regional studies for the City of Elliot Lake, the Township of Seguin, City of Greater Sudbury and District of Muskoka. Studies included the determination of phosphorus and water loads to the lakes and modeling to predict phosphorus concentrations that consider in-lake dynamics of phosphorus settling and internal loading from lake sediments. Management recommendations were developed to include technical and planning approaches.

Lake of Bays Water Quality Monitoring Program, Lake of Bays, Ontario. From 2006 to 2016, provided technical guidance and oversight for the Lake of Bays Association water quality monitoring program. Revised the program over the years to maximize resources and address emerging water quality concerns. Completed annual reports to document existing conditions, assess trends in phosphorus and *E.coli*, and evaluated mechanisms influencing those trends.

Seguin Township Water Quality Monitoring Program, Seguin, Ontario. Developed a comprehensive water quality monitoring program for spring overturn total phosphorus, and end-of-summer dissolved oxygen, temperature and total phosphorus in more than 60 area lakes. Conducted annual reviews and summaries of monitoring results and provided support to the Town's field staff from 2008 to 2017. [Prior to AECOM]

Peer Reviewed Publications

- Branaavan, S., A.M. Paterson, K.M. Rühland, D. Köster, **T.L. Karst-Riddoch** and J.P. Smol, 2018: Diatom responses to 20th century shoreline development and climate warming in three embayments of Georgian Bay, Lake Huron. *Journal of Great Lakes Research*, 44: 1339-1350.
- Faulkenham, S.E., R.I. Hall, P.J. Dillon and **T.L. Karst-Riddoch**, 2003: Effects of drought-induced acidification on diatom communities in Ontario lakes. *Limnology and Oceanography* 48:1662-1673.
- Karst, T.L.**, and J.P. Smol, 1998: Tracking the cultural eutrophication history of Collins Lake (southeastern Ontario, Canada) using paleolimnological techniques. *Journal of Lake and Reservoir Management* 14:456-465.
- Karst, T.L.**, and J.P. Smol, 2000: Paleolimnological evidence of limnetic nutrient concentration equilibrium in a shallow, macrophyte-dominated lake. *Aquatic Sciences*. 62:20-38.
- Karst-Riddoch, T.L.**, M.F.J. Pisaric and J.P. Smol, 2005: Diatom responses to 20th century climate-related environmental changes in high-elevation mountain lakes of the northern Canadian Cordillera. *Journal of Paleolimnology* 33: 265-282.
- Karst-Riddoch, T.L.**, M.F.J. Pisaric, D.K. Youngblut and J.P. Smol, 2005: Postglacial record of diatom assemblage changes related to climate in an alpine lake from the northern Rocky Mountains, Canada. *Canadian Journal of Botany* 83: 968-982.
- Karst-Riddoch, T.L.**, H.J. Malmquist and J.P. Smol, 2009: Relationships between freshwater sedimentary diatoms and environmental variables in Subarctic Icelandic lakes. *Fundamental and Applied Limnology* 175:1-28.
- McGowan, S., P.R. Leavitt, R.I. Hall, B.B. Wolfe, T.W.D. Edwards, **T.L. Karst-Riddoch** and S.R. Vardy, 2011: Interdecadal declines in flood frequency increase primary production in lakes of a northern river delta. *Global Change Biology* 17:1212-1224.
- Pisaric, M.F.J., J.M. Szeicz, **T.L. Karst** and J.P. Smol, 2000: Comparison of pollen and stomate spectra as indicators of treeline in montane and alpine lake sediments from northwestern Canada. *Canadian Journal of Botany*. 78:1180-1186
- Pisaric, M.F.J., C. Holt, J.M. Szeicz, **T.L. Karst** and J.P. Smol. 2003: Holocene treeline dynamics in the mountains of northeastern British Columbia, Canada, inferred from fossil pollen and stomates. *The Holocene*. 13(2): 161-173
- Sinnatamby, R.N., Y. Yi, M.A. Sokal, K.P. Clogg-Write, T. Asada, S.R. Vardy, **T.L. Karst-Riddoch**, W.M. Last, J.W. Johnston, R.I. Hall, B.B. Wolfe and T.W.D. Edwards, 2010. Historical and paleolimnological evidence for expansion of Lake Athabasca (Canada) during the Little Ice Age. *Journal of Paleolimnology* 43:705-717.
- Wolfe, B.B., **T.L. Karst-Riddoch**, S.R. Vardy, M. Falcone, R.I. Hall and T.W.D. Edwards, 2005: Impacts of climate and river flooding on the hydro-ecology of a floodplain basin, Peace-Athabasca Delta, Canada since A.D. 1700. *Quaternary Research* 64: 147-162.
- Wolfe, B.B., **T.L. Karst-Riddoch**, R.I. Hall, T.W.D. Edwards, B. English, R. Palmi, S. McGowan, P.R. Leavitt and S.R. Vardy, 2006: Classification of water balance and hydro-limnological relationships in northern floodplain basins (Peace-Athabasca Delta, Canada) from analysis of stable isotopes ($\delta^{18}O$, δ^2H) and water chemistry. *Hydrological Processes*. 21 (2) 151-168.
- Wolfe, B.B., R.I. Hall, W.M. Last, T.W.D. Edwards, M.C. English, **T.L. Karst-Riddoch**, A. Paterson, R. Palmi, 2006: Reconstruction of multi-century flood histories from oxbow lake sediments, Peace-Athabasca Delta, Canada. *Hydrological Processes* 20:4131-4153.

