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COPY

Mill Pond Dam Feasibility Study

Oakland County Parks and Recreation Commission

August 9, 2018

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August 9, 2018

Andy J. Krumwiede
Oakland County Purchasing Unit
Executive Office Building 41W – Lower Level
2100 Pontiac Lake Road
Waterford Mi 48328

RE: Mill Pond Dam Feasibility Study, Charter Township of Springfield, Oakland County, Michigan

Dear Mr. Krumwielde,

AECOM understands the importance of the Mill Pond Dam Feasibility Study. Having completed dozens of similar studies we understand the significance that a pond can have with a community, costs associated with its upkeep, effective rehabilitation options, and key elements to consider if contemplating dam removal. For this project, it is our understanding that you want to evaluate and understand how dam disposition options will impact recreation, support a vibrant and attractive downtown, respect historical significance, protect and improve ecological/environmental health, promote pedestrian connectivity and minimize short-term and long-term maintenance and capital investment. Our feasibility study will evaluate each dam disposition option against these community concerns.

At AECOM our local dam practice has been actively engaged on recent dam removal and rehabilitation projects within Michigan and throughout the Midwest. Many of these projects have included a public engagement phase. This experience will allow us to develop a practical public input process that can be integrated into the feasibility study approach. Based on our experience we propose that you consider three basic options for dam disposition: rehab/repair the dam; modify the dam; or remove the dam. Each option provides different benefits and costs. The option selected should consider many factors, but is ultimately a community choice based on your unique needs and desires.

AECOM is very qualified to help you navigate the feasibility study process and meet your goals for the project. Our integrated team has experience working on other bridge, creek restoration, dam removal, dam rehabilitation, and public engagement projects throughout Michigan. Our familiarity with Michigan Department of Environmental dam safety and regulatory staff, transportation design guidelines, current dam design guidelines, and recent dam removal projects give our team multidisciplinary technical qualifications to make this project a success and provide actionable information as part of the feasibility study. AECOM's approach is to collaborate with the Township and County on the process so that we meet your goals and answer the questions you have on the possible disposition of the Mill Pond Dam.

AECOM has comprehensive and unsurpassed ability and qualifications to conduct the proposed scope of services to ensure that project implementation is a success. To successfully achieve these goals, The Township and County need a team that offers an innovative approach and has knowledgeable and talented engineers and environmental professionals who will work closely with them and the various project stakeholders. AECOM can provide an integrated team of engineers, geologists, environmental scientists, restoration designers and ecologists, hydrologists, geomorphologists, fish passage experts, and permitting specialists.

AECOM is uniquely well qualified to complete this project. We offer the following benefits:

1. Specific technical expertise.

Our project team has been involved in dozens of dam related projects in Michigan and many more throughout the Midwest and nationally. Our Project Team (Troy Naperala, PE, Dan DeVaun, PE, and others), has been directly involved with similar projects including the Reedsburg Dam Rehabilitation Project; Otsego Township and City Feasibility Study; Boardman and Sabin Dam Removal on the Boardman River; Marion Mill Pond Feasibility Study; Monroe Dams on the River Raisin; Little Rapids Restoration Project and Mill Creek Dam in Dexter. Several of these projects included vehicle or pedestrian bridges which is an important consideration for this project. The successful nature of these projects was one reason Troy Naperala was awarded the 2015 Midwest Region Award of Merit by the Association of State Dam Safety Officials.

2. People make the difference.

Our project team has been working together on dam related projects similar to the Mill Pond Dam Feasibility Study for years. Our team members share a mutual dedication and passion for value-oriented, environmentally-friendly solutions to water resource planning challenges. Troy Naperala brings an unequaled ability to bridge the gap between stakeholders from varying backgrounds, disciplines, and sectors. He is backed by a team of top-notch task managers and technical leads in their respective fields, with a particular focus on disciplines applicable to this project's specific issues. Not only is Mr. Naperala a practitioner in the field of dam engineering, he is actively engaged in expanding the art and science of this field. He has presented dam related presentations at WEFTEC, National Conference on Ecosystem Restoration, Hydrovision, State Floodplain Manager Conference, and the MDEQ's State of Lake Michigan Conference.

3. Organization makes it happen.

Our proposal includes organizational concepts that have proven successful on similar multi-disciplinary projects requiring public engagement and stakeholder interaction and coordination. At AECOM, the completion of all of our projects on time, within budget, and with the highest quality, is standard practice, not a coincidence. We employ a systematic approach to track project needs, schedules, and budget requirements. In doing so, we deliver on our commitments and produce deliverables that stand up to scrutiny from the Michigan Department of Environmental Quality and US Army corps of Engineers. Above all, we understand the importance of frequent and regular communications with you, our client. Our ability to plan, organize, and execute work is demonstrated by the many similar and successful projects that we describe in this proposal. Because of our outstanding track record, we are confident in our ability to deliver a final project that you will be happy with.

4. Start with the end in mind.

When AECOM provides engineering and environmental feasibility study or design services, our ultimate goal is to help our client meet their goals. For your project, our job will be to evaluate the various dam disposition options available at the Mill Pond Dam site. We will present the benefits, costs, and challenges associated with each option to you in a format that you can use to make decisions.

Please do not hesitate to contact me if you have any questions regarding our proposal. We look forward to the opportunity to work with you on the Mill Pond Dam Feasibility Study.

Sincerely,

AECOM

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Document name	Ref	Prepared for	Prepared by	Date
Proposal for Mill Pond Dam Feasibility Study	OPP-852216	Oakland County Parks and Recreation Commission	C. Esterle	08/09/2018

01 Business Organization

Business Information

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Introduction to AECOM

For the past 80 years, AECOM, through its legacy firms, has been a leader in dam engineering projects throughout the nation and worldwide.

National Dams Practice

AECOM is a national leader in the field of dam engineering and dam safety and has provided dam engineering services to our clients for over 80 years. We recognize Dam and Reservoir Engineering as a key technology and maintain a national practice network of dam practitioners across the country. The purpose of this network is to provide consistency of service, share knowledge, transfer technology, and provide the firm's best technical resources regardless of project location. Through this process, we have successfully provided dam engineering services to clients across the country resulting in award-winning, innovative, and cost-effective projects.

#1 TOP500 **ENR2018** DAMS & RESERVIORS

AECOM is at the forefront of dam safety policy and standards. We are ranked as the #1 firm for Dams and Reservoirs in the *Engineering News-Record Top 500 Sourcebook - Environment* (June 25, 2018). AECOM provides leadership for organizations such as the Association of State Dam Safety Officials (ASDSO), the United States Society on Dams (USSD), and the United States Committee on Large Dams. Our National Dams Technology Leader, John France, served with distinction on the National Dam Safety Review Board. In addition, other AECOM staff members also share their expertise by authoring technical papers and training manuals, and serving on dam safety committees and review boards including the U.S. Army Corps of Engineers (USACE) and the U.S. Bureau of Reclamation (USBR).

Dam Rehabilitation Practice

AECOM is a national and international leader in the fields of dam rehabilitation engineering and dam safety and risk analysis. Our team has extensive experience in delivering dam engineering projects for public- and private-sector clients. We combine our connected expertise across multiple disciplines to solve our clients' most complex challenges. This integrated approach allows us to pair local knowledge with global expertise to deliver the best project outcomes for our clients.

Because of our recognized expertise involving decades of experience on dams worldwide, AECOM has been selected to work on some of the more challenging dam engineering projects in the world. For example, AECOM has provided engineering review, analysis, and design on several high-profile dam rehabilitation projects, including:

- Mosul Dam, Iraq, which was built on a soluble rock foundation, and has been named the "most dangerous dam in the world" by the U.S. Army Corps of Engineers (USACE).
- Olmsted Dam, which is one of the largest civil works projects undertaken by USACE and is located on one of the busiest stretches of inland waterway in the U.S.

The experience and expertise from these iconic dam projects can be leveraged to regional projects through the engagement of our technical practice network.

Regional and local projects that our team has completed include:

- Reedsburg Dam rehabilitation, Houghton Lake, Michigan which included an evaluation of the concrete spillway, wooden stoplogs, and earthen embankment and recommendations for rehabilitation.

- Soo Locks Center Dike evaluation, Saulte Ste. Marie, Michigan included the evaluation of an earthen embankment and aging crib dam. The AECOM team evaluated the structural stability and seepage of these structures in the context of operation and maintenance of the Soo Locks facility.

- Consumers Energy Dams at various locations throughout Michigan. AECOM has conducted several evaluations of Consumer's Energy owned dams that have included spillway stability analysis, earthen embankment seepage analysis and geophysical investigations into embankment dams.

- Marquette Board of Light and Power, Tourist Park Dam, complete redesign and rebuild. During 2003 the dam washed out during a large storm and AECOM designed the rebuild and provided quality control and inspection during construction.

- Upper Shaker Lakes Dam, Shaker Heights, Ohio, which included the rehabilitation of masonry walls constructed by the North Union Shakers over 160 years ago.

- Briar Hill Lake Spillway, Solon, Ohio, which evaluated several spillway alternatives, before determining that the installation of pneumatically operated Obermeyer gates would meet the goals of the project while potentially saving $928,000 in construction costs.

Soo Locks facility, Saulte Ste. Marie, MI

Dam Removal and Restoration Practice

Heralded as one of ENR's top-ranked environmental and design firms, AECOM has developed efficient processes specifically for streamlining all aspects of environmental, design, and construction projects, and has specifically developed a dam removal practice to respond to the increasing need to remove aging dams nationwide. We have been very successful working with project stakeholders to define projects, conceptualize issues, identify and procure funding, work with regulating/ permitting agencies, identify qualified and experienced contractors, and designing constructible projects at the lowest costs.

There are thousands of dams in the United States, many of which are currently not serving their intended purpose, such as generating electricity, in need of repair or will require a mechanism for providing fish passage. Numerous studies show that dams have negative environmental impacts on riverine systems including alteration of sediment transport capability, degradation of water quality, and associated impacts to the aquatic organism and riparian communities. In addition, many dams represent public safety concerns and a significant associated liability to their owners.

Dam rehabilitation and/or fish passage can be very expensive ventures for dam owners, particularly if the dam no longer serves a useful purpose or no longer provides income from the use for which it was designed. Often times, these factors present a decision to dam owners; rehabilitate, provide fish passage, or remove the dam. Removal may be the least expensive option and often can be funded by state, federal, private, or non-profit groups. Dam removal, if conducted sensitively and properly, creates minimal temporary environmental impact and has numerous long-term environmental benefits, as well as the elimination of owner liability. Finally, once the dam is removed, there is no longer the need for costly future maintenance.

AECOM is currently involved in some of the largest dam removal projects in the United States. Our Seattle, Washington Office assisted the National Park Service by providing construction management services on the largest dam removal in United States history, the Elwha and Glines Canyon Dams on the Olympic Peninsula in Washington State. Our Sacramento, California office is also involved in the largest dam removal in California history, the 108' high San Clemente Dam which was just recently removed. Our Traverse City, Michigan and Harrisburg, Pennsylvania offices are involved in the dam removal and river restoration design for the Boardman and Sabin dams on the Boardman River, the largest dam removal in Michigan history.

At AECOM, our experts provide a wide range of services related to dams, rivers, and reservoirs throughout North America for local, state, and national government clients.

AECOM is committed to the practice of river and stream restoration and our experience includes the design and execution of approximately 60 dam removal projects and many other river restoration/fish passage projects throughout the United States. We can provide a full range of services from initial feasibility assessments through construction and final completion. Providing our hands-on aquatic resource restoration design experience with our vast construction experience has allowed us to refine our project delivery approach and build a trusted network of contractors to provide us with a "design-build" approach, when appropriate. At a minimum, this has allowed us to design projects which are "constructible" at a reasonable cost.

Technical Capabilities

Our dam removal projects to date have restored nearly 1,000 miles of streams, most on third order streams or larger. Our experienced professionals can address all technical areas required to complete river and stream restoration projects, with particular emphasis on dam removal, natural approaches to the passage of aquatic species, and riverine restoration functionality. The types of services that have been applied by AECOM on our dam removal projects typically include some or all of the following:

- Funding and Grant Application
- Topographical, Bathymetric Surveys
- Wetlands Delineations / Assessments
- Natural Channel Design
- Impounded Sediment Characterization
- Stream Restoration
- Construction Drawings/Specifications
- Construction Oversight
- Alternatives Analyses
- Cultural and Historical Resources Evaluations
- Hydrology and Hydraulics Analysis
- Dam Inspections / Assessments
- Sediment Transport and Scour Analyses
- Project Permitting
- Construction Cost Estimating
- Post-removal Flood Evaluations
- Feasibility Analyses
- Threatened and Endangered Species
- Mussel Surveys and Relocation
- Geotechnical Investigations
- Fish Passage Design
- Public Involvement / Outreach
- Bidding and Contract Management
- FEMA Flood Plain Mapping

In developing our dam removal practice, AECOM has forged strong relationships with many key local, state, and national conservation groups and sportsman's groups. We have been very successful working with all project stakeholders to define the project, conceptualize issues, identify and procure funding, work with regulating/permitting agencies, identifying qualified and experienced contractors, and designing constructible projects within identified budgets.

AECOM has completed dam safety, removal and restoration designs and/or feasibility studies for the following groups/ agencies:

- American Rivers
- Pennsylvania Fish and Boat
- Clearwater Conservancy
- Non-profit Watershed Groups
- Exelon
- Aqua America
- Trout Unlimited
- Conservation Resource Alliance
- The Nature Conservancy
- Grand Traverse County
- Detroit District USACE
- The City of Monroe, Michigan
- Consumers Energy
- Eastern Upper Peninsula Regional Planning and Development
- Public Water Supply Utilities
- Cabot Oil and Gas
- Pennsylvania American Water
- Michigan DNR
- Michigan DEQ
- Grand Traverse Band of Ottawa and Chippewa Indians
- Great Lakes Fishery Commission
- Northeast Ohio Regional Sanitary District
- Ohio DNR
- Chippewa County Road Commission
- California State Coastal Conservancy
- Natural Lands Trust
- NRCS
- FEMA

Sacramento River Restoration Project, Sacramento, CA

Midwest Dams Practice

AECOM has led the way with dam removals in the Midwest by providing clients with design, permitting, and construction oversight services. Having developed strong, positive relationships with state agencies and local non-profit watershed groups, AECOM has created a unique niche in providing this service. These relationships also create a distinctive capability to help clients identify funding mechanisms to help defray all or some of the costs of dam removal, as well as facilitate and expedite the permitting process. Our experienced team works efficiently within State and Federal guidelines and regulations to limit costs.

Within the Midwest AECOM has worked with multiple agencies and project partners on dam removal projects. These have included state and federal resource and regulatory agencies, Native American Tribes, municipalities and not for profit conservation organizations. AECOM has completed design and permitting for the removal of dozens of dams of varying size throughout Michigan, Pennsylvania, Delaware, Maryland, and Virginia. Designing the removal of a dam involves collecting topographical features of the flood plain, stream and dam structure, and sediment properties. This information facilitates in calculating the volume of impounded sediment, establishing the thalweg through the dam, and stabilizing the streambanks post removal. In addition, this information fulfills the design requirements needed for state, federal and local agency approval.

Every dam was unique in its design and addressing the complex issues associated with removal requires an equally innovative and unique approach to succeed. Impounded sediment (quantity and quality), dam construction materials, erosion and sediment control, and historical and societal issues are some of the issues that need to be addressed. AECOM does not take a "cookie cutter" approach to projects, and our goal is to provide innovative project designs and solutions, responsiveness to clients, and to identify and protect water resources.

Mill Creek Dam Removal & Bridge Replacement, Village of Dexter, MI

Before

After

02 Statement of the Problem

Having completed dozens of similar studies, we understand the challenges that a community faces when determining what to do with an aging dam. Often the pond formed by the dam, and in some cases the dam itself, are a long established component of the community. Whether the pond provides recreation opportunities or is a historic part of the local landscape, it can generate strong feelings within the community.

Our approach is to work with the dam owners to identify cost effective options for the dam that meet the communities needs over the long term. Generally, there are three primary options for dams:

1. **Rehabilitate the dam.**
   This option keeps the dam in its current configuration, but repairs it to meet current dam safety and design standards.
2. **Modify the dam.**
   This option keeps the dam and level of the pond, but modifies the configuration of the dam to better meet current dam safety and design standards, reduce operation and maintenance costs, and/or to improve other uses (habitat, recreation, power generation, etc.).
3. **Remove the dam.**
   This option removes the dam and the pond. It generally eliminates long term operation and maintenance costs, changes the aesthetics of the area, and changes the habitat and recreation types supported in the area.

