Exhibit A

COASTAL INFRASTRUCTURE RESILIENCE RESEARCH AND DEVELOPMENT RFP NO. 21-AA16

CITY OF DULUTH
TECHNICAL PROPOSAL
APRIL 29, 2021

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Project name	**Coastal Infrastructure Resilience Research and Development**
Client name	**City of Duluth**
Type of proposal	**Technical Proposal**
Date	**April 29, 2021**
Bidder/Tender	**Ramboll**

Ramboll
Suite 440, 4th Floor
Interlachen Corporate Centre
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Edina, MN 55436

https://ramboll.com

APPENDIX A - PROPOSAL COVER SHEET
CITY OF DULUTH
RFP 21-AA16
COASTAL INFRASTRUCTURE RESILIENCE RESEARCH & ASSESSMENT

Proposer Information:	
Proposer Name	Ramboll US Consulting, Inc.
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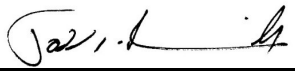
Authorized Signature	
Title	Todd Renville, PG, Principal

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1. COVER LETTER

April 26, 2021

City of Duluth
Attn: Purchasing Division
City Hall, Room 120
411 West 1st Street

Duluth, MN 55802

Ramboll
Suite 440, 4th Floor
Interlachen Corporate Centre 5050
Lincoln Drive
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https://ramboll.com

Re: Coastal Infrastructure Resilience Research and Development – RFP No. 21-AA16

To Purchasing:

Ramboll US Consulting, Inc. (Ramboll), is pleased to offer the following Technical Proposal in response to RFP No. 21-AA16 Coastal Infrastructure Resilience Research and Development to provide the City of Duluth with practical solutions to address coastal erosion and shoreline failures and corresponding infrastructure risks along the North Shore of Lake Superior, from Brighton Beach to the French River, and select areas in the St. Louis River Estuary and select areas on Minnesota Point. The objectives of this project are to identify and demonstrate economically feasible methods for reducing shoreline erosion and failure and to provide data and recommendations, including asset protection, that could be used in similar situations and locations along the lakeshore.

Ramboll also acknowledges receipt of Addendum 1 through 3 to the RFP and include Addendum 1, as requested, behind this cover letter. The Cost Proposal is under separate cover, as identified in the RFP.

Ramboll's team is highly qualified to develop engineering solutions and preliminary designs for managing shoreline risks for the City of Duluth, and to provide the quality and innovative thinking that the assignment requires. Ramboll is a global engineering, design, environmental, and management consultancy. Our mission is to create sustainable and long-term solutions for our customers and society. Headquartered in Copenhagen, Denmark, and privately owned, Ramboll has 16,500 employees across 35 countries and in 300 offices, including 11 Midwest/Great Lakes offices and an office in Minnesota, within driving distance of Duluth. Ramboll's North American division includes over 2,000 personnel, including coastal experts in site characterization, risk assessment, engineering design, construction management, performance monitoring, treatment system operation and maintenance, and habitat restoration. Many of our best experts are located in the Midwest and include our project manager, Jim Hutchens, PE, based in Minnesota. By managing this work from our Minnesota office and extending our reach nationally, we provide strong local knowledge and experience with global expertise.

Ramboll's engineers plan, implement, and oversee sediment and coastal resiliency projects throughout the world. The proposed team offers unparalleled experience in coastal resiliency management and design, soil mechanics, and construction cost and schedule estimation. Ramboll has conducted project-specific engineering designs to evaluate technology options and has prepared engineering cost estimates as part of sediment management and coastal resiliency option assessments for rivers, lakes, and harbor projects. As remediation project managers, Ramboll's engineers and technical specialists design effective solutions, help manage costs, improve the likelihood of project success, and develop effective long-term monitoring plans to demonstrate remedy performance, risk reduction, and environmental improvement.

As our project descriptions attest, Ramboll is a leader in shoreline resiliency assessments and design, soil mechanics, and construction cost estimation. The Ramboll Team also brings considerable experience related to public consultation and works easily and collaboratively with others. We pride ourselves in our client-focused model, where our clients come first. We are comfortable working with stakeholders and the public, and with other consultants as needed, and we anticipate a seamless relationship with the communications consultant for this work. Members of the proposed team have led public consultation meetings with residents, First Nations, and municipalities in a broad range of platforms (e.g., round table discussions, science fair style, large group meetings, webinars, written responses to questions). We recognize that a lack of trust can derail a project, and therefore we strive to build trust early through demonstrated credibility, reliability, transparency, and low self-orientation.