White Papers

- Page, M. B. MacAllister, M. Campobasso, A. Urban, C. Thomas, C. Cender, C. Arnett, C. White, E. Martinez-Guerra, A. Boyd, E. Gao, A. Kennedy, T. Biber, K. Pokrzywinski, C. Grasso, B. Fernando, C. Veinotte, J. Riley, A. Gonzalez, J. Miller, K. Gunderson, L. Schideman, Y. Zhang, B.K. Sharma, D. Levy, W. Colona, D. Pinelli, **T. Karst-Riddoch**, and W. Lovins, 2021: Optimizing the Harmful Algal Bloom Interception, Treatment, and Transformation System (HABITATS). US Army Corps of Engineers, Engineer Research and Development Center (ERDC). Technical Report TR-21-18. 227 pp.
- Karst-Riddoch, T.L.**, D. Jackson, D. And S. Bhavsar, 2008: Changes in contaminant burdens in Niagara River sport fish following remedial actions to reduce toxic loadings since 1986/87. University of Toronto and Ontario Ministry of Environment. ISBN 978-1-4249-7674-4.
- Clark, B. and **T.L. Karst-Riddoch**, 2011: Ontario: Surface Water Intakes. *LakeLine*, North American Lake Management Society, 31:3 9-11.

Lorin Hatch, Ph.D.

Independent Technical Reviewer, Limnologist, Water Quality Specialist

Education	Years of Experience	Professional History	Training and Certifications
Doctor of Philosophy (PhD), Ecology, University of California - Davis, 1997	With AECOM: 1 With Other Firms: 30	07/2021 - Present, AECOM USACE Program/Project Manager	Technology of Participation Facilitation Training
Bachelor of Arts (BA), Biology, University of Iowa, 1989	Professional Affiliations	03/2019 - 06/2021, Widseth Smith Nolting water quality specialist	National Environmental Policy Act
Master of Science (MSc), Ecology, Iowa State University, 1992	Minnesota Water Resources Planning Committee	08/2017 - 08/2018, RMB Environmental Laboratories Director of Operations 06/2015 - 02/2017, WSB Senior Scientist 08/2006 - 06/2015, HDR Engineering Senior water quality specialist	

Summary

Dr. Hatch has over 30 years of experience in water resources and ecosystem management in the academic, public, and private sectors. He has worked on lakes, rivers, streams, watersheds, and estuaries on multiple spatial and temporal scales, ranging from pristine to highly impacted ecosystems across the country. He has extensive experience in project and team management. Dr. Hatch has served as an adjunct professor and student advisor at the University of Minnesota in both the Water Resources Science and the Conservation Biology graduate programs. He has over 20 peer-reviewed publications. Trained as a limnologist Lorin specializes in watershed management, monitoring program design, modeling, water chemistry, and algal response. Given his emphasis on water chemistry he has worked in many sectors including drinking water, wastewater, water resources, environmental, and hydropower.