It is the AECOM team's understanding that Oakland County Parks and Recreation Commission (OCPRC) and the Charter Township of Springfield (CTS) are seeking engineering and science support to evaluate options regarding the Mill Pond Dam. Our objective for this project will be to provide you with the information needed to make an informed decision. Based on the RFP, it is our understanding that you want to evaluate and understand how dam disposition (rehabilitation, modification or removal) options will impact recreation, support a vibrant and attractive downtown, respect historical significance, protect and improve

ecological/environmental health, promote pedestrian connectivity and minimize short-term and long-term maintenance and capital investment. Our feasibility study will evaluate each dam rehabilitation option against these community concerns, while also considering a dam removal option against those same concerns.

Based on our experience, you have developed a detailed RFP that covers the most important aspects for this type of study. However, to clarify our approach, schedule and fee we have made the following assumptions regarding what is expected.

1. The request related to deeds and titles is for the purpose of understanding easements that may impact dam repair, modification or removal options.
2. The dam is not a flood control structure.
3. Sediment sampling conducted will be to inform the feasibility study and will not be of sufficient quantity (i.e. numbers of samples) to support permitting or design.
4. Cost estimates for dam repair, modification, or removal options will be based on similar construction projects recently completed and will be based on estimated quantities and unit rates.
5. Any engineering calculations or drawings provided will be done for demonstrating conceptual understanding and will not be suitable for construction.
6. Specifications will not be developed for the feasibility level study.
7. County GIS data will be used for the purposes of identifying property boundaries adjacent or within the pond.

Limitations

Assumptions used in developing this proposal are as follows:

- We have assumed no geotechnical investigation is required as part of this project.
- We have not included scope or budget to complete any slope stability or seepage modeling.
- We have assumed that we will not need to route the HEC-RAS model downstream past Kirby Lake or upstream past Davisburg Trout Pond. We have assumed that the flooding impacts from dam removal will be negligible at that point.

03 Approach

The approach described for the Mill Pond Dam Feasibility study largely follows the specific technical items requested in the Request for Proposals. Our approach to feasibility studies will be to collect and evaluate data needed to help Oakland County Parks and Recreation Commission (OCPRC) and the Charter Township of Springfield (CTS) make sound decisions regarding the Mill Pond Dam. With this in mind we have tailored the level of detail proposed in this study to allow AECOM to make sound engineering decisions for a reasonable cost.

TASK 1: Existing Data Collection, Review, and Analysis

A successful project relies on evaluating, understanding, and using existing data effectively. To complete this task, AECOM will review the available data from the OCPRC and the CTS. As part of this proposal process, AECOM has already reviewed the documents listed in the RFP, including:

- Preliminary Evaluation Report (S&ME, 2011);
- Dam Safety Inspection Report (MDEQ, 2013);
- OCPRC Five-Year Recreation Master Plan, 2018-2022 (OCPRC, 2018); and
- Agreement for Mill Pond Dam Maintenance and Repair between Oakland County and Charter Township of Springfield.

AECOM will also review the following documents even though these documents are not listed in the RFP to gain a better understanding of the project:

- Dam Safety Inspection Reports from 2003, 2008, 2013, and 2018 as prepared by the Michigan Department of Environmental Quality (MDEQ);
- Water Resource Commissioner video completed in 2016; and
- Evaluations completed by Hubbell Roth & Clark in 2016 and 2017.

The information and data combined in these reports will be used to understand the existing condition of the dam, past repairs and maintenance activities, ownership, and planned uses of the site. In addition, the MDEQ Dam Safety Reports are useful for assessing how the dam's condition has changed over time and how quickly it may deteriorate further. These reports will also help define the extent of the study area, social impact of the dam (e.g. recreational uses, community attachment, and historical structures), and environmental benefits and costs of the dam.

We expect the study area to encompass the dam embankment, inlet and outlet structures, impoundment, approximately 500 feet upstream of the impoundment and the area approximately 500 feet downstream of the dam. Based on the results of the data review, AECOM will refine and clarify the overall project study area.

Task 2: Topographical Survey and Base Mapping

AECOM will field verify, confirm, and adjust the existing topographic survey completed in 2000 by Earthtech, Inc. as required for this study. We will also supplement this survey with LiDAR and/or field survey data as appropriate.

We expect to collect all of the survey data needed for the feasibility study. This effort will focus on topographical data of the earthen embankment, appurtenances (inlet/outlet works, energy dissipation structure, etc.), roadway, toe of the dam and several elevation points around the impoundment.

We will also survey critical cross sections along the Shiawassee River. These cross sections will be used in the hydraulic analysis that is described in Task 4. For purposes of this proposal, we have assumed that six critical cross sections will be required. These will be collected from locations above the impoundment and below the dam.

Finally, AECOM will conduct a deed and title search on the dam site and the properties abutting the impoundment to determine if there are any land ownership issues. Specifically, this review property boundaries and flowage easements. This information will be included in the Feasibility Study.

TASK 3: River/Impoundment Survey

AECOM will perform a bathymetric survey of Mill Pond impoundment. The purpose of the survey is to identify the depths throughout the navigable portion of Mill Pond. The survey will be conducted with a small jonboat transported to the work site via a pickup truck. The survey boat will be equipped with a submeter-accuracy Trimble DSM 232 DGPS unit, and an Odom HydroTrac single-beam digital echosounder, calibrated to field conditions. Depth soundings and positions will be recorded with an on-board laptop along transects aligned generally perpendicular to the thalweg. The transects will be spaced at approximately 100 feet, and depth soundings will be recorded at approximate 10-foot spacing along transects. In areas with emergent or submerged weeds (which can interrupt sonar signal returns), the survey crew will collect spot soundings with a survey pole.

Following the bathymetric survey, a sediment thickness survey will be performed. This survey will be performed from the survey boat at random locations throughout the Mill Pond, by manually advancing a metal probe/pole until refusal. A data point, comprised of northing, easting, and elevation will be recorded at each location.

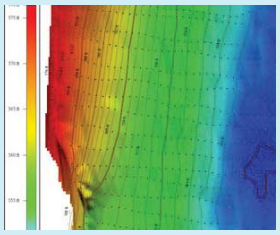
Survey field data (bathymetry, and probe refusal) will be post-processed after the fieldwork, imported to AutoCAD Civil3d for advanced terrain modeling, contour map visualizations, sediment thickness mapping and volume calculations.

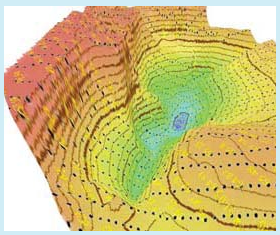
Once completed, the Mill Pond bathymetric survey will be depicted in plan view with contours and as several cross sections. Once the extent of sediment within the impoundment is determined, AECOM will calculate the total volume of material and create a figure that depicts sediment thickness within the impoundment. Based on this information we will collect sediment samples for a quality and grain size analysis. For a feasibility level study, we recommend taking two (2) quality samples from areas with the finest sediment. This will be the location where we would expect contaminants to be located and will provide us with a good understanding of whether the impoundment sediment will require special handling if removed (Additional sampling will be required if the material is eventually slated for removal). The grain size analysis will provide data to evaluate sediment transport, alternative beneficial uses, storage locations, and dewatering rates.

This evaluation of sediment characteristics and bathymetric data will be used to evaluate the sediment quantity and quality on dam disposition alternatives. We will assess sediment impacts upstream and downstream relative to sediment analysis results, mobility, and deposition. Our team will also recommend appropriate sediment management options.

HYDROGRAPHIC SURVEY

AECOM uses state-of-the-art techniques to perform bathymetric surveys for a wide range of public and private sector clients. We have performed thousands of acres of surveys on rivers, inland lakes, industrial ponds, and open-water Great Lakes projects. AECOM tailors the survey vessel and equipment configuration to individual project requirements and specifications.





STANDARD EQUIPMENT CONFIGURATION

- Trimble DSM 232 DGPS submeter positioning instrument, or
- Trimble R8 GNSS survey grade positioning system
- Odom HydroTrac single-beam fathometer with 200 kHz transducer
- Trimble HydroPro survey data collection and processing software package
- Water Level Tide recording instrumentation
- Water profiling equipment
- Sediment-collection and sampling tools

Our single-beam hydrographic surveys can be performed in accordance with USACE or NOS specifications.
Survey data can be delivered to the client in a variety of formats including:

- AutoCAD DWG or DXF files
- ESRI Shapefiles
- Portable-Document files
- GeoTIFF
- ASCII comma-delimited text files
- Proprietary Trimble-format raw data files

Task 4: Hydrologic and Hydraulic Analysis

AECOM will evaluate flood elevations and discharge capacity for the dam. Our approach will be to use peak flow estimates for the Mill Pond Dam from the MDEQ Flow Discharge. This database will be used within HEC-RAS to evaluate river stage and spillway capacity for various storm events. This analysis will be used to confirm the existing culvert is sized appropriately and recommend seasonal elevations for the Mill Pond Dam sluice gate in order to meet dam safety requirements.

Our project team will also conduct a hydraulic analysis using HEC-RAS software. Critical cross sections collected from the surveying task in Task 2 as well as cross sections demarcated from topographical maps produced by the USGS will be input into the HEC-RAS model. For purposes of this proposal, we have assumed a steady-state HEC-RAS model will be completed.

The hydraulic models will be run under three conditions: the existing condition, proposed modifications, and the post-removal condition. Running these models for all conditions will allow AECOM to evaluate the impact of any changes on the flood profile and determine the impact of dam modification or removal on adjacent properties.

Finally, we will obtain the location of wells within the general project area from MDEQ and evaluate the expected impact of dam removal on these wells. We have completed this type of evaluation on other dam removal projects and have found that dams generally raise the water table equivalent to the additional head at the dam (in this case approximately 14 feet) and that this impact does not generally extend far from the impoundment (of course this depends on the local geology). Our analysis will include estimating the impoundments impact on groundwater levels and comparing this within the depth of well screens within 1,000 feet of the impoundment. Wells with screens that are less than 30 feet deep will be flagged as potentially being impacted by removal of the dam.

The analyses conducted as a part of this task and the dam removal impacts will be summarized in the Feasibility Study.

TASK 5: Ecological and Environmental Assessment

AECOM will evaluate the ecological and environmental impact of the options considered as part of the feasibility study. This will include evaluation of wetland impacts, threatened and endangered species, water quality impacts and habitat.

AECOM will review the National Wetlands Inventory (NWI) maps produced by the U.S. Fish and Wildlife Service (USFWS) to provide an estimate of the wetland impacts if Mill Pond Dam were to be rehabilitated or removed. Our team will also search the USFWS database to determine if there are any threatened or endangered animal or plant species that would be impacted by changes or removal of the Mill Pond Dam. We will also assess the potential for invasive species to populate exposed lands in the impoundment area post-dam removal. Finally, our team will evaluate water quality and habitat under existing conditions and under each option. These evaluations will be included in the Feasibility Study.

This analysis is important primarily for the dam removal option. If dam removal is selected, the permitting process will require an analysis of wetland loss and/or formation. The presence of threatened or endangered species, such as Snuffbox Mussel and Northern long eared bat, can impact the timing of construction. Thus, these items should be evaluated as they may impact the cost of design and construction of the dam removal option.

TASK 6: Dam Maintenance and Improvement Assessment

AECOM will review the Preliminary Evaluation Report completed by SME in 2011 as well as the Water Resource Commissioner video completed in 2016 as a part of Task 1. Our team of experts will conduct a visual inspection of the dam and its appurtenances in order to identify new issues or further deterioration of previously identified issues. This inspection will inform our evaluation of the dams need for improvement and/or maintenance. A summary of our

inspection, as well as a summary of the potential ecological and recreational benefits of retaining the dam, will be included in the Feasibility Study.

Task 7: Dam Disposition Alternatives and Impact Analysis

AECOM proposes evaluating three main options for this project. We propose evaluating a spillway rehabilitation option (such as lining the existing CMP spillway culvert with a structural liner), a spillway replacement option (such as removing the existing CMP spillway culvert and replacing it with a concrete chute spillway), and a dam removal option. We propose evaluating three sub-options for the dam removal option. Each sub-option would remove the dam and replace it with a means to convey flows from the Shiawassee River. For example, these sub-options could include a piped culvert, a box culvert, or a clear-span bridge. The specific options to be evaluated in this alternatives analysis will be selected at the kickoff meeting with OCPRC and CTS. At this meeting, AECOM will present a high-level overview of several options. The options selected for analysis in this project will be made with input from OCPRC and CTS.

As part of the alternatives analysis, AECOM will develop conceptual level schematics for each option. These schematics will include a conceptual plan view of each option and will allow OCPRC and CTS to visualize each option. Additionally, AECOM will develop a conceptual level cost estimate for all options with an expected accuracy of approximately -20% to +30%. The cost estimates will include expected permitting, engineering, design, and construction or deconstruction costs.

AECOM will also develop a decision matrix in order to weigh the relative advantages and disadvantages of each option. A decision matrix allows for both monetary and non-monetary (i.e., permitting implications, recreation benefits, downstream impacts, wetland/fens impacts, etc.) factors to be considered when choosing between options. Advantages and disadvantages will be presented for each option. The decision matrix will initially be left blank in the draft Feasibility Study and will not be populated until AECOM meets with OCPRC and CTS to discuss the draft Feasibility Study. The completed decision matrix, along with any recommendations, will not be presented until the final Feasibility Study is submitted.

Task 8: Funding Grant Sources

AECOM will investigate all eligible grant funding sources for the continued operation and maintenance of Mill Pond Dam, as well as any eligible grant funding sources available for the removal of Mill Pond Dam. We will investigate federal, state, and local funding opportunities. A summary of the funding grant sources will be included in the Feasibility Study. The AECOM team has helped other projects secure millions of dollars in funding through MDEQ, USEPA, GLRI, USFWS and other funding sources.

Task 9: Other Issues of Importance

Our team will also address several other issues that are of importance to OCPRC and CTS. These issues include:

- Structural roadway impacts, including assessing the impacts of dam removal on the Davisburg Road, Broadway Road and railway embankment infrastructure. This assessment will also include assessing the impact to the current utilities that are located within these roads.
- Recreational impacts, including assessing the impact of dam removal on recreational uses of the Shiawassee River and Mill Pond.
- Pedestrian access options between the Village, Mill Pond Park, and Rotary Park.
- Evaluating current and potential water quality with respect to recreational use.
- Evaluating current and potential impacts to adjacent railroad easement.

Task 10: Outreach and Coordination Meetings

AECOM believes that communication is an essential element to a successful project. Accordingly, AECOM proposes to hold both a kickoff meeting and regularly scheduled progress meetings with the OCPRC and CTS to ensure that the lines of communication remain open throughout the duration of the project.

The goals of the kickoff meeting will be to:

- Determine known issues and concerns with the Mill Pond Dam.
- Tap into the extensive stakeholder knowledge base.
- Develop a list of project goals to guide the project moving forward.
- Develop a list of anticipated outcomes, including schedule and deliverables, for the project.

AECOM will also conduct three progress meetings with project partners to provide the partners with updates, ensure that the project is progressing appropriately, and address any questions. AECOM will lead the meetings and provide a standing agenda.

Furthermore, AECOM will attend three OCPRC meetings and two CTS Board meetings. Information for these meetings will be submitted in advance of the meetings. The purpose of these meetings is to update the OCPRC and CTS Board on the status and progression of the project.

Finally, AECOM will coordinate and facilitate two informational meetings or open houses. One meeting will serve to provide an initial project overview, including timeline, issues to be addressed, and an overview of existing data. The purpose of the second meeting will be to present the draft feasibility study. Comments from this public meeting will be addressed in the final feasibility study.

Deliverables

AECOM will prepare a draft comprehensive Feasibility Study incorporating all work completed as part of this project. The Feasibility Study will include the following sections:

- Executive summary
- Topographical survey and base map
- Bathymetric survey (including plan and cross section of impoundment area)
- Ecological and environmental assessments
- Hydrologic and hydraulic analyses
- Dam maintenance and improvement recommendations
- Dam disposition alternatives analysis (including evaluation and implications of spillway rehabilitation, spillway replacement, and dam deconstruction options)

AECOM will initially submit an initial draft of the Feasibility Study for review by OCPRC and CTS. Comments from the initial draft will be incorporated into a final draft Feasibility Study. The final draft Feasibility Study will be presented to the public. Comments on the final draft from the public, as well as additional comments from OCPRC and CTS, will be incorporated into a final Feasibility Study. The final Feasibility Study will be to the OCPRC and CTS Board. Six hard copies and one electronic Adobe Acrobat (.pdf) file will be delivered, along with two final presentation boards of the recommendations for public display.