Project Experience

Xcel Energy, Cabin Creek Hydro Relicensing Project, Clear Creek County, Colorado. Water Quality Expert. Assisted with the development of a water quality monitoring plan to support the relicensing of a 324 MW pump storage facility, as well as designed strategic sampling efforts to understand iron dynamics in the system. Task also involved assisting with a feasibility study to mitigate excess iron in the system.

City of Gillette Wyoming, Fishing Lake TMDL, Gillette, WY. Water Quality Expert. Gillette Fishing Lake has been placed on the WY DEQ 303 (d) List of Waterbodies with Water Quality Impairments (siltation and phosphorus). As part of the project team, Dr. Hatch assisted the City of Gillette, WY to complete the requirements to gain access to the grant money and provide baseline environmental data so that implementation can be effective. The project involved stakeholder coordination, project management, water quality sampling, modeling and data analysis, completing the TMDL report, and on-going public involvement.

City of Cheyenne, Board of Public Works Manganese, Iron and Biological Study, Wyoming. Water Quality Expert. Evaluated the sources of manganese and iron entering the Sherard Water Treatment Plant (WTP). A review of flow and water quality data for the Sherard WTP supply indicated that the problem arose in the reservoir system and in the raw water pipeline. Responsibilities involved developing multiple alternative solutions for avoiding colored water events and recommended corrective actions in a staged approach to prevent future manganese events. The recommended actions included hypolimnetic aeration of the terminal reservoir, additional oxidation of manganese, improvements to mixing and coagulation, and provision of a sequesterant feed system.

Minnehaha Creek Watershed District, MCWD, Stubbs Bay Improvement Project/Classen Wetland Restoration, Hennepin County, MN. Project Manager and Water Quality Expert. Dr. Hatch analyzed water quality issues in this eutrophic bay of Lake Minnetonka and proposed wetland restoration and headwater lake controls to restore hydrology in the Classen Creek subwatershed. Part of project utilized University of Minnesota students for their senior capstone project.

Minnehaha Creek Watershed District, Lake Water Quality Data Analysis, Hennepin County, MN. Water Quality Expert. Dr. Hatch performed long-term trend analysis on multiple lake sites for several parameters and made recommendations to streamline monitoring efforts on both a spatial and temporal basis. He also reviewed the client's long-term water quality monitoring program and provided feedback to improve the program.

PacifiCorps, Pilot Study of Algal Conditions Management within a Selected Reservoir Cove, CA. Water Quality Expert. Dr. Hatch reviewed multiple mechanical alternatives to reduce the intensity of blue- green algal blooms in Iron Gate Reservoir on the Klamath River, California. Alternatives included low- speed paddlewheels, impeller-aspirator systems, axial flow pumps, pump and cascade systems, air- powered mixers, and sonicators.

EXHIBIT A TO RESOLUTION 2024-011

USACE Kansas City District, Lake Contrary Restoration Project, St. Joseph, MO. Water Quality Expert. A Planning Design and Analysis Report (PDA) for the Section 514 Missouri and Mississippi River Enhancement Project at St. Joseph, Missouri was prepared. The project was a continuation of activities to analyze six alternatives to restore Lake Contrary, an oxbow lake that became hypereutrophic due in part to sedimentation. Dr. Hatch used the SCS method to calculate water budgets, and the RUSLE method to calculate sediment loads.