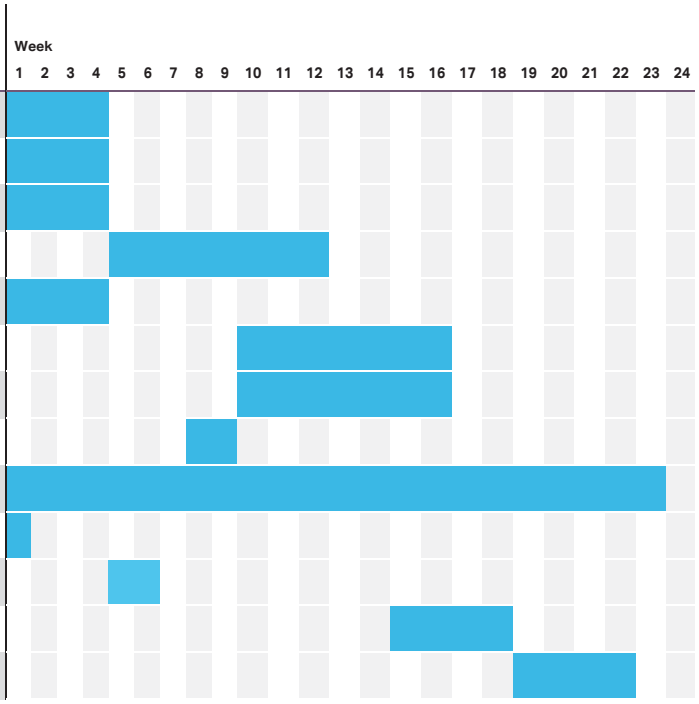
AECOM will also prepare meeting agendas and minutes for all meetings. We will also prepare graphics for presenting ideas, concepts, and recommendations at public, commission, and board meetings.

04 Schedule

The schedule proposed for the feasibility study is 6 months long. Our plan is to complete the required field work during the fall of 2018 and the analysis during the winter of 2018/19. This will allow the township and county to evaluate options and be prepared to seek funds for one of the options in the spring. This is an excellent time (late winter/early spring) to engage MDNR and MDEQ staff on potential funding sources for all of the options under consideration.

Mill Pond Dam Feasibility Study

ACTIVITY	PLAN START	PLAN DURATION
Exisisting data collection, review and analysis	1	4
Topographical survey and base mapping	1	4
River impoundment survey	1	4
Hydrology and hydraulics analysis	5	8
Ecological and environment assessment	1	4
Dam maintenance and improvement assessment	10	7
Dam deconstruction alternatives and impact analysis	10	7
Funding and grant sources	8	2
Outreach meetings	1	23
Report Outline	1	1
Draft Report (Data)	5	2
Draft Report (90%)	15	4
Draft Report (Final)	19	4



05 Prior Experience/References

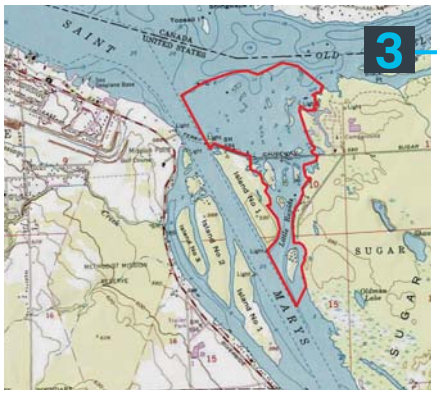
The best evidence of successfully executing engineering and construction administration services is our team's portfolio of completed projects where similar requirements were established and met. We encourage you to contact the references we have provided who can attest to the quality of our services. In addition, several project profiles are provided on the following pages which demonstrate our team's experience and expertise.

Otsego City & Township Dam Assessment; Contaminated Sediment Removal; Dam Removal and Stream Restoration

Mark Mills
Michigan DNR Wildlife Division
621 N. 10th Street
Plainwell, MI 49080
269-204-7046
millsm@michigan.gov

Boardman River Dam Phase 2

Frank Dituri
Director of Department of Public Services
City of Traverse City
625 Woodmere Ave.
Traverse City, MI. 49686
231-922-4900, ext 116



Ecological Restoration of the Little Rapids Area of the St. Mary's River

Alicia Krouth, PE
County Highway Engineer
Chippewa County Road Commission
3949 South Mackinac Trail
Sault Ste. Marie, MI 49783
906-635-5295

Otsego City & Township Dam Assessment; Contaminated Sediment Removal; Dam Removal and Stream Restoration

Otsego, MI

Client
Michigan Department of Natural Resources

Project Duration
2012-Ongoing

Key Personnel
Troy Naperala, PE
Dan DeVaun, PE, CFM
Dan Broekhuizen, PE
Chris Hendrix

Client Contact
Mr. Mark Mills,
DNR, Wildlife Division
621 N. 10th Street
Plainwell, MI 49080
269-204-7046

Overall Value
$400,000

AECOM is providing the Michigan Department of Natural Resources (through a contract with the Michigan Department of Technology, Management and Budget) with multi-faceted services for two dam removal and stream restoration projects on the Kalamazoo River.

AECOM is providing the Michigan Department of Natural Resources (through a contract with the Michigan Department of Technology, Management and Budget) with multi-faceted services for two dam removal and stream restoration projects on the Kalamazoo River. These projects draw on AECOMs full service capabilities in aquatic biology, structural engineering, geotechnical engineering, hydraulics, stream restoration, contaminated sediment management and construction administration.

Otsego City Dam and Otsego Township Dams are former hydroelectric facilities. Otsego City Dam has a normal head of 9.3 feet and an impoundment area of 73 acres and a 1.2 mile stretch of backwater. Otsego Township dam has a normal head of 9 feet, an impoundment area of 96 acres and a 1.5 mile stretch of backwater. In the mid to late 1950s paper mills along the Kalamazoo River discharged wastes with polychlorinated biphenyl contamination (PCBs). This resulted in PCB contaminated sediments being distributed from Comstock, Michigan to the river's mouth near Saugatuck, Michigan.

AECOM's role at this site included providing engineering analysis related to the dam structures; stream restoration; wetland restoration; water level control design (i.e. a new dam) to support removal of contaminated sediments assessment; and construction oversight of contractors building the water control structure.

- Field investigation and data analysis. Existing data was supplemented with additional field investigations which included geotechnical explorations and visual observations. This information was used to assess

Project: Otsego City & Township Dam Assessment; Contaminated Sediment Removal; Dam Removal and Stream Restoration (continued)

the stability and condition of the existing spillway and embankment. Ultimately this assessment resulted in the recommendation to stabilize the existing spillway and remove the earthen embankment and replace it with a new dam structure.

- Schematic level design of dam stabilization and repair alternatives. AECOM developed multiple repair and stabilization alternatives to meet the MDNR needs and budget. AECOM worked with the MDNR and MDTMB in a collaborative manner to address immediate (dam stability) and future (river restoration) needs in an innovative and cost effective manner.

- The hydraulic aspects of the water control structure was designed using HEC-RAS. The water control structure is designed to safely pass the dam safety required design storm without raising the upstream or downstream water levels above acceptable levels.

- A sheet pile water control structure was designed for each dam location. The sheet pile wall is designed to be temporary structure designed to manage water level, contain contaminated sediments, stabilize the aging dams, and facilitate sediment removal and dam removal.

- Stream and wetland restoration included developing natural stream characteristics (depth, width and floodplain area) for the restoration; developing dam removal and restoration sequencing for both dams; developing a planting plan for exposed bottomlands; and designing riparian wetland areas. Since the impoundments contain large volumes of contaminated sediments and removal of this material largely drives overall project costs three restoration options were evaluated that required different volumes of material to be removed.

- The volume of material requiring removal and approach to removal PCB contaminated sediment was provided for the full river restoration and water control structure design. This included cost estimates, design details and specifications.

- Construction oversight services were provided. AECOM worked closely with DTMB staff to select a contractor, maintain a safe work site, comply with permit conditions and maintain schedule and payment terms.

Each restoration option included specific streambank/ floodplain plantings; bank stabilization measures; and floodplain stabilization measures. The restoration options would provide for removal of contaminated sediments, fish passage and canoe/ kayak access, and improving fish and wildlife habitat with varying degrees of long term maintenance and capital costs.

Boardman River Dam Phase 2
Traverse City, MI

Client
Grand Traverse County

Project Duration
2012-Ongoing

Key Personnel
Troy Naperala, PE
Dan DeVaun, PE, CFM
Janeen McDermott, PE
Dan Broekhuizen, PE
Bill Weihbrecht

Client Contact
Dave Benda
County Administrator
Grand Traverse County
Governmental Center
400 Boardman Avenue
Traverse City, MI 49684
231.922.4635 Phone

Overall Value
$15 M

Comprehensive ecosystem restoration and design with a focus on safety and risk management.

Project Overview

Located in the northeast corner of Michigan's Lower Peninsula, the Boardman River is a valued community asset and nationally significant recreational resource noted for its "blue ribbon" trout fishing and "natural rivers" designation. Three dams currently impound water on the main stem of the Boardman River (i.e., Boardman Dam, Sabin Dam, Union Street Dam). The first two of these dams have long been operated by Traverse City Light and Power (TCLP) and licensed by the Federal Energy Regulatory Commission (FERC) for hydropower generation. Several factors (e.g., FERC requirements, dam safety issues, economics of hydropower production) prompted TCLP to surrender their FERC license. Under a Settlement Agreement between multiple parties, a community- based dams disposition study, spearheaded by a Boardman River Dams Committee (BRDC) was initiated to provide advice to the dam owners (i.e., Traverse City, Grand Traverse County) on the fate of this four dam system. The results of this process lead the dam owners to begin removal of the dams and subsequent restoration of the Boardman River. The removal of these dams will reconnect over 160 miles of free-flowing, col-water stream and restore hundreds of acres of wetland and upland habitat. This is one of the largest dam removal and habitat restoration projects in the Great Lakes Region. The AECOM Team provided support throughout this process; from inception through design and construction administration

Client Benefits

- Worked cooperatively with multiple partners
- Experienced staff helped navigate complex permit system with no delays
- Strong public engagement throughout the project

Work Performed

The AECOM Team was awarded this project to provide comprehensive engineering and scientific expertise to this project, which is billed as the largest dam removal and habitat restoration project in Michigan's history. AECOM provided:

- Meeting facilitation and support services during the public information and education component of the project. AECOM attended hundreds of meetings over a 2 year intensive public process that supported the dam owners decision to remove the dams.

Project: Boardman River Dam Phase 2 (continued)

- Preliminary engineering analysis and engineering studies to provide the data required to complete designs for removal of the dams and ecological restoration of the riparian corridor. This will include wetland assessment and delineations, geotechnical investigations and geomorphic assessment of the river and watershed to aid in design.
- Hydrology and hydraulic analysis to support detailed design, permitting and development of the
- Environmental Assessment. A detailed HEC-RAS model was developed to aid in channel design, dam breach analysis and to assess potential depositional areas.
- River restoration design, using natural design techniques, is being completed for the formerly impounded areas. The goal of the restoration design is to return the river to its pre-dam channel form and function.
- Dam breaching design will be developed from geotechnical and structural data related to the concrete and earthen components of the dams. Due to the configuration of Boardman Dam, this structure will be breached through its earthen embankment. A series of siphons and auxiliary channels will be used to provide for a controlled draw down. Sabin Dam will be breached through the existing auxiliary spillway. The concrete walls, foundation and energy dissipation material will be used to control flow during the breaching operation.
- A complete NEPA and permit application will be developed based on the designs. This included a detailed wetland assessment that analyzed the existing and future potential for wetlands in the project area. This analysis was used to protect and enhance wetlands that were expected to form once the dam was removed.
- Attendance to public meeting concerning the project and preparation of presentations to the public for public comment and Q/A sessions.

“

The Conservation Resource Alliance is very pleased with the work completed by AECOM. They have managed and delivered complex, interdisciplinary project documents on time and within budget. The completed construction plans meet our goals for the restoration of the Boardman River. In addition to delivering excellent construction plans, AECOM has demonstrated an ability to work with multiple project partners and regulatory agencies in a productive and collaborative manner. This combination of technical proficiency and “people skills” has resulted in an efficient and effective working relationship between AECOM and the larger project team. Thank you for your part in a job well done!

”

Amy Beyer
Conservation Resource Alliance
Boardman River Project

Ecological Restoration of the Little Rapids Area of the St. Mary's River

Chippewa County, MI

Client
Eastern Upper Peninsula Regional Planning & Development Commission

Key Personnel
Troy Naperala, PE

Client Contact
Jeff Hagan, Executive Director
EUPRPDC
125 Arlington St.
Sault Ste. Mario, MI 49783
906.635.1581

Contract Value
$1.1 M

Project Duration
2006 - Ongoing

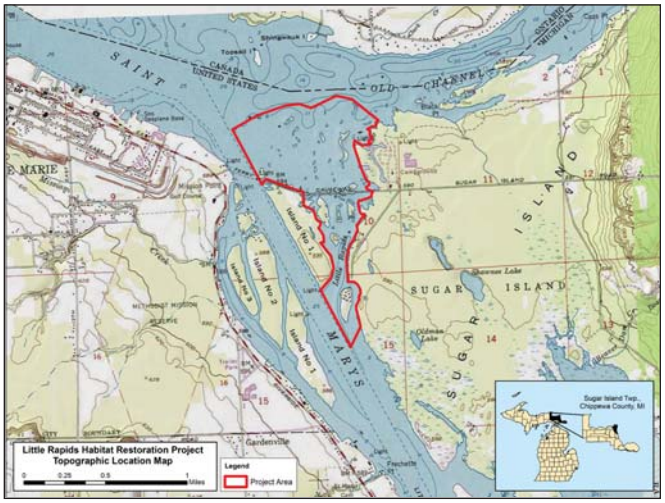
Restoring flow at the St. Mary's River will increase fish and aquatic organism foraging, spawning and nursery habitat.

Since the mid-1800s, the St. Mary's River has undergone extensive man-made alterations for the purposes of navigation, travel and hydroelectric power. These changes destroyed habitat at the East and West Neebish Rapids, the Little Rapids, and left only remnants of the Main Rapids. Today, the Main Rapids receives less than 10 percent of its historical flow and represents the only remaining rapids habitat of this globally unique river; however, the Little Rapids is a candidate for restoration.

The construction of the causeway, from the ferry dock on Island No. 1 to Sugar Island, destroyed the Little Rapids by diverting flow away from the shallows. Where waters once flowed freely, they now are restricted by two submerged six-foot culverts. These culverts are a safety hazard and result in poor habitat for fish and wildlife due to the restricted flow. With restored flow, however, the area has potential to once again provide foraging, spawning and nursery habitat for a wide variety of sport fish and other aquatic organisms.

Restoration of the Little Rapids will involve reconnecting the upper and lower sections of the river between Island No. 1 and Sugar Island. The project will replace the existing culverts with a bridge creating an opening approximately 600 feet wide that will improve water flow, increase velocities and ultimately create conditions that will benefit the aquatic community of the Great Lakes. Restoration of this area is directly related to the removal of several beneficial use impairments.

AECOM provided engineering analysis and design services and acted as the owner's representative during the design build process. AECOM developed a hydraulic computer model of the system, an Environmental Assessment, habitat assessment, preliminary design plans, and design-build



documents. Key components of this process were the 2D hydraulic model used for permitting process and habitat evaluation; geotechnical evaluation of the subsurface conditions at the causeway; permitting; and management of the design-build process.

AECOM used the 2D hydraulic model to evaluate the flow rate, water depth and water velocity in Little Rapids under various scenarios. The results of the model, in conjunction with data on channel substrate was used to evaluate the physical habitat available for fish species present in the St. Marys River system. This analysis resulted in a spatial assessment that reported habitat characteristics suitable for target species under various seasonal flow conditions.

During construction, AECOM Construction group is providing full-service project management and full-time, on-site inspection oversight while the Design-Build contractor is completing the work. The primary role of our staff is to verify that work conforms to documented project standards while operating within a safe job site. Key features of this ongoing process include; validation of all Design-Build engineering submittals, review and verification of design plans, continuous project communication; and documentation of work conforming to standards.

Mill Creek Dam Removal and Stream Restoration
Dexter, MI

Client
Village of Dexter

Project Duration
2004– 2006

Key Personnel
Troy Naperala, PE
Dan Broekhuizen, PE
Bill Weihbrecht

Client Contact
Donna Dettling, Manager
Village of Dexter
8140 Main Street
Dexter, MI 48130-1092
734.426.8303

Overall Value
$300,000

Dam removal and stream restoration integrated with bridge and road replacement work.

Project Overview

This dam is approximately 70 feet wide and approximately eight feet high and is located immediately upstream of the Main Street bridge, and forms a 20 plus acre impoundment. Originally constructed in 1824 as a rock filled timber crib, the dam was reportedly rebuilt in 1910 and 1932. The spillway is approximately two feet wide along the crest and has a concave shape where it is tied into a grouted apron under the Main Street bridge. The base of the dam at the bottom is approximately 8 feet thick. Metal sheet pile was driven along the entire upstream face of the dam and is capped with 8" x 8" x ½ " angle iron.

Mill Creek is located immediately adjacent to the Main Street Bridge. With the long term goal of restoring Mill Creek to free-flowing condition, the Village expressed a desire to have the dam removed concurrently with the bridge replacement. The bridge replacement design maintained the concrete apron under the bridge which was also a barrier to fish movement. The Village was also interested in restoring the stream bank, as well as the former impoundment area, to provide for enhanced recreational opportunities (e.g., nature trails, wildlife observation, fishing, canoeing/ kayaking).

Work Performed

AECOM (performed as URS) successfully completed the bridge replacement, dam removal and stream restoration components on time and on- budget. Services includes sequenced design and construction management to allow for concurrent completion of project components; phased dam breaching; permit development, submittal, negotiation and monitoring; sediment sampling/ analysis; sediment management plan development and implementation; aquatic invasive species plan development and implementation; rock structure design and construction oversight (including fish passage features); wetland and floodplain delineation services; parks and recreation planning assistance; intergovernmental coordination; grants acquisition and management; and stakeholder engagement.

Special challenges included project sequencing to meet bridge replacement needs; managing sediment with slightly elevated contaminant levels (Cadmium); designing rock structures to "step down" the former impoundment; negotiating a complex permit process with several dozen conditions; and accessing additional grant funds to facilitate project completions.

Marion Dam
Marion, MI

Client
USACE - Detroit District

Project Duration
November 2010 – 2013

Key Personnel
Troy Naperala, PE
Dan Broekhuizen, PE
Dan DeVaun, PE, CFM
Chris McDonald, PE
Michael J. Donahue, PhD

Client Contact
Mr. Paul A. Powell, PE
US Army Corps of Engineers – Detroit District
313-226-2094

Overall Value
$100,000

AECOM (formerly URS Corporation) developed a conceptual and feasibility level design for the ecological restoration of the Middle Branch River of the Muskegon River in Marion, Michigan.

Using a reference reach approach, we led the stream restoration design with dual aims of improving habitat and increasing recreation for the optimal cost. In addition to channel restoration, AECOM (formerly URS) also investigated the dam removal and staging design process for the potential removal of the Marion Pond Dam as part of this project.

The Marion Pond Dam was built back in 1930 to replace a dam built in 1878 that was used to help power a saw, planing, and lathe mill. The Marion Pond is no longer used for logging purposes, but now serves as a small recreational area. As part of the ecological restoration of the Middle Branch River, a number of different options for the dam are being considered including removing the dam in its entirety or rerouting the river around the dam (keeping the dam in place as a historical marker only). Applicable costs for ongoing structural maintenance and removal are being developed for each option, as appropriate.

Reedsburg Dam
Merritt, MI

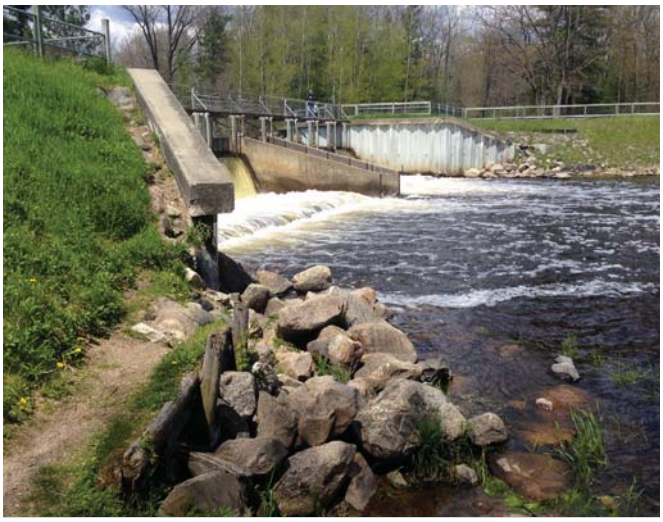
Client
Michigan Department of Natural Resources

Key Personnel
Troy Naperala, PE
Vik Gautam

Client Contact
Keith Fisher (MDNR)
8717 N. Roscommon RD
Roscommon, MI 48653
989-275-5151 x2031

Value
Planning $86,000

Project Duration
2016-2017 (Planning & Design)
2018-2019 (Construction)



AECOM provided planning and design engineering services to the Michigan Department of Natural Resources through a state contract with the Department of Technology, Management, and Budget.

The purpose of the contract is to provide a detailed analysis of the existing dam (earthen embankment, spillway, auxiliary spillway, pedestrian bridge, fencing, and stairway) and recommend interim risk reduction measures for the dam and develop a phased capital improvement plan for the dam that would allow the state to bring the structure into compliance with dam safety regulations and existing best practices for dam design.

Scope of Work
The proposed services provided to the State under this contract included: 1) Study Phase that included review of existing plans and data; photogrammetric/ historical analysis; and topographical, geotechnical, structural and hydrological data collection. 2) Program Analysis Phase that uses the available data to evaluate and understand the physical condition and risk of failure of the dams principal spillway and earthen embankment. 3) Schematic Design Phase that develops conceptual level designs for the repair/ modification of the Reedsburg dam to identify any geotechnical, structural or hydrological deficiencies that pose an unacceptable risk to the health and welfare of the public.

The information generated on needed repairs was presented to the State as a prioritized list of interim risk reduction measures. The State used this list to select capital improvement projects for the Reedsburg Dam.

Technical Highlights and Challenges
AECOM encountered several challenges with this project that were overcome with innovative approaches such as:

- Limited documentation on existing dam was overcome through a thorough assessment of existing plans, reports and photographs.
- Inspection of concrete spillway and stoplogs in flowing water using devices designed to see below the shallow flowing water.
- Schedule was accelerated to accommodate the States desire to move to construction sooner than planned.

Performance
AECOM was able to meet a very aggressive schedule for the evaluation and preliminary design phases of this project.

St. Mary's Falls, Center Dike and Cable Relocation Master Plan
Sault Ste. Marie, MI

Client
USACE Soo Area Office and Detroit District

Project Duration
2015-Ongoing

Key Personnel
Troy Naperala, PE
Dan Broekhuizen, PE
Aaron Humphrey, PE
James Hooker, PE
Brent Finner,
Paul Kovnat
Meredith Cote
Chris Warren

Client Contact
Mr. Jon Imbrunone
(313) 226-2156

Mr. Blake Gerken
(313) 226-3189

AECOM worked with the USACE Soo Area Office and Detroit District to develop multiple alternatives (documented in an Alternatives Development Report) and provide preliminary engineering plans, construction schedule and cost estimates for the preferred alternative. The project was complex due to the constraints of the project site, multiple disciplines involved and short schedule.

The Soo Locks Complex is situated on the southern shore of the St. Marys River near Sault Ste. Marie, Michigan. The project area includes two active and two inactive locks on the St. Marys River, the connecting channel between Lake Superior and Lake Huron. These locks allow ships to transit the 21-foot elevation difference between the two lakes. The locks are operated and maintained by the Detroit District, U.S. Army Corps of Engineers (USACE). In addition to the locks, the complex has two hydroelectric plants: Unit 10 located at the west end of the Center Dike, and the New Power Plant (NPP) located at the east end of the Center Dike, and compensating works.

The purpose of the project is to improve access and security at the Center Dike and the NPP components of the Soo Locks Complex, while improving working conditions and providing a more secure power source. To achieve the intent of the project, four alternatives were developed as described below. Improvements on the following aspects of the complex are investigated as part of each alternative:

- Electrical and communication cable updates to improve service and reliability:
  - Magazine Street Feeder updates to meet current and proposed needs
  - Manhole Access Control to improve security
  - Lighting along roads and bridges
- Sanitary and potable water connection to the NPP to improve health and safety conditions
- Temporary and permanent vehicle and heavy equipment access from Portage Avenue to Unit 10, the NPP, and across the Unit 10 Tailrace
- Improvement of Center Dike structures and embankments
- Footbridge demolition

Each alternative is listed and briefly described below:

Alternative 1A: Bridge Over Unit 10 Tailrace with Two Lane Ramp to the NPP
This alternative provides access to the Center Dike using temporary bridges over the active locks (Poe and Macarthur) and permanent bridges over the inactive locks (Davis and Sabin) and the Unit 10 Tailrace. Access to the east end of the crib dam and to the NPP loading dock doors is provided via a two-lane retaining wall supported ramp structure from the Center Dike. Roads are provided between bridges and to the Unit 10 Power House and the NPP. Electrical and communication cables are removed from the footbridge and routed along the new bridges to the existing deep service tunnel. The footbridge is removed.

Alternative 1B: Bridge Over Unit 10 Tailrace and Bridge to the NPP Loading Dock
This alternative provides access to the Center Dike using temporary bridges over the active locks (Poe and Macarthur) and permanent bridges over the inactive locks (Davis and Sabin) and the Unit 10 Tailrace. Access to the NPP loading dock door is provided via a new bridge structure and loading dock platform over the Unit 10 Tailrace. Vehicle access is provided along the crest of the Center Dike Embankment and across the Crib Dam. This allows vehicles to access Unit 10 Powerhouse and NPP via roads connecting from Government Park. This alternative requires structural modifications to the western portion of the crib dam so that the design vehicle(s) may travel directly on the crib dam. Electrical and communication cables are removed from the footbridge and routed along the new

Project: St. Mary's Falls, Center Dike and Cable Relocation Master Plan (continued)

bridges to the existing deep service tunnel. The footbridge is removed.

Alternative 2: New Deep Service Tunnel (DST)
The existing DST (with an extension) could be used to route electrical, communication, water and sewer to the NPP directly from existing municipal water connections and allow them to be contained in a controlled environment to reduce exposure to security risks and freeze/thaw conditions. Maintenance would also be simplified if water and sewer pipes are within the DST. Sanitary lines would be connected to the existing septic tank and drainage field at the Davis Building.

Alternative 2 provides access to the Center Dike using temporary bridges over the active locks (Poe and Macarthur) and permanent bridges over the other locks (Davis and Sabin) and the Unit 10 Tailrace. To access the Center Dike, a bridge is needed over the head race of the Unit 10 Power Plant. In addition, a roadway would be constructed along the northern edge of the Center Dike and from the north and south to the Unit 10 Power Plant. This roadway would also extend to the east with vehicle traffic being routed across the top of the crib dam which would require structural upgrades of the western portion of the existing crib dam. This option does not include access to the NPP loading dock door. The footbridge is removed.

Alternative 3: Route Cables, Water and Sewer on Vehicle Bridges
Vehicle access for this alternative includes use of the railway bridge to traverse the MacArthur and Poe Locks. To access the western portion of the Northwest Pier, a permanent bridge is required to span the lateral flow connection between the North Canal and the Unit 10 Intake. Once on the Northwest Pier, vehicles would travel east to permanent bridges that cross the Davis and Sabin Locks. To access the Center Dike, a bridge is needed over the head race of the Unit 10 Power Plant. In addition, a roadway would be constructed along the northern edge of the Center Dike and from the north and south to the Unit 10 Power Plant. This roadway would also extend to the east with vehicle traffic being routed across the top of the crib dam which would require structural upgrades of the western portion of the existing crib dam. This option does not include access to the NPP loading dock door. The footbridge is removed.

Each of the proposed alternatives provides differing benefits to the USACE Soo Area Office (SAO) at various levels of capital and maintenance cost expenditures. The largest costs are related to tunnels, bridges/structures and electrical/communication cable relocation. Water and sewer capital costs are relatively small compared to other features of the alternatives. However, the possibility of cold weather maintenance issues (e.g., freezing pipes) could provide larger operation and maintenance costs in electrical (i.e., heating) and repair costs.

This Master Plan Report (MPR) provides design information for the selected alternative for the completion of proposed upgrades and improved access to the Center Dike at the St. Marys Falls Canal (i.e., Soo Locks Complex) in Sault Ste. Marie, Michigan. The alternative described in this report, referred to as the preferred alternative, has been developed in sufficient detail for estimating costs, quantities, alignments and construction phasing. The Center Dike improvements considered during the development of this report are as follows:

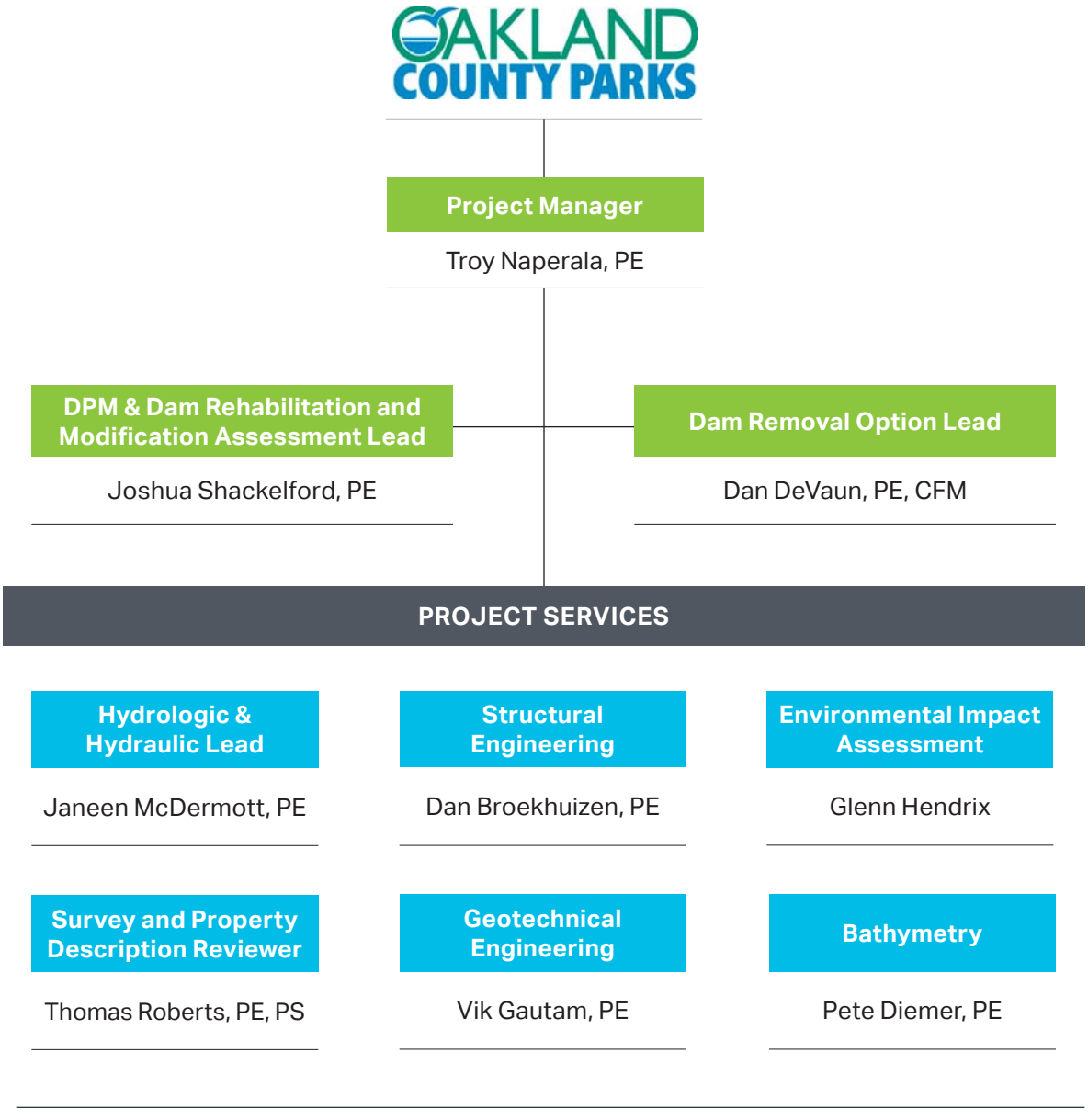
- Relocation of all utilities beneath the steel footbridge crossing the Unit 10 Tailrace Canal.
- New duct bank from Unit 10 Manhole #5 to Deep Shaft #5.
- Four new 15kV feeders from New Power Plant (NPP) to Magazine Street Substation ; one new 15kV feeder from NPP to Unit 10 Manhole #5; two new 15kV feeders from Davis Building Assembly A and B canal feeders to NPP; and one new 15kV feeder from Davis Building generator to NPP. New control cables and 125V DC cables from Unit 10 Manhole #5 to NPP.
- Connection of the NPP to a wastewater treatment system and potable water service.
- Temporary vehicle and heavy equipment access bridging during the winter maintenance period from Portage Avenue to the Unit 10 Power Plant.
- Permanent vehicle and heavy equipment access bridging across the Unit 10 Headrace and Tailrace near the Unit 10 Power Plant.
- Vehicle and heavy equipment access road from Unit 10 to the NPP.
- Improvement of Center Dike structures and embankments.
- Improvements to the Crib Dam that would allow vehicle and heavy equipment access to NPP.
- Footbridge demolition.
- Decommissioning option for Davis and Sabin electrical distribution assemblies C, D, and E.
- New stairway option installed north of Deep Shaft #5.