Private Client, Swan Lake Pumped Storage Project, OR. Water Quality Expert. Researched and prepared a water quality feasibility report for a proposed pumped lake storage project in southern Oregon. Dr. Hatch examined the potential impacts of temperature and chemical constituents on future water quality conditions and possible algal issues.

Water Environment Federation, Management of Disruptive Aquatic Species in Pacific Northwest Drinking Water Supplies, WA. Senior Algal Ecologist and Water Quality Expert. Analyzed water quality and algal monitoring data to determine cause-and-effect relationships as well as invasive algal species niche analysis for the two largest water suppliers in Washington State. The study addressed drinking water quality and treatment issues related to alien or indigenous plankton species in source waters of the Coastal Pacific Northwest region, focused on understanding what drives the production of problem species, developed monitoring strategies and tools to help utilities predict occurrence in source waters, and provided practical guidelines for managing the impacts of problem species on drinking water supplies.

Vadnais Lake Area Water Management Org, Water Quality Modeling of the VLAWMO Watershed, St. Paul, MN. QA/QC Reviewer and Modeler. Developed a BATHTUB water quality model for lakes in the watershed. This model was used to set individual lake water quality goals and guide management activities in the watershed.

Stearns County Environmental Services, Pelican Lake of St. Anna Clean Water Partnership Phase I Diagnostic Study, Stearns County, MN. Project Manager and Water Quality Expert. Assisted with writing project reports, modeling, and providing technical advice to Pelican Lake Association for the CWP grant to monitor the lake and stream water quality for two years.

Riley Purgatory Bluff Creek Watershed District, Aquatic Invasive Species Management Plan, Chanhassen, MN. Project Manager and Water Quality Expert. Reviewed aquatic invasive species (AIS) concerns in the District, determined vectors and pathways for those organisms, developed an AIS prevention matrix, recommended implementation plan alternatives and associated costs, and wrote the final plan.

City of San Francisco, Lake Merced Harmful Algal Bloom Monitoring, San Francisco, CA. Limnologist and Water Quality Expert. Dr. Hatch conducted a field visit with City staff and is guiding analysis of available water quality data to provide the client with monitoring guidance for this backup non-potable water supply for the City.

City of Watertown, Phosphorus Removal Facility Project, Watertown, SD. Senior Algal Ecologist. Provided technical support for the modification of a functional, but recently decommissioned water treatment facility (1.5 MGD capacity), along the shores of highly-eutrophic Lake Kampeska to grow algae year-round to remove phosphorus from the lake water. The algae were harvested and the lower-phosphorus water returned to the lake to reduce the overall P content in the lake over time.

Water Environment Research Foundation, Nutrient Regulatory Issues: Nutrient Effluent Discharge Permitting Guidelines. Water Quality Expert. Assisted with the development of a report that reviewed how nutrients are addressed in NPDES discharger permits. Case studies were analyzed, and emphasis was placed on watershed permitting, water quality trading programs, and nutrient offsets.

Chisago Lakes Lake Improvement District, Basin-Wide SWAT Model, Chisago County, Minnesota. Ecologist. Developed a preliminary SWAT model targeted to the Chisago Chain of Lakes. The SWAT models used to simulate the movement of sediment and phosphorus through the Chisago Chain of Lakes system. The model builds upon the body of knowledge developed in previous studies such as the Storm Water Management Model and the BATHTUB modeling projects

California Department of Water Resources, Bay Delta Conservation Plan, Sacramento, California. Water Quality Expert. Assessed current water quality conditions for the EIR/EIS and the impacts of selected management strategies to support the Bay Delta Conservation Plan which examines strategies to deliver high-quality water to central and southern California, while at the same time addressing environmental issues pertaining to fisheries in the Sacramento-San Joaquin Delta. Parameters assessed included sediments, nutrients, heavy metals, pesticides, PAHs, and emerging contaminants.