These improvements will enhance access and address security issues at the Soo Locks Complex. This will entail improvements to facilitate commercial vehicle access to the NPP while the locks are closed for maintenance; improve maintenance of the Center Dike (i.e., removal of brush and grading); expand the availability of potable water; remove the existing aging footbridge; and conform to modern standards of wastewater treatment and disposal at the NPP.

06 Capability and Qualifications

Our Team

We have developed an organizational chart for this project that brings together a technical team that has experience managing and completing similar feasibility studies and the actual design for dam rehabilitations, modifications and removals. **Troy Naperala, Dan DeVaun, Vik Gautam,** and **Dan Broekhuizen** have worked on all of the projects listed in this proposal while the others have worked on many of them or other similar projects. Thus, you are getting a team that knows what is needed to complete the dam feasibility study, are experienced working with dam owners, and have organized and presented at public meetings for these types of projects. Resumes of all key staff are included in this section and short bios of Troy Naperala, Josh Shackelford and Dan DeVaun are provided on the following page.



Troy Naperala, PE - Project Manager

Mr. Naperala has over nineteen years of experience working on and managing water resources engineering projects. He has participated in and managed numerous projects dealing with dams, dam removal, ecosystem restoration, wetlands, stormwater management, watershed management, and permitting/ NEPA issues for a variety of clients. Troy has had a leadership role in nearly all of the dam related projects completed by AECOM in Michigan during the last 5 years. Troy excels at bridging the gap between technical disciplines, facilitating discussion to find common ground within a wide range of expertise and perspectives, and transforming project concepts into buildable, permittable alternatives and, subsequently, construction documents.

As Project Manager, Troy will coordinate all technical and environmental tasks and will be the day-to-day point of contact for the project. Troy will be bringing key task and technical leads together for overall internal progress and collaboration meeting, to ensure the team is sharing data and information as efficiently as possible. Budget and schedule tracking will be updated continually throughout the Project and Troy will be available to discuss project progress at your convenience.

Dan DeVaun, PE – Dam Removal Lead

Mr. DeVaun has over fifteen years of professional experience. His primary technical areas of expertise is hydrology and hydraulics; sediment transport analysis; stream restoration; civil site design; and environmental permitting. For the past 10 years Dan has been involved in dam removal and stream restoration projects in Michigan. He is currently the project manager for the Boardman River Ecosystem Restoration project which includes the removal of Boardman and Sabin Dams and provided engineering and design work on several other related projects (Marion, Otsego Township, Otsego City, Henry ford, Dexter Dam, and Little Rapids Restoration). Dan has experience in all technical aspects required for the Mill Pond Dam project and he will have an active role evaluating the dam removal option.

Joshua Shackelford, PE – Dam Rehabilitation and Modification Assessment Lead

Mr. Shackelford has over sixteen years of progressive experience working on dams, spillways, and their associated appurtenances, including dam rehabilitation projects involving spillway design and repair, seepage and slope stability issues, overtopping protection, dam inspections, and dam construction. As a senior project manager within the Midwest Dams Practice Group of AECOM, Josh has served as the project manager and/or lead technical engineer on several new dam or dam rehabilitation projects, including projects with construction costs over $10 million and dam heights over 130 feet. Projects completed within the last three years include the design of a roller compacted concrete overlay to provide overtopping protection for a 30-foot high earth embankment dam, design and construction of a new 10-foot wide trapezoidal crest overflow spillway for a 24-foot high earth embankment dam, analysis of the alternatives available to replace a spillway and make general operation repairs for a 25-foot high earth embankment dam, and the design and construction of a new weighted filter overlay on a 130-foot high earth embankment dam. For the Mill Pond Dam Feasibility Study, Josh will serve as the deputy project manager and will lead the evaluation of the dam rehabilitation and modification tasks.

Troy R. Naperala, PE
Project Manager

Education
MS, Civil Engineering, University of Virginia, 2000

BS, Environmental Engineering, Michigan Technological University, 1997

Years of Experience
19

Professional Registrations/ Certifications
Professional Engineer, MI

Certified Industrial Stormwater Operator, Michigan

Professional Affiliations
State of Michigan Board of Professional Engineers (2012 – present)

The Watershed Center Board of Directors (2008-2012)

TC-TALUS Board of Directors

Troy has over nineteen years of experience working on and managing water resources engineering projects. He has participated in and managed numerous projects dealing with river restoration, dams, dam removal, environmental permitting, stormwater management, and watershed management for a variety of clients. Troy has been engaged in 20+ dam removal projects. These tasks have been completed for a variety of different project types, such as, ecological restoration, TMDLs, NPDES permits, watershed assessments, storm water management studies and regional planning studies. He has completed projects such as these for municipalities, state agencies, federal agencies, industries, regional planning organizations and regulatory agencies in urban, rural, and agricultural areas.

Relevant Project Experience

Boardman River Ecosystem Restoration and FishPass Projects, Traverse City, MI. Lead project engineer, technical facilitator, project manager, and project principal for this set of inter-related projects. Troy acted as a technical advisor during the early phases of the public engagement process. As part of this role he served on teams tasked with understanding community sentiment on various aspects of the project. This included providing technical guidance related to funding, planning, engineering, design, and construction.
As project manager of the USACE funded preliminary engineering and environmental studies project, Troy managed the development of the Environmental Assessment and preliminary engineering designs and supporting documents. This role included coordinating closely with the local sponsor (City of Traverse City and Grand Traverse County) as well as important funders and stakeholders (such as the Grand Traverse Band of Ottawa and Chippewa Indians). Throughout the project, Troy served as the main point of contact for all technical and regulatory activities that the project involved. This provided for interaction and collaboration with regulatory and resource agencies (MDNR, MDEQ, USFWS, GLFC, USACE, SHPO, USEPA) with an interest in the Boardman River. Technically the project included channel design, dam breaching, sediment management (including detailed sediment transport modeling), and environmental permitting.

During final design of the project Troy served as the Principal-in-charge. This included overseeing the inter-disciplinary team and overall approach to the design of the project. The project included structural and geotechnical analysis of the dam breaching and dewatering operations; hydrologic and hydraulic modeling to assess flood risk; sediment transport modeling; development of the Joint Permit Application; identification of the relic river channel for restoration; developed engineering plans and specifications for construction of dam removal, channel restoration and Cass Road Bridge; and provided engineering during construction.

Kalamazoo River Restoration, Michigan Department of Natural Resources. Project manager and client contact for the planning and design projects conducted at Otsego City, Otsego Township and Trowbridge Dam. The project includes geomorphic data assessment, natural channel design, development of engineering plans for removal of three dams, design of a water control structure, HEC-RAS and CONCEPTS computer modeling, design plans for channel restoration and a planting plan.

The project included developing restoration alternatives for each dam which the MDNR used to guide the design plans being negotiated between the responsible parties and USEPA. The guidance and advice that AECOM played help the MDNR identify key restoration goals and components for the project. In addition, AECOM lead the design of water control options for the removal of each dam. For the Otsego Township Dam, AECOM designed a temporary means of water control (which was constructed by AnLaan). This is a

Troy R. Naperala, PE (continued)

complex dam removal/ ecosystem restoration project that included contaminated sediment; multiple stakeholders; and multiple land ownership issues. Troy has assisted the MDNR in navigating these issues over the last decade.

Saint Mary's Little Rapids Restoration, Eastern Upper Peninsula Planning. Project manager for an ecosystem restoration project designed to increase the habitat area for native fish species by restoring a historical rapid. This project included complex 2-D hydraulic modeling; development of an Environmental Assessment; quantification of aquatic habitat types; bridge and culvert design for 300' span with an emphasis on fish passage; and engineering and design plans for a design – build process. AECOM is serving as the owners representative during the construction phase. Throughout this process AECOM has provided guidance related to the funding, planning, engineering, design and construction of the project. During the course of the project we worked with the regional planning organization, NOAA, and the Road Commission. Key stakeholders included the USACE, USFWS, MDEQ, MDNR, and the GLFC.

River Raisin Dam Removals, Monroe County, MI. Troy assessed the hydraulic impacts of six dam removal or dam modification projects on the River Raisin near Monroe Michigan. Flood stage increases and safety of hydraulic "rollers" was investigated. The dam modification project was in an urbanized area and included utility considerations in addition to habitat restoration benefits.

Meadowbrook Lake Dam Engineering and Feasibility Study, City of Novi, MI. Troy provided project management and hydrologic and hydraulic engineering services related to structural modifications to a City of Novi dam. AECOM completed a structural and geotechnical analysis of the concrete and earthen portions of the dam. Troy coordinated all tasks and lead the evaluation of the dams hydrology and hydraulics, design, permitting and construction.

Mill Creek Dam Removal, Dexter, Michigan, Village of Dexter, MI. Troy provided sediment transport analysis, flow assessment and QA/QC of final construction plans for the Mill Creek Dam Removal. The Mill Creek dam removal in Dexter Michigan, was a complex project that included coordination with MDOT, as the bridge was integrated into the bridge structure. The project team developed bridge and dam removal plans that utilized a rock ramp structure that reduced the impoundment size while providing fish passage.

Marion Dam Removal and Stream Restoration Design, USACE. Troy was the project manager for the conceptual and feasibility level design for the ecological restoration of the Middle Branch River. Using a reference reach approach Troy managed the stream restoration design, dam breaching and sediment management design with the goal of improving habitat and recreation.

Henry Ford Estate Dam Removal and Stream Restoration Design, USACE, Dearborn, MI. Troy was the project manager for the conceptual and feasibility level design for the ecological restoration of the Rouge River at the Henry ford Estate in Dearborn Michigan. Using a reference reach and computer modeling based approach Troy managed the assessment of a fish passage system that would maintain the historic nature of the site while achieving natural resource goals.

River Falls Dam Removal Feasibility Study, River Falls, WI. Troy is providing a feasibility assessment for removing the Junction Falls and Powell Falls Dams that are currently used to generate hydroelectric power. Troy is assessing dam removal on existing infrastructure (bridges, water main, sanitary main, stormwater outlets, overhead/ underground electric) and providing input on feasible approaches and costs for removal. This work is being conducted with Interfluve for the Friends of the Kinnickinnic River.

Estabrook Dam Fish Passage Project, Milwaukee, WI. Troy provided quality assurance and quality control reviews and periodic technical checks on the Estabrook Dam fish passage project. Troy served as a senior resource to the project team.

Dan DeVaun, PE, CFM
Dam Removal Option Lead

Education
BS, Civil Engineering, Michigan Technological University, 2003

Years of Experience
15

Professional Registrations/ Certifications
Professional Engineer, MI, #6201054585
Certified Floodplain Manager

Professional Affiliations
American Society of Civil Engineers
Michigan Water Environment Association
Association of State Floodplain Managers
Michigan Storm Water Floodplain Association

Dan has 15 years of professional experience developing and analyzing hydrologic and hydraulic computer modeling results and data for storm water assessment projects. He is currently the AECOM Michigan Water Resource Lead and project manager on several dam removal and river restoration projects. He has hands-on experience with the latest HEC, FHWA and EPA modeling software. Dan is also experienced in commercial site design, land development, road design, sanitary sewer and water supply systems design, permitting, and construction inspection. His responsibilities have ranged from engineering design and analysis, plan and specification preparation, preparation of NEPA documents, permitting and project management.

Relevant Project Experience

FishPass – Union Street Dam Modification, Traverse City Michigan. AECOM is working with the Great Lakes Fishery Commission, in partnership with US Army Corp of Engineers and the City of Traverse City, to develop an experimental fish passage facility at the site of the Union Street Dam in downtown Traverse City. Design of this facility includes a new dam with an arced labyrinth wier for improved hydraulics, a naturalized bypass channel, a 400 feet long experimental fish passage channel with fish sorting chambers and headworks, gantry crane, pedestrian bridge, research building, and park improvements. Professional services include development of construction contract documents, cost estimating, public engagement and environmental permitting. Dan's role consisted of project manager and design lead.

Boardman River Phase II Final Design, Traverse City, Michigan. AECOM was awarded the contract to provide comprehensive engineering and scientific expertise in the development of dam removal and river restoration design for Boardman and Sabin Dams. The project consists of dam breaching design, river restoration design, sediment management, bridge and roadway design, wetland assessment and mitigation design, geotechnical analysis, hydrologic and hydraulic analyses, and environmental permitting. Dan's role is project manager and technical lead for hydrologic and hydraulic studies and dam breaching design.

Otsego City and Township Dam Removal Allegan County, Michigan. Dan was the project engineer for dam removal and stream restoration at two large dams on the Kalamazoo River (Otsego City and Township Dam). The project included structural evaluation; engineering and design for dam removal; engineering and analysis for natural channel based designs; floodplain restoration plans; permitting and engineering for a water control structure. Dan's responsibilities include analyzing hydrologic, hydraulic and geomorphic components of the natural channel design and development of dam removal and river restoration plans and specifications.

Alcott Dam Removal, Kalamazoo County. The Alcott Dam removal project consists of removing the dam and restoring Portage Creek through a former paper mill site. Sediments on site have low levels of contaminants present. The goal of the project is to remove the dam and provide fish passage for all species and year classes present. Dan provided technical guidance on the development of hydraulic models, natural channel design, dam removal, sediment management, and construction sequencing.

Little Rapids Habitat Restoration, Chippewa County, Michigan. Dan was the lead hydraulic modeler and supporting author of NEPA documents for a restoration project on the St. Marys River that includes hydraulic modeling, NEPA assessment; geotechnical investigation, hydrographic survey; bridge design; and public involvement. Dan provided modeling and geomorphic assessment of Little Rapids area and provided support to preparation of NEPA documents.

Dan DeVaun, PE, CFM (continued)

North Branch Ecorse Creek Flood Risk Management and Engineering Design Analysis, Wayne County, Michigan. Civil Engineer for a joint effort between Wayne County and the USACE Detroit District. Hydrology and hydraulics tasks included an analysis of past modeling efforts, analysis of gage data to assess flood event frequency and the development of hydrologic and hydraulic models using HEC-RAS and HEC-HMS to support the evaluation of flood mitigation alternatives. Dan was responsible for developing hydrology and hydraulics models for a study of on-going flooding in the North Branch Ecorse Creek Watershed.

Mill Creek Dam Removal, Dexter, Michigan. The Dam was built on Mill Creek, a tributary of the Huron River, in 1920. The purpose of the dam no longer exists and maintenance has been an on-going challenge. As a result, the Washtenaw County Road Commission and the Village of Dexter have decided to remove the dam as part of a bridge reconstruction project. Dan's responsibilities inlude QA/QC review for data analysis and plan review and conducting hydraulic and sediment transport analyses related to stream restoration.

City of Novi, Meadowbrook Lake Dam Modifications, Novi, Michigan. The dam required modifications to meet current MDEQ dam safety requirements. Primary project goals included detaining smaller storm events in order to reduce peak flows and velocities in the Middle Rouge River downstream of the dam; and providing adequate capacity to pass the 100-yr flood as required by Michigan's dam safety regulations (Michigan Natural Resources and Environmental Protection Act, Act 451 of 1994). As part of the analysis a detailed model of upstream and downstream hydraulics, including bridges and culverts, was developed using HEC-RAS and HY8 computer models. Duties: Responsible for development of hydraulic model to assess spillway capacity for proposed dam modifications. Developed design drawings for construction.

Joshua Shackelford, PE
DPM & Dam Rehabilitation and Modification Assessment Lead

Education
BS, Civil Engineering, University of Wyoming, 2002

Years of Experience
16

Professional Registrations/ Certifications
Professional Engineer, Alaska, #12672
Professional Engineer, Colorado, #48516
Professional Engineer, Georgia, #43031
Professional Engineer, Indiana, #11800092
Professional Engineer, Ohio, #83088
Professional Engineer, Wyoming, #11078

Professional Affiliations
American Society of Civil Engineers
Association of State Dam Safety Officials
North American Society for Trenchless Technology

Josh is a project manager and senior engineer with 16 years of project management, design, and construction management experience with projects of varying size, complexity, and scope. He has extensive experience managing, planning, designing, and constructing large and complex multi-disciplinary projects. His specific areas of expertise include: design and rehabilitation of dams and their appurtenant structures, hydrologic/ hydraulic modeling, water transmission and sewer collection utilities (including municipal and industrial applications), large-diameter pipelines, trenchless technologies (including tunneling, jacking and boring, slip lining, horizontal directional drilling, cured in place pipe, and pipe bursting), pipeline abandonment, pipeline condition assessment, and pump stations. Josh is adept at coordinating and managing multi-disciplinary professional staff during the execution of a project. He efficiently meets project milestones while maintaining strict quality standards and managing budget constraints.

Relevant Project Experience

Project Manager and Lead Technical Engineer, Shaker Lakes Dam Rehabilitation Project (2017-2018), Northeast Ohio Regional Sewer District, Cleveland, Ohio. Led an engineering design team to complete plans and specifications for the design of a new roller compacted concrete overlay for a 30-foot high earth embankment dam (Upper Shaker Lake Dam) and a new 72-foot wide trapezoidal crest overflow spillway for a 19-foot high earth embankment dam (Green Lake Dam). These rehabilitations are being completed so that each dam can pass the inflow design flood as required by State of Ohio regulations.

Lead Technical Engineer, Siphon Bypass System (2017), Confidential Power Client, Central North Carolina. Led an engineering design team to complete plans and specifications for the design of a siphon system required to provide the regulatory required minimum discharge for a 100-foot high earth embankment dam. This project also included the abandonment of the existing 10-inch diameter minimum discharge conduit that had corroded and was no longer serviceable.

Project Manager and Lead Technical Engineer, Spillway Replacement Project (2016-2018), Confidential Power Client, Western Indiana. Led an engineering design team to complete plans and specifications for a new 10-foot wide trapezoidal crest overflow spillway for a 24-foot high earth embankment dam. Created a HEC-HMS hydrologic model to determine the inflow design flood into the reservoir. Created a HEC-RAS hydraulic model to simulate and design the new spillway. The new cast-in-place concrete spillway incorporates a stepped spillway chute (each step is 6 feet long and 2 feet high) and a 20-foot long energy dissipation stilling basin. This project also includes the installation of approximately 260,000 square feet of a composite liner system, consisting of a 60-mil high density polyethylene (HDPE) textured geomembrane, geosynthetic clay liner, and a protective non-woven geotextile. Managed quality assurance tasks during construction of this project.

Task Technical Lead, Ash Recycle Evaluation and Pond Closure Design (2017), Confidential Power Client, Southern Indiana. Led a technical design team to evaluate multiple options to remove coal combustion residual (CCR) materials from a 160-acre ash pond for offsite beneficial reuse of the materials as feedstock to cement production. This exhaustive study included evaluating material excavation and dewatering methodologies, material processing mechanisms, staging and storage options, and conveyance and trucking alternatives. An alternatives

Joshua Shackelford, PE (continued)

analysis report was developed that included assigning weighting and scoring criteria for each alternative based on life-cycle cost, construction and implementation duration, environmental and regulatory considerations, public perception and acceptance, and risk considerations.

Project Manager and Lead Technical Engineer, Shreve Lake Spillway Alternatives Analysis (2017), Ohio Department of Natural Resources, Wayne County, Ohio. Led an engineering design team to evaluate the alternatives available to replace the spillway and make general operational repairs for a 25-foot high earth embankment dam. The options included three alternatives to replace the spillway and one alternative to decommission the dam.

Project Manager, Spillway Redesign and Discharge Piping Project (2015-2016), Confidential Power Client, Southern Indiana. Led an engineering design team to complete plans and specifications for the design of a new concrete prototype spillway (incorporating two 8-foot wide inlet boxes with stop logs to act as weirs for flow control) for a 29-foot high earth embankment dam. This project also included the installation of 1,700 linear feet of 48-inch diameter PVC discharge piping. Managed quality assurance tasks during construction of this project. This project was constructed at a cost of $3.2 million.

Assistant Project Manager, Weighted Filter Overlay Project (2014-2016), Confidential Power Client, Central North Carolina. Facilitated efforts of an engineering design team to complete design plans and specifications for a new weighted filter overlay on a 130-foot high earth embankment dam. Managed onsite engineering construction team for design-build project. Managed quality assurance tasks during construction of this project. This project was constructed at a cost of $7.9 million.

Hydraulic/Hydrologic Design Lead, Phase 2 Reconstituted Design Project (2014-2015), Confidential Power Client, Western Indiana. Led an engineering design team to complete hydraulic and hydrologic analyses used to assess the design condition of four coal ash impoundments. Created a HEC-HMS hydrologic model to verify that each ash impoundment has the capacity to manage the inflow design flood. The dams ranged in height from 24 feet to 55 feet and the reservoirs ranged in storage from 36 to 1,400 acre-feet.

Lead Design Engineer, Phase 1 Facility Issues (2014), Confidential Power Client, Western Indiana. Led an engineering design team to complete design plans to remedy facility issues, including seepage and erosion issues, at four coal ash impoundments. The dams ranged in height from 24 feet to 55 feet and the reservoirs ranged in storage from 36 to 1,400 acre-feet.

Construction Project Manager, Inclined Intake Project (2013), Confidential Mining Client, Central Colorado. Coordinated efforts of engineering staff and managed quality assurance tasks during construction of a 75-foot high concrete inclined intake structure.

Project Manager, Middle Piney Reservoir Feasibility Project (2009-2010), Wyoming Water Development Commission, Sublette County, Wyoming. Led an engineering design team to evaluate the alternatives available to replace the spillway and outlet works for an existing 24-foot high rock fill dam in poor condition. Evaluated feasibility of different alternatives available to replace spillway and outlet works.

Project Manager, Dempsey Basin Reservoir Feasibility Project (2009-2010), Wyoming Water Development Commission, Lincoln County, Wyoming. Coordinated the efforts of engineering sub-consultants to evaluate the feasibility and alternatives available for constructing a new 35,000 acre-foot earth embankment dam to provide storage water for industrial and agricultural uses.

Project Manager and Lead Design Engineer, White River Diversion Dam and Pump Station (2009), US Indian Health Service, Whiteriver, Arizona. Led an engineering design team to complete final plans and specifications for a 50-foot wide Obermeyer crest diversion structure, associated intake structure, and 600-horsepower pump station. Created a HEC-RAS hydraulic model to verify that the new diversion structure would not increase the historic 100-year flood elevation. This project was constructed at a cost of $1.4 million.

Project Manager and Project Engineer, Saddleback Dam Rehabilitation Project (2008), Saddleback Development Company, Converse County, Wyoming. Completed design plans and specifications for improvements to the outlet works for a 25-foot high earth embankment dam. This project was constructed at a cost of $250,000.

Construction Engineer, High Savery Dam and Reservoir Project (2004), Wyoming Water Development Commission, Carbon County, Wyoming. Conducted quality assurance tasks for and managed construction of the concrete spillway. This project was constructed at a cost of $30 million.

Janeen McDermott, PE
Hydrology & Hydraulics Lead

Education
MS, Civil Engineering – Water Resources, Wayne State University, 2014

BS, Environmental Biology / Zoology, Michigan State University, 2010

Years of Experience
8

Professional Registrations/ Certifications
Registered Professional Engineer, #6201066931, MI

Janeen has 8 years of professional experience developing and analyzing hydrologic and hydraulic computer modeling results and data for storm water assessment and ecosystem restoration projects, including dam removals. She has hands-on experience with the latest HEC, FHWA and EPA modeling software. Janeen also has experience in developing permits for submittal including Joint Permit Applications, NDPES permits, and Natural Rivers Permits. Janeen has completed projects for various state agencies, USACE, municipalities and private clients. These projects have included river restoration and storm water management projects including flood control studies, sediment transport studies, dam removals, development of storm water master plans, and design of storm water BMPs and green infrastructure. Janeen's primary responsibilities have ranged from engineering design and analysis, plan and specification preparation, and preparation and submittal of permitting documents.

Relevant Project Experience

Boardman River FishPass Preliminary Engineering, Traverse City, Michigan. AECOM was awarded the contract to provide preliminary engineering and scientific expertise in the development of a dam modification design including the development of a selective bi-directional fish passage project for the Union Street Dam located in downtown Traverse City. The project consists of dam modification design, river and landscaping design, sediment management, pedestrian bridge design, geotechnical analysis, hydrologic and hydraulic analyses, and environmental permitting. Janeen's role is design engineer for the hydrologic and hydraulic studies, as well as leading preparation of the design plans.

Boardman River Phase II Final Design, Traverse City, Michigan. AECOM was awarded the contract to provide comprehensive engineering and scientific expertise in the development of dam removal and river restoration design for Boardman and Sabin Dams. The project consists of dam breaching design, river restoration design, sediment management, bridge and roadway design, wetland assessment and mitigation design, geotechnical analysis, hydrologic and hydraulic analyses, and environmental permitting. Janeen's role is lead design engineer for the hydrologic and hydraulic studies, dam breaching design and permitting preparation.

Otsego Township Dam Removal, Allegan County, Michigan. Janeen was Project Engineer for dam removal and stream restoration at the Otsego Township Dam on the Kalamazoo River. The project included structural evaluation; engineering and design for dam removal; engineering and analysis for natural channel based designs; floodplain restoration plans; permitting and engineering for a water control structure. Janeen's responsibilities included analyzing hydrologic and hydraulic components of the natural channel design including rock sizing for energy dissipation and development of dam removal plans.

Alcott Dam Removal, Kalamazoo County, Michigan. The Alcott Dam removal project consists of removing the dam and restoring Portage Creek through a former paper mill site. Sediments on site have low levels of contaminants present. The goal of the project is to remove the dam and provide fish passage for all species and year classes present. Janeen prepared design plans and specifications for the dam removal, restored river channel construction, sediment management, and construction sequencing.

Shaker Lakes Dams Rehabilitations, Cleveland, Ohio. AECOM was awarded the contract by the Northeast Ohio Regional Sewer District to provide analysis and design for rehabilitation of 2 dams on Doan Brook in northeast Ohio. Janeen performed hydrologic and hydraulic analyses on the design of the proposed new concrete spillway at the Green Lake Dam, and assisted in the design of the Upper Shaker Lake Dam using HEC-RAS. Design included step and training wall sizing for a roller compacted concrete overlay and rock sizing for energy dissipation at the toe of the dam. As well as development of dam rehabilitation design plans.

Peter J. Diemer, PE
Bathymetry

Education
BS, Environmental Science, University of Wisconsin - Green Bay, 1997

Years of Experience
19

Professional Registrations/ Certifications
Professional Engineer, Wisconsin
Certified Hydrographer

Professional Affiliations
National Society of Professional Surveyors
American Society of Civil Engineers

Training
Boat Safety Proficiency/Certificate
Professional Engineering Ethics & Conduct

Peter is a project engineer specializing in survey, design, permitting, and construction management of civil and shoreline projects. His work includes a strong emphasis applied to lake, dam/reservoir, stream, river, and harbor projects. He uses geographic information systems and hydrologic/hydraulic modeling tools to develop site-specific design solutions and river modeling software to analyze flood risks and to evaluate proposed construction elements, effects to flood profiles, and cost implications. Peter is a hydrographer specializing in performing bathymetric surveys and has conducted hundreds of single-beam sonar surveys for a diverse array of projects. Software programs regularly used include AutoCAD Civil 3D; HEC-RAS, HEC-2, HEC-HMS, HY-8, TR-55, HydroCAD, Trimble HydroPro, Globalmapper v.15.1, and SonarTRX v.12.1.

Relevant Project Experience

Town of Richmond, Turtle Lake Dam Feasibility Study, Delavan, Wisconsin. Prepared an hydrologic and hydraulic analysis including HEC-RAS modeling. Developed a conceptual repair strategy to reconstruct the small dam to improve retention of water during droughts while providing for overtopping protection stability for flood events. Project to be constructed in 2019.

City of Stevens Point, McDill Point - Levee Modifications and Accreditation, Stevens Point, Wisconsin. Provided project management, including staff coordination, preparation of hydraulic modeling, and coordination with the Federal Emergency Management Agency to secure a letter of map revision for levee modifications and accreditation.

Village of Rosholt, General Engineering Services, Rosholt, Wisconsin. Provided a lead engineering role for design of a dam reconstruction. Prepared hydrologic and hydraulic models for evaluation of dam flow capacity. Generated a design report for the proposed dam modifications. Developed bidding documents, including plans and technical specifications for reconstruction. The project was bid in February 2018 for reconstruction in the summer of 2018.

Confidential Paper Company, Paper Mill Raw Water Intake Geotechnical Engineering, Pennington, Alabama. Conducted a hydrographic survey of Tombigbee River at mill intake structure. Developed plans and permitting documents for maintenance dredging.

Wisconsin Department of Administration, SC Dam Failure Analyses, Various Locations, Wisconsin. Worked on technical team for development of dam failure analyses for 9 state-owned dams. Prepared reports, and developed recommendations for client.

Washburn County Highway Department, County-owned Dam, Minong, Wisconsin. Prepared initial evaluation of this county-owned non-permitted dam in northwest Wisconsin. Worked with the owner to prepare permitting documents required by the regulatory agency, Wisconsin Department of Natural Resources. These documents included dam reconstruction design, construction cost estimates, permitting documents, hydrologic and hydraulic modeling, and flood study analyses.

Tecumseh Products Company, Hayton Dam Inspection, Chilton, Wisconsin. Performed dam inspection in 2017, which included preparing updates to inspection, operation, and maintenance plan, and updates to the emergency action plan. Recommended dam repairs planned for 2018.

Peter J. Diemer, PE (continued)

Wisconsin Department of Administration, Yellowstone Lake State Park - Dam Gate Repair, Madison, Wisconsin. Provided project management for survey, investigation, and design of repair for a vertical slide gate dam. Worked with mechanical and electrical engineers in diagnosis of electrical and mechanical issues contributing to gate inoperability. Developed bidding document for repairs and performed construction oversight resulting in a fully-operable gate. Completed in 2016.

City of Sheboygan Falls, General Engineering Services, Sheboygan Falls, Wisconsin. Performed dam inspection in July of 2015. Prepared dam repair plans and cost estimates to be used for 2019 repair work.

Fox River Navigational System Authority, Rapide Croche Dam Preliminary, Kaukauna, Wisconsin. Project engineer responsible for bathymetric survey of riverine areas upstream and downstream of this lock and dam. Assisted in preparation of design drawings and construction cost estimates for a feasibility study, which was prepared for the purpose of evaluating the future boat lifting and cleansing system, proposed to limit the introduction of aquatic invasive species upstream of dam.

Village of Amherst, General Engineering Services, Amherst, Wisconsin. Project engineer and surveyor for the design of dam improvements including embankment stabilization, new concrete walls, demolition, and integration of new vertical slide gate to increase flow capacity to meet Wisconsin Department of Natural Resources requirements. Performed hydrographic survey of reservoir for use in design development. Completed December 2016.

Expera Speciality Solutions LLC, Thermal Modeling Study, Kaukauna, Wisconsin. Performed hydrographic and thermal survey of Fox River in the vicinity of an industrial warm water discharge outfall. Data collected was used within 3D flow models to determine the extent of thermal plumes.

Basin Electric Power Cooperative, Ash Ponds Hydrology and Hydraulic Study, Stanton, North Dakota. Prepared hydrologic and hydraulic studies in support of ash-pond embankment stabilization evaluations.

Jefferson County, Carlin Dam Design, Jefferson County, Wisconsin. Project engineer responsible for topographic survey of the dam and dry reservoir following a flood-induced earthen-cut dam breach in June of 2008. Utilized HEC-RAS to develop updated floodplain models and dam failure analysis, which were approved by the Wisconsin Department of Natural Resources. The project included design and permitting of concrete labyrinth structure, completed in 2010.

Domtar Corporation, Nepco Lake Finger Dikes, Nekoosa, Wisconsin. Performed hydrographic survey of a water-supply reservoir.

US Tennessee Valley Authority, Fort Loudoun Dam Mooring Buoys, Knoxville, Tennessee. Prepared hydraulic modeling in support of mooring buoy anchorage design, downstream of the lock at Fort Loudon Dam.