Texas Water Development Board, Nueces Watershed Pre- and Post-Development Nutrient Budgets, Texas. Water Quality Expert. Evaluated pre-development and current conditions nutrient budgets, quantified differences between these budgets, assessed potential causes of these differences (e.g., reservoir operations, frequent and extended drought periods, etc.), and facilitated consideration of metrics for identification of the desired future condition for estuarine productivity. Once any potential nutrient imbalances were identified through the nutrient budgeting process, cost-effective strategies to address such imbalances were developed. Responsibilities also involved assisting with data management and analysis.

EXHIBIT A TO RESOLUTION 2024-011

HWSP Water Quality Mitigation Plan, Milton Seaman Reservoir
City of Greeley

10/13/2023

Fee Estimate

Prepared: JC / TKR Date: 11-Oct-23
Reviewed: CK Date: 12-Oct-23
Approved: KS Date: 13-Oct-23

Task/Scope	LABOR HOURS BY CLASSIFICATION																				TOTAL HOURS	LABOR COST	EXPENSE COST	TOTAL COST
	Project Manager	Project Engineer	Project Controller / Tech Editing	Senior Limnologist	Mid-level Limnologist	Independent Technical Review (Limnology)	Independent Technical Review (Engineering)	Aeration System SME Reviewer	Senior Electrical Engineer	Electrical Engineer	Structural Engineer	Structural Drafting	Process Mechanical Design (Aeration)	CAD Designer	Cost Estimator	Senior Engineering Geologist	Tower Structural	Project Engineer	Independent Technical Reviewer	Gates Expert				
	N. Walker	J. Crouch	Project Controller	T. Karst-Riddoch	B. Winston	L. Hatch	V. Adams, R. Hawthorne, B. Skolozdra	Aeration System SME	C. Adams	Q. Harlen	S. Pauls	G. Hesselstine	S. Weber	R. Carpio	R. Watts	Sr. Geologist	M. Simon	S. Warren	ITR	L. Gerbig				
	\$279	\$161	\$186	\$173	\$134	\$232	\$264	\$311	\$279	\$122	\$186	\$130	\$216	\$216	\$216	\$279	\$279	\$147	\$338	\$413				
PHASE 1																								
Task 1: Project Management	62	48	32	28	0	0	0	0	0	0	0	0	0	0	0	2	14	6	0	0	192	\$41,168	\$2,136	\$43,304
Site Visits	12	24		24													12				72	\$14,712	\$2,136	\$16,848
H&S Plan			6																		6	\$1,116	-	\$1,116
Kick-Off Meeting (Phase 1 and 2)	20	4																			24	\$6,224	-	\$6,224
Progress Meetings	20	20		4												2	2	6			54	\$11,490	-	\$11,490
Project Set-Up			6																		6	\$1,116	-	\$1,116
Prepare Invoices	10		20																		30	\$6,510	-	\$6,510
Task 2: Water Quality Review and Analysis	8	12	4	44	60	10		6													144	\$24,746	\$0	\$24,746
Task 3: Feasibility Design for Oxygenation and Aeration Systems	24	78	6	18	0	2	14	12	44	40	38	30	28	52	0	0	0	0	0	0	386	\$76,780	\$0	\$76,780
Oxygenation and Aeration System Options Analysis	20	72		16		2		12													122	\$24,136	-	\$24,136
Prepare 15% BODR	4	4	6	2			4		40		8		16								84	\$20,382	-	\$20,382
Prepare 15% Design Drawings (Includes: Draft, comment responses, and Final)		2							4	40	30	30	12	52							170	\$29,622	-	\$29,622
QAQC							10														10	\$2,640	-	\$2,640
Task 4: Feasibility Design and Engineering of Multi-Level Outlet Tower	39	76	45	8	0	0	0	4	36	54	0	0	75	80	30	64	151	158	22	55	897	\$204,069	\$0	\$204,069
Task 4A Data Review and Development of Study Approach	2	72							4	8			12	0	0	10	16	16	4	8	152	\$31,096	-	\$31,096
Task 4B Civil and Structural Analysis for Alternatives	32	2	30	8				4	0	0			4	80	30	24	100	100	18	17	449	\$104,483	-	\$104,483
Task 4C Mechanical and Electrical Analysis for Alternatives	5	2	15						32	46			59	0	0	30	35	42	0	30	296	\$68,490	-	\$68,490
Task 5: Evaluation and Cost Estimating of Water Quality Mitigation Options	9	58	12	2	8	2	0	0	2	6	4	2	4	0	16	0	6	18	2	1	152	\$27,986	\$0	\$27,986
Evaluation of options	8	56	12	2	8																86	\$14,898	-	\$14,898
Prepare Cost Estimate (Task 5)	1	2				2			2	6	4	2	4		16	0	6	18	2	1	66	\$13,088	-	\$13,088
Task 6: Water Quality Mitigation Plan Recommendations and Reporting	4	12	10	2	4	4			4		4		4			4	4	4	2	2	64	\$13,764	\$0	\$13,764
PHASE 1 Subtotal	146	284	109	102	72	18	14	22	86	100	46	32	111	132	46	70	175	186	26	58	1835	\$ 388,513	\$ 2,136	\$ 390,649
PHASE 2																								
Task 7: Outlet Gates 60% Design	28	104	32	10	0	0	0	0	24	40	0	0	0	164	24	31	80	274	9	10	830	\$162,841	\$0	\$162,841
60% Design Drawings	24	100							8	40				164		18	48	124	4	6	536	\$105,804	-	\$105,804
Draft Technical Specifications			16						8							2	8	30	2	4	70	\$14,736	-	\$14,736
Basis of Design Report									8							10	6	45	2		71	\$13,987	-	\$13,987
Cost Estimate															24	1	4	34	1		64	\$11,915	-	\$11,915
Draft Submittal			10	6													2	7			25	\$4,485	-	\$4,485
Final Submittal	4	4	6	4													12	34			64	\$11,914	-	\$11,914
PROJECT Total	174	388	141	112	72	18	14	22	110	140	46	32	111	296	70	101	255	460	35	68	2665	\$551,354	\$2,136	\$553,490