Wisconsin Department of Natural Resources, Montello Dam Preliminary Design, Montello, Wisconsin. Project engineer responsible for bathymetric survey of areas immediately upstream and downstream from the dam.

Private Dam Owner, Republic Dam Removal, Republic, Michigan. Developed hydraulic models for 5 miles of the Michigammee River to evaluate flood stage with and without the dam in place, to generate boundary conditions for design, and to assess habitat impacts. Completed hydrographic surveys to support the development of hydraulic models.

Legend Lake Protection and Rehabilitation District, Legend Lake Dam Inspection, Keshena, Wisconsin. Project engineer responsible for the inspection of 2 earthen dams, appurtenant structures, and updating the emergency action plan to Wisconsin Department of Natural Resources standard format.

Glenn Hendrix
Senior Scientist

Education
BS, Zoology, Michigan State University, 1977

MS, Biological Sciences, Michigan Technological University, 1984

Years of Experience
38

Professional Registrations/ Certifications
Professional Engineer, Wisconsin
Certified Hydrographer

Professional Affiliations
National Society of Professional Surveyors
American Society of Civil Engineers

Training
Boat Safety Proficiency/Certificate
Professional Engineering Ethics & Conduct

Glenn is a senior scientist with 38 years of experience. He completes environmental projects for industry, government, and business. His experience includes multidisciplinary permitting for energy facilities; remedial investigations; risk assessments; groundwater monitoring; sediment, and water quality studies; NPDES permitting; environmental assessment; and wetlands delineation, permitting, and mitigation. Glenn specializes in projects involving compliance with multiple statutes, including the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), Clean Water Act, Resource Conservation and Recovery Act (RCRA), Michigan Part 201, wetland regulations, and other federal and state laws. His knowledge of the many regulations affecting facility siting and remedial action contributes to early identification regulatory requirements and expedites approvals by regulatory agencies.

Relevant Project Experience

Hydroelectric Dam, Fish Entrainment and Mortality Study, Portland, Michigan. Managed a yearlong study of the impacts of a hydroelectric dam on fish populations. Large nets were placed below the turbines for three consecutive days at two-week intervals. The entrained fish were identified, measured, and counted. The data on entrainment were analyzed to determine the mortality due to turbine passage at different times of the year to each species and size class of fish. The results indicated that only 1% of the fish were killed or injured by passage through the turbines.

Hydroelectric Dam, Water Quality Monitoring, Portland, Michigan. Conducted a year-long study of the impact of a hydroelectric dam on Michigan's largest river. Negotiated the study plans with the MDNR and two federal agencies. The study involved extensive sampling and monitoring for metals, chlorophyll a, dissolved oxygen, dissolved solids, pH, specific conductivity, and temperature. The results of the study indicated that the dam had no significant impact on water quality. Completed follow-up studies at five-year intervals as required by the Federal Energy Regulatory Commission (FERC) license for the dam.

Hydroelectric Power Plant, Hydroelectric Licensing, Cuyahoga Falls, Ohio. Prepared pre-application document and study work plans for a Federal Energy Regulatory Commission (FERC) license for a proposed hydroelectric power plant. The proposed project made use of an existing dam and related facilities to minimize or avoid environmental impacts. The application used FERC's integrated licensing process. The pre-application document summarized existing environmental information, identified data gaps, identified potential impacts of the project, and recommended studies to provide needed information. The study plans provided details on proposed studies of potential impacts of the project..

Sabin Dam Removal, Traverse City, Michigan. Delineated complex wetlands adjacent to a mile-long impoundment and evaluated impacts of dam removal on wetlands.

Michigan Department of Natural Resources Otsego Township Dam Removal. Delineated wetlands adjacent to the Otsego Township Dam on the Kalamazoo River. The delineation allowed this dam removal project to avoid wetland impacts.

Hydroelectric Power Plant, Hydroelectric Licensing, Pennsylvania. Project manager for preparation of Federal Energy Regulatory Commission filings for a license application for hydroelectric power generation at an existing dam. Used the FERC's new integrated licensing procedure and prepare the pre-application document and study plans to support the license application and environmental

Glenn Hendrix (continued)

assessment. The study plans included surveys for threatened or endangered species, aquatic life surveys, water quality studies and habitat surveys.

Streambank Stabilization and Mitigation, Conneaut, Ohio. The U.S. Army Corps of Engineers and the Ohio Environmental Protection Agency issued an emergency permit for stream bank stabilization in Conneaut Harbor. The permits required stream bank mitigation. Evaluated options for mitigation including fish habitat improvement, conservation easements, bank restoration, low-head dam removal and bridge removal. Selected purchase of stream bank "credits" through Ohio's new "in lieu of mitigation" program operated by the Nature Conservancy. This approach provided cost-effective, low risk and environmentally beneficial mitigation, and was one of the first projects to use the new program.

Orvana USA, Wetland Permit Application, Gogebic County, Michigan. Prepared wetland/inland lakes and streams permit applications and conceptual mitigation plans for development of a new copper mine, a 2-mile long access road, and a large tailings basin. The mitigation plan included wetland preservation, enhancement, and creation. The permit was issued by the Michigan Department of Environmental Quality.

Proposed Dolomite Quarry, Permitting Analysis, Goetzville, Michigan. Prepared an assessment of critical environmental issues and cost estimates for environmental surveys and permitting for a proposed major dolomite quarry with a large pier in one of the Great Lakes to load dolomite onto barges and freighters. The recommended surveys included a cultural resources investigation, a protected species survey, a fish habitat survey, and a wetland delineation. The required permits included a Great Lakes construction permit and lease, a Section 404 dredge/fill permit, wetlands permits, and a mineral mining reclamation plan.

Bill Weihbrecht
Senior Stream Restoration Specialist

Education
BS, Environmental Biology, Millersville University, 1979

Years of Experience
42

Professional Registrations/ Certifications
Applied River Morphology, 1997

Freshwater Wetland Construction, 1995

State of Maryland, Erosion and Sediment Control Certification

Professional Affiliations
Watershed Alliance of York (WAY) Board of Directors, 2003 to present

Virginia Fish Barrier Task Force

Bill has more than 42 years of professional experience related to watershed studies and stream restoration. He is involved in the majority of AECOM's dam decommissioning projects throughout New England, Mid Atlantic and Midwest Regions. Bill has extensive experience in dam removals including feasibility analyses, sediment assessment, staged dam breach sequencing, stream restoration design and construction oversight. He has completed the design and/or construction management of 42 dam removal and fish passage projects throughout the Mid-Atlantic, New England and Upper Midwest regions. He has experience in coordinating with state and federal government agencies related to design and permitting issues. His regulatory and construction experience compliments the permitting and design tasks. This hands-on experience results in practical, cost effective designs while minimizing environmental impacts. The majority of his experience includes using a natural channel design approach to restore natural stream functions and quality habitat. Bill is experienced at making field adjustments during construction to minimize impacts, reduce construction costs and enhance habitat.

Relevant Project Experience

Atlas Dam Removal, Hockendaqua Trout Unlimited, Northampton, PA. Completed the design, permitting and construction oversight of the Atlas Dam on Hokendaqua Creek, a tributary to the Lehigh River. Project involved the removal of 17,000 CY of impounded sediment, restoration of 2,000 feet of stream channel and creation of 1.7 acres of wetland.

Mill Creek Dam Removal, Village of Dexter, Dexter, Michigan. Completed the design and construction oversight. Project involved the removal of an eight foot high dam associated with a bridge replacement. Design included installation of 5 in-stream grade control structures which minimized sediment mobilization, provided upstream floodplain connectivity and enhanced fish passage and recreational boating.

Sabin and Boardman Dam Removal, Conservation Resource Alliance, Traverse City, MI. Largest dam removal project in the state of Michigan. Involved in data collection, preparing phased dam breaching plans, risk assessment, stream restoration design and construction management. Boardman Dam (2017), Sabin Dam (2018).

Saucon Creek and Historic Bethlehem Dam Removals / Bethlehem, PA / Client, City of Bethlehem. Completed the dam removal designs, permitting and construction oversight for both dams. Project included several hundred feet of stream restoration. Both streams are high quality, naturally reproducing brown trout fisheries.

Cumberland Marsh Dam Removal / New Kent, VA / Client, The Nature Conservancy. Completed design, permitting and construction oversight of a large earthen dam removal across an unnamed tributary to Holts Creek. Located in a tidally influenced area of Holts Creek, the construction sequencing needed to consider tide changes during the final breach. A breach was sized as well as a low flow channel which would allow fish passage at low tide. Design changes in the field resulted in enhanced habitat for a federally protected plant species within the fluctuating tide zone. Project resulted in the creation of 6 acres of wetland.

Lake Charles Dam Removal / Charles City, VA / Client, The Nature Conservancy. Completed the design, permitting and construction oversight of an earthen dam removal on Kimages Creek, a tributary to James River.

Bill Weihbrecht (continued)

Project involved breaching the dam in a fluctuating tide area of James River. A low flow channel was constructed for low tide to allow for fish passage into the newly created marsh.

Stroud Preserve Dam Removal / West Chester, PA / Client, Natural Lands Trust. Completed the design, permitting and construction oversight of an earthen dam removal on an unnamed tributary to East Branch Brandywine Creek. Project involved restoring the stream channel back to its historic location. In-stream rock grade control structures were utilized to minimize sediment mobilization, enhance wetland creation and restore a natural meandering channel through the former impoundment.

Spanglers Mill, Witlinger and Green Lane Farm Dam Removals/ Camp Hill, PA / Client, Cumberland Valley Trout Unlimited. Completed the design permitting and construction oversight of three dams on the Yellow Breeches Creek. Project involved stream restoration and trout habitat improvements.

Flock Process Dam Removal and Fish Passage/ Norwalk, CT / Client City of Norwalk, Connecticut. Completed the design of a dam removal and engineered riffle to restore anadromous runs of alewives, herring and sea run brown trout to the Norwalk River. Project involved close coordination with the Connecticut State Fish Passage Coordinator. Construction scheduled for 2018.

Daniel S. Broekhuizen, PE
Lead Structural Engineer

Education
MS, Structural Engineering, Texas University, 1996

BS, Engineering, Calvin College, 1994

Years of Experience
22

Professional Registrations/ Certifications
Professional Engineer, MI, No. 48568

Daniel is experienced in the analysis and design of structures constructed from many different materials, including structural steel, reinforced concrete, prestressed concrete, and timber. His experience also includes the design of variable message sign supports and foundations and bridge load rating.

In addition to his work on transportation projects over the last 20 years, Daniel has also worked on a number of dam removal projects. His work has included evaluation of existing dams, review of existing plans, developing cost estimates, writing specifications, and designing and detailing any structural components for various jobs, including a sheet-piling and wooden stop-log structure as part of the Otsego Township project. Daniel routinely leads design efforts on projects within his area of expertise. He performs quality reviews and is intimately familiar with plan and specification preparation in multiple formats.

Relevant Project Experience

Marion Dam Removal and Stream Restoration Design. Lead Structural Engineer for the conceptual and feasibility level design for the ecological restoration of the Middle Branch River. Daniel is leading the portion of the project that is evaluating the current Marion Pond Dam from a structural standpoint, including developing costs for ongoing structural maintenance if the dam is left in place and construction costs if the dam is removed.

Meadowbrook Lake Dam Engineering and Feasibility Study. Lead Structural Engineer for a project related to structural modifications to a City of Novi dam. AECOM completed a structural and geotechnical analysis of the concrete and earthen portions of the dam. Daniel performed all structural calculations and detailing for any modifications to the existing dam.

Otsego City Dam Removal, Otsego, MI. Lead Structural Engineer for engineering and design for dam removal and stream restoration at the large Otsego City Dam on the Kalamazoo River. The project included structural analysis and design of a steel sheet pile combi-wall system water control structure, maintenance walkway, and stop log structure as well as an evaluation of the existing dam and meeting with contractors to determine the most efficient way to remove the existing dam.

Alcott Dam Removal, Kalamazoo, MI. Lead Structural Engineer for dam removal and stream restoration design for the Alcott Dam on Portage Creek in Kalamazoo, MI. Daniel is developing options for removal of the dam, investigating the ramifications of the removal on the adjacent Alcott Street Bridge, and evaluating the condition of the existing retaining walls. The goal of the project is to remove the dam and provide fish passage for all species and year classes present. The dam is on a former paper mill impoundment.

Cass Road over Boardman River, Traverse City, MI. Lead Bridge Engineer full engineering services including: bridge design, road design, traffic engineering, geotechnical engineering, hydraulics, and surveying. This bridge replacement project is part of the Boardman River restoration and dam removal project which AECOM is also performing.

Boardman River Dam Disposition Study, US Army Corps of Engineers, Detroit, MI. Lead Bridge Engineer for this community-based dams disposition study, spearheaded by a Boardman River Dams Committee (BRDC). The study was initiated to provide advice to the dam owners (i.e., Traverse City, Grand Traverse County) on the fate of the four dam system. An Engineering and Feasibility Study was subsequently initiated, unique in that it provided for

Daniel S. Broekhuizen, PE (continued)

equal consideration of environmental, engineering, socio-economic and cultural considerations in examining various alternative futures for the dams (i.e., combinations of retain/repair, modify, remove).

Otsego Township Dam Removal and River Restoration Engineering Design, Otsego, MI. Lead Structural Engineer for engineering and design for dam removal and stream restoration at the Otsego Township Dam on the Kalamazoo River. The project included structural analysis and design of a steel sheet pile combi-wall system water control structure, maintenance walkway, and stop log structure as well as design of a steel sheet pile wall to help stabilize the existing dam spillway until the original dam could be removed.

I-94 over Hickory Creek, Berrien County, MI. Senior Bridge Engineer for the complete replacement of the eastbound and westbound I-94 bridges over Hickory Creek. Initially scoped for a deep overlay, the project was changed to a complete replacement due to significant predicted scour. AECOM was responsible for the design of the bridge replacements, approaches, cross-overs, MOT, permanent signing and markings, and geotechnical investigation.

35th Street over the Kalamazoo River, Kalamazoo County, MI. Lead Bridge Engineer for an American Public Works Association award-winning design for the replacement of the 35th Street bridge over the Kalamazoo River, including surveying, permanent signing and pavement markings, maintenance of traffic plans, and wetland mitigation and design. The design accounted for a future boat launch area and hike-and-bike trail near the site.

D Avenue over the Kalamazoo River, Kalamazoo County, MI. Project Bridge Engineer for the design and construction engineering for complete a bridge replacement, including survey, realignment of D Avenue approaching the bridge, hydraulic and scour analysis, culvert design, maintenance of traffic and public meetings. AECOM received a CRAMmy award for public communications related to the seven-mile detour route.

M-6 Non-Motorized Trail, Kent County. Lead Bridge Engineer for the design and construction engineering for 7 miles of new non-motorized pathway to extend the Paul Henry Trail along the M-6 corridor to Kent Trail. The design included a railroad crossing, design of a grade separation at Division Avenue, a bridge over Buck Creek, boardwalk, timber bridges, retaining walls, wetland mitigation, and right-of-way.

Border-to-Border Non-Motorized Trail, Village of Dexter, MI. Design Engineer for the design of 1,000 feet of non-motorized path along the Border-to-Border Trail connecting Hudson Mills Metro Park to Warrior Park in Dexter, including a new bridge over Mill Creek, 600 feet of elevated timber boardwalk, and a covered section of boardwalk beneath the Norfolk Southern Railroad trestle over Mill Creek..

Vik Gautam, PE
Geotechnical Engineer

Education
BS, Civil Engineering, Case Western Reserve University, 2000

MS, Structural Engineering, Case Western Reserve University, 2001

Years of Experience
18

Professional Registrations/ Certifications
Professional Engineer, MI, #6201055245
Professional Engineer, OH, #PE.70374
Professional Engineer, IN, PE11600291

Vik is a geotechnical/civil engineer specializing in analysis and detailed design of geotechnical structures, with emphasis on geotechnical engineering for dams and dikes, industrial and power clients, landfills, and remediation projects. He is currently the Geotechnical Practice Leader in AECOM's Cleveland, OH office, leading a regional team of over twenty geotechnical engineers, technicians, and geologists. Vik specializes geotechnical modeling, including finite element seepage analyses and slope stability analyses. He has also been involved in numerous geotechnical site investigations and studies, with responsibilities including coordination and management of drilling and laboratory programs and preparation of geotechnical engineering reports and recommendations.