FEE SCHEDULE

PERSONNEL CHARGES

The charge for all time required in performing the Scope of Services, including office, field, and travel time, will be at the Unit Price Hourly Rates set forth below for the labor classifications indicated.

<u>Labor Classification</u>	<u>HourlyRate</u>
Assistant/Support Staff 1	51
Assistant/Support Staff 2	65
Assistant/Support Staff 3	78
Assistant/Support Staff 4	90
Assistant/Support Staff 5	103
Assistant/Support Staff 6	118
Assistant/Support Staff 7	130
Assistant/Support Staff 8	143
Assistant/Support Staff 9	156
Assistant/Support Staff 10	169
Staff 1	95
Staff 2	109
Staff 3	122
Staff 4	134
Staff 5	147
Project 1	161
Project 2	173
Project 3	186
Project 4	200
Project 5	216
Consultant 1	232
Consultant 2	248
Consultant 3	264
Consultant 4	279
Consultant 5	295
Principal 1	311
Principal 2	338
Principal 3	364
Principal 4	389
Principal 5	413

Charges for temporary personnel under Company supervision and using Company facilities will be invoiced according to the hourly rate corresponding to their classification.

OTHER PROJECT CHARGES

Subcontracts

The cost of services subcontracted by the Company to others will be charged at cost plus 5%.

Travel and Other Direct Costs

The cost of travel (airfares, lodging, meals, rental vehicles, parking fees, baggage handling cost, etc.) or other direct costs (field supplies, report binding supplies, leased or rented field equipment, etc.) will be charged at cost. A per diem may be used for lodging and meals.

Document Reproduction

In-house labor for document reproduction will be charged directly to projects.

Vehicles and Mileage

Company owned or leased field vehicles (cars, pickups, vans, trucks, etc.) used on project assignments will be charged at the current mileage rate established by the Internal Revenue Service. The mileage charge for personal autos will be the current mileage rate established by the Internal Revenue Service.

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