Relevant Project Experience

Lead Geotechnical Engineer, Boardman Dam Removal, Grand Traverse Band of Ottawa and Chippewa Indians, Traverse City, MI. The Boardman dam is an approximately 50 ft high earthen structure, which formerly impounded the Boardman River for hydropower generation. A consortium of public entities has gathered funding for removal of the dam and restore the original channel and flow of the Boardman River. In addition to the dam removal, the project also involves construction of a new 3-span bridge, carrying Cass Road over the proposed restored channel, just downstream of the existing dam. The AECOM team provided multidisciplinary engineering services to establish the construction sequence and specifications for the dam removal and to provide full detailed design of the bridge. Vik served as lead geotechnical engineer on this interesting project. Geotechnical tasks included drilling thirteen borings at the site of the dam and bridge, full geotechnical analysis and design services for the bridge, and evaluation of the structural and geotechnical capacity of the dam structure (including a reinforced concrete core wall structure that will be utilized for temporary support during the removal operations). Vik was also responsible for the design of a temporary emergency spillway and energy dissipating structure that will provide overflow capacity to protect against flooding that could occur during construction.

Lead Geotechnical Engineer, Michigan Department of Natural Resources, Water Control Structure, Otsego Township Dam, Otsego, MI. Provided engineering design and exploration services to the Michigan Department of Natural Resources (MDNR) for the design of a new water control structure to be constructed at the location of the existing Otsego Township Dam, along the Kalamazoo River near Otsego, Michigan. The existing dam is a dated hydroelectric structure that has stability and spillway capacity issues and is scheduled for removal in the future. The water control structure (WCS), consists of a combi-section sheet pile wall with stop-log control weir. River flows will be diverted around the existing deteriorating reinforced concrete overflow spillway and over the WCS. The structure will be in service for approximately 3 years, while the overall dam removal project is being designed and contracted.

The MDNR retained AECOM to perform full geotechnical, structural, and hydraulic design services, as well as on-site resident engineering services during construction. Vik acted as Engineer of Record on the project, and was directly responsible for overseeing the geotechnical and structural design of the WCS, and providing office engineering support services during construction.

Lead Geotechnical Engineer, Michigan Department of Natural Resources, Water Control Structure, Otsego City Dam, Otsego, MI. Provided engineering design and exploration services to the Michigan Department of Natural Resources for the design of a new water control structure to be constructed upstream of the Otsego City Dam, along the Kalamazoo River in Otsego, Michigan. The existing dam is a

Vik Gautam, PE (continued)

dated hydroelectric structure that has stability and spillway capacity issues and is scheduled for removal in the future. The water control structure, which is to consist of a sheet pile wall with stop-log control section, is intended to control river flows in case of dam failure prior to removal.

The MDNR needed detailed design of the water control structure, including associated field exploration services. The team drilled geotechnical borings within the Kalamazoo River from a barge, in order to collect subsurface information required to support the design. Geotechnical and structural engineers used this information to implement design, plan preparation, and construction specifications for the control structure. Vik was responsible for planning and implementing the geotechnical exploration, for performing detailed structural and geotechnical design of the sheet pile structure, and for developing construction sequences for installing the structure in an actively flowing stream.

Geotechnical Engineer and Designer, Swan Lake Dam Rehabilitation Project, Copley, Ohio. Engineering design services for improvements to a small, urban dam. Design included addition of a primary spillway, road lowering, a new fuse plug emergency spillway, and outlet erosion protection. Vik was responsible for implementing the geotechnical exploration for the project, as well as for geotechnical and structural design of the primary and fuse plug emergency spillways, including design plans and technical specifications.

Geotechnical Engineer and Designer, Briar Hill Lake Dam Rehabilitation Project, Solon, Ohio. Engineering design and construction QA/QC services for improvements to a small, urban dam. The project included improving the existing primary spillway, adding an Obermeyer Gate emergency spillway and outlet erosion protection, including dredging plan and mechanical control building. Vik was responsible for implementing the geotechnical exploration for the project, as well as for geotechnical and structural design of the primary and fuse plug emergency spillways. Ran slope stability and seepage analyses to support design of the improvements; Performed structural concrete design for the spillway system, including foundations for the Obermeyer gate; Prepared plans and specifications for these features. During the construction phase, provided office support to field QA/QC tasks, and performed shop drawing review and approval.

Project Geotechnical Engineer and Designer, Newark Dam, Newark, OH. Geotechnical investigation, detailed design and contract preparation, construction QA/QC services for a new concrete slurry cut-off wall for the existing Newark Dam in Newark, Ohio. As lead design engineer on the project, responsibilities included: establishing and implementing appropriate geotechnical and structural analysis and design for the proposed cut-off wall, management of the design team and subsurface investigation work, preparation of construction drawings, specifications, and bid documents, and interaction with the client. During slurry wall construction, responsibilities included guidance/management of the full-time field inspector, in-house engineering support during construction, and periodic site visits/inspections.

Project Engineer, Lawco Lake Dam, Lawrence County, Ohio. Engineering and design services related to expanding the discharge capacity of an existing earth dam retaining a 20-acre recreational lake. The project included the design of new principal and emergency spillways and stilling basins. Implemented and oversaw the engineering analysis and detailed design of the new spillways, including management of the geotechnical investigation, hydraulic and structural design of the spillways, and preparation of construction drawings and specifications. Communicated and worked with the Ohio Department of Natural Resources and gained approval of the project.

Project Engineer, Bailey Lakes Dam, Village of Bailey Lakes, Ohio. Engineering, contract administration, and construction QA/QC services for a new outlet structure at an existing earth dam, including hydrologic modeling and preparation of construction drawings and specifications for replacement of the existing outlet structure. Performed geotechnical and structural design for the new structure, assisted in preparation of construction drawings and specifications, and acted as project engineer during the bidding and construction of the project.

Thomas Roberts, Jr., PE, PS
Survey and Property Description Reviewer

Education
AAS, Survey Technology, Owens College, Toledo, Ohio, 2006

BSCE, Civil Engineering, Michigan State University, 2002

Years of Experience
17

Professional Registrations/ Certifications
Professional Surveyor, MI #58193; OH # 8349; CO # 38113

Professional Engineer, MI # 58637; CO # 44395

Hazwoper 40hr Certified

Thomas has over 17 years of experience in civil engineering and surveying, including site feasibility studies, due diligence, control surveys, right of way surveys, topographical surveys, hydraulic surveys, structure surveys, bathometric surveys and construction staking. Thomas is proficient processing of field data drawings in both Microstation and AutoCad format. Also experienced in FAA tower documentation, three wires leveling, GPS control surveys, monumentation/ remonumentation documents, ALTA surveys, legal description preparation, and boundary surveys.

Relevant Project Experience

Otsego City and Township Dam Removal, Allegan County, Michigan. Thomas was the Surveying Manager for the dam removal and stream restoration at two large dams on the Kalamazoo River (Otsego City and Township Dam). The project included structural evaluation; engineering and design for dam removal; engineering and analysis for natural channel based designs; floodplain restoration plans; permitting and engineering for a water control structure. Thomas' responsibilities included providing the design base-maps and interlacing the existing utility information into these maps.

Mill Creek Dam Removal and Stream Restoration. Surveying Manager for dam removal/stream restoration project in Dexter, Michigan. Tasks included base map generation and construction staking. Component of larger, $4 million bridge replacement/road realignment project. (Washtenaw Country Road Commission and Village of Dexter, Michigan)

Alcott Dam Removal, Kalamazoo County, Michigan. The Alcott Dam removal project consists of removing the dam and restoring Portage Creek through a former paper mill site. Sediments on site have low levels of contaminants present. The goal of the project is to remove the dam and provide fish passage for all species and year classes present. Thomas provided the survey base-maps for the project including bathometry.

City of Novi, Meadowbrook Lake Dam Modifications, Novi, Michigan. Surveying manager for dam modifications to meet current MDEQ dam safety requirements. Primary project goals included detaining smaller storm events in order to reduce peak flows and velocities in the Middle Rouge River downstream of the dam; and providing adequate capacity to pass the 100-yr flood as required by Michigan's dam safety regulations (Michigan Natural Resources and Environmental Protection Act, Act 451 of 1994). As part of the analysis a detailed model of upstream and downstream hydraulics, including bridges and culverts, was developed using HEC-RAS and HY8 computer models. Responsible for acquiring survey data for hydraulic model to assess spillway capacity for proposed dam modifications. Staked design drawings for construction.

Stormwater and Streambank Assessment, City of Novi, Michigan. Surveying Manager for regional storm water modeling geared towards evaluating the City's regional detention system with respect to flooding and streambank erosion mitigation. A GIS database of regional detention site was developed, with training provided to City staff on the storm water assessment tool. An analysis of the regional detention basin system resulted in a system determining when the detention basins are at capacity and what impact they have on flooding and stream bank erosion. Also an approach based on sound science for controlling storm water when regional storage reaches capacity was developed, as well as alternative stormwater management options to meet the City's future needs.

Storm Water Improvements for Bacteria Reduction, Village of Suttons Bay, Michigan. Survey Manager for multi-phased stormwater project to reduce human health risks by improving the quality of the water discharged to the

Vik Gautam, PE (continued)

Grand Traverse Bay during and after precipitation events from three stormwater outfalls. Reducing discharge from these outfalls will reduce the quantity of bacteria, nutrients, sediments and other pollutants entering the bay and reduce the negative impacts of stormwater, such as, beach closings, macrophyte growth and algae growth. The AECOM team assessed the contributing drainage areas for optimal sites for green infrastructure, low impact development and ultra-urban best management practices. These techniques were used to provide an integrated combination of source control and end of pipe treatment that will meet project goals and achieve improved water quality within Suttons Bay. Responsible for creating base- maps for project.

I-75 from Gibralter to Sibley and Vreeland to King, Wayne County, Michigan. Project Surveyor for urban freeway reconstruction project. Performed supplemental topographic surveys to determine underground utility and tree locations.

M-10 Bridges Rehabilitation Project, Wayne County, Michigan. Project Surveyor for various repairs and/or replacements to 35 local road and pedestrian bridges over M-10. Completed control surveys and topographic surveys for approach work. Completed detailed structure surveys for 11 Overcrossing Structures and 4 Pedestrian Overcrossings.

CC2E Lift Station Study, Dow Chemical Company, Michigan Operations. Project Surveyor for design solution to provide wet weather diversion pumping for a 60-acre area of a developed industrial site. Project involved establishment of hydraulic parameters for a new 5 to 20 million gallon per day station pumping into existing storage tanks, including bore-and-jack. A hydraulic model was used to evaluate the benefit for the existing sewer system.

City of Dearborn, Topographic Survey for the Combined Sewer Separation, Dearborn, Michigan. Survey field work entailed creating a vertical and horizontal control network utilizing RTK-GPS instruments. A bench loop was completed to ensure vertical accuracy within the project area. Upon establishment of a vertical and horizontal control network, a full topographic survey extending 10' beyond the right-of-way limits was completed. All topographic features within the project area were located utilizing robotic survey instruments. A right-of-way investigation was performed throughout the collection of topographic features by locating and observing property and section corner monuments. Field inspection and inventory of all sewer and water structures was then provided.

07 Basis of Fees

The RFP requests a fee broken down by the key steps of the project, a rate sheet, a cost per public meeting, and description of other reimbursable costs. These items are provided below.

Detailed Cost Breakdown

TASK	HOURS	FEE
Existing data collection, review and analysis	10	$1,000
Topographical survey and base mapping	16	$2,000
River impoundment survey	60	$7,000
Hydrology and hydraulics analysis	60	$5,500
Ecological and environment assessment	25	$5,500
Dam maintenance and improvement assessment	68	$5,500
Dam deconstruction alternatives and impact analysis	68	$5,500
Funding and grant sources	2	$1,500
Outreach meetings	116	$14,000
Deliverables	57	$5,500
	Labor costs	$53,000
	Title Search and Other Direct Costs	$12,000
	TOTAL FEE	**$65,000**

Rate Sheet

PROJECT ROLE	HOURLY RATES
Project Manager	$180
Senior Project Engineer	$135
Structural Engineer	$135
Senior Environmental Scientist	$135
Professional Surveyor	$120
Project Engineer II	$100
Project Engineer I	$90

Per Meeting Cost

For a public meeting we have assumed a cost of **$2,200**. This includes attendance of four (4) people (the project manager, task leads and one project engineer). This cost includes attendance and preparation for the meeting.

Reimbursable

Mileage at **$0.55 per mile**.

08 Additional Information

Based on our past experience, we have provided some additional items for your consideration for this project. These items will be included in our feasibility study but thought we would also mention them in this section of the proposal for your consideration.

Property issues

Our surveyors will pull the documents that provide a description of the property boundary and plot the boundary. However, a deed can convey other rights that may or may not be clear and may contradict other property owners in the area. From our previous projects we have found varying levels of certainty about riparian rights when reviewing deeds. While we can share our opinion of the meaning of a deed and the associated rights that it confers, ultimately, these decisions are often made via legal proceedings.

Funding options

There are many sources of funding for dam removal, dam repair, and dam modification. In addition, since this dam is integral to the road, transportation related funding options may also be a source of funding. We can help you explore and navigate these options. The first step is to have a discussion with state dam safety, DNR and road commission officials to determine how this project may rank against other projects under consideration.

Dam and road engineering experience

Dam engineering is a specialized subset of civil engineering. Working on dams that are integrated with bridges and roads adds additional challenges to the projects. Our team is fortunate to have worked on several projects that have been on the intersection of dams, roads, and bridges. These projects have included Dexter Dam removal, Alcott Street Dam, Boardman Dam/Cass Road Bridge, and Little Rapids Restoration project.

Habitat and fishery value

Most dam removals are driven by habitat consideration. When grant funders are evaluating projects for support they often consider whether a project is part of a larger plan. To increase the potential for funding from these sources we will help you put the request in the context of a larger restoration plan. Engaging other land owners and watershed groups is a proven approach that has worked with others.

Dam safety and O&M costs ROI

As part of our evaluation we will evaluate the lifecycle costs of the dam (including capital costs and ongoing O&M) against other options, such as removal and modification.

A Appendix: Completed Forms

OAKLAND COUNTY MICHIGAN

OAKLAND COUNTY EXECUTIVE L. BROOKS PATTERSON

COMPLIANCE OFFICE
PURCHASING

(248) 858-0011 | purchasing@oakgov.com

SOLICITATION FORM

Contact Information: Oakland County Purchasing Division Building 41 West - Lower Level 2100 Pontiac Lake Road Waterford, MI 48328	Buyer:	Krumwiede, Andy J
	Phone:	(248)858-7678
	Fax:	(248)858-1677
	Email:	krumwiedea@oakgov.com

Solicitation Event ID: 004382	**Response Due:** 8/9/2018	**By:** 2:00 PM ET
Hard Copy: ◉ **Online:** ○ **Online or Hard Copy:** ○		

Event Title: Mill Pond Dam Feasibility Study
Category Codes: 91800-92517-92523-91846-90629-92535-92533-92545-92558-91855-91843

Oakland County Purchasing is issuing a Bid/Request for Proposal (RFP) seeking bidders to provide services or goods as detailed in Attachment (B).

Index:

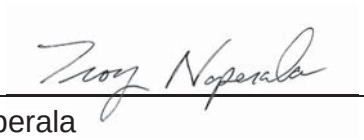
- Solicitation Form (This Form- Bidder Information and Signature Page)
- Attachment (A) – Mailing Label
- Attachment (B) – Solicitation Specifications - 004382
- Attachment (C) - 2000 Existing Topographical Survey Plans, EarthTech
- Attachment (D) - 2011 Preliminary Evaluation Report, SME
- Attachment (E) - 2013 Dam Safety Inspection Report, MDNR
- Attachment (F) - Agreement for Mill Pond Dam Maintenance and Repair between Oakland County and Charter Township of Springfield

Bidder Information	
Legal Name:	AECOM Technical Services Inc./AECOM Great Lakes Inc.
Street Address:	27777 Franklin Road, Suite 2000 American Center
City:	Southfield
State, Zip	Michigan, 48034
Corporate I.D. or Taxpayer I.D. #:	95-2661922
Bid/Request Contact Name:	Troy Naperala
Contact Phone:	(231) 392-9685

Contact E-Mail:	Troy.Naperala@aecom.com

I have reviewed the TERMS AND CONDITIONS and insurance requirements stated below prior to submitting this bid solicitation. This Solicitation Form must be included and returned signed in your bid response.

Vendor's Authorized Agent

Signature:  **Date:** 8/8/2018

Printed Name: Troy Naperala

Title: Associate Vice President

Phone: (231) 392-9685

Date: August 9, 2018

E-Mail: Troy.Naperala@aecom.com