Ramboll's project portfolio reflects extensive experience using risk-based approaches and investigation tools to assess and manage environmental problems in streams, rivers, estuaries, ports, and harbors. We have led the design, implementation, and construction oversight for multiple contaminated flood management and coastal resiliency projects. We understand the technologies, constructability and cost effectiveness needed to implement those projects, including the specialty tasks of sediment transport, hydrology, geomorphology, and geology. This direct experience will aid us in developing the design, vetting restoration options, and completing accurate schedules and cost estimates. Among the projects highlighted in our proposal is the Lake Ontario Coastal Resiliency and Economic Development Initiative (REDI) project on behalf of the State of New York. Under REDI, we have evaluated and screened 500 miles of Lake Ontario coastal properties to identify and characterize risks to existing assets and infrastructure, and to identify and propose solutions to manage those risks. We work with the State of New York, local municipalities, public groups, and various stakeholders in cities and counties impacted by shoreline erosion. This is one of multiple examples of Ramboll's expertise and experience, positioning us to provide the level of support needed to make this project a success for the City of Duluth.

Ramboll is committed to bringing proven nature-based solutions to the complex environmental challenges posed by Lake Superior to the City of Duluth. Effective restoration adopts a long-term perspective while considering adaptive management, the use of native flora and fauna, and protection of sensitive species. Our applied experience in the restoration of complex habitats provides unique perspective, a repertoire of proven solutions, and command of the ecological principles necessary for success. The Great Lakes shoreline is complex and requires an advanced understanding of the physical environment including storm impacts and local geology, along with a wide range of stakeholder perspectives. Ramboll is uniquely positioned to provide natural and nature-based features and green engineering infrastructure projects that "work with nature." It is likely the solutions will require a blend of "green" and "gray" engineering features to optimize habitat and promote long-term resiliency. Our Midwest-based Team, with leadership in Minnesota and work experience in Duluth, is intimately aware of the sensitivities and the beauty of Duluth's coastline and the importance of the public input in to keeping or enhancing that beauty.

Our Work Plan provides several examples of green engineering solutions that will be evaluated for this project, including shoreline habitat nourishment paired with biostabilization using native vegetation, artificial reef structures to reduce coastal energy associated with waves and storms while also providing wildlife habitat, living shorelines such as those modeled after the National Oceanic and Atmospheric Administration (NOAA) Systems Approach to Geomorphic Engineering (SAGE 2015) Natural Structural Measures for Shoreline Stabilization, and blending of rock and vegetated features to provide strength and resilience with opportunities for habitat uplift. More alternatives will be evaluated, as needed, to thoroughly assess the opportunity to integrate natural and nature-based features into the project.

As leaders in our field, Ramboll's senior scientists and engineers have been working with the US Army Corps of Engineers (USACE) Engineering Research and Development Center (ERDC) in Vicksburg, MS, to change the Nation's conventional engineering paradigm for coastal infrastructure to include Engineering with Nature (EWN™; https://ewn.el.erdc.dren.mil/) and building with Natural and Nature-Based Features (NNBF; https://ewn.el.erdc.dren.mil/nnbf.html). Our Project Team, including Randy Mandel, and Ramboll's senior sediment practitioner and Global Practice Leader, have developed guidance with USACE ERDC on such topics as EWN™, NNBF, ecosystem services, habitat uplift, and sediment beneficial use. Creating opportunities that improve nature is part of Ramboll's DNA, and we will bring that experience of creative thinking and innovative design to the project.

Thank you for considering Ramboll for this matter. If awarded this work, we look forward to supporting the City of Duluth. Should you have any questions, please reach out to our Project Manager, Jim Hutchens, PE, at the number or email below. Ramboll looks forward to working with the City on this exciting project.

Yours sincerely

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THE CITY OF DULUTH MINNESOTA

Purchasing Division
Finance Department

Room 120
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Addendum 1 to
Solicitation 21-AA16 RFP for Coastal Resilience Research and Assessment

This addendum serves to notify all bidders of the following changes to the solicitation documents:

1. For proposal planning purposes, the anticipated budget for this project is expected to be in the area of $300,000.

Please acknowledge receipt of this Addendum by including a copy of it with your proposal.

Posted: **April 9, 2021**

2. RELEVANT PROJECTS

LAKE ONTARIO COASTAL RESILIENCY AND ECONOMIC DEVELOPMENT INITIATIVE (REDI)

At the forefront of responding to new climate challenges

CLIENT
New York Office of General Services Design & Construction
Albany, NY

LOCATION
Lake Ontario and St Lawrence River

PERIOD
2019-present

FEE
$2MM

SERVICES PROVIDED
Program management
Community engagement
Asset risk assessment
Project identification
Preliminary design
Collaborative prioritization
Reporting
Artistic renderings
Coastal management guidance document development

In response to the extended pattern of flooding along the shores of Lake Ontario and St. Lawrence River and underlying economic challenges, REDI was created to address the immediate and long-term coastal resiliency and economic development needs of these areas. REDI aimed to develop a new vision for rebuilding the Lake Ontario and St. Lawrence River shoreline, including protecting public facilities as well as enhancing natural features and processes.

Ramboll assembled a team of over 100 engineers, scientists, planners and landscape architects to implement engineering solutions across 500 miles of shoreline, over an intensive 13-week period. Work performed by Ramboll's engineering team included:

- Multi-agency coordination across 11 NY State agencies to facilitate overall project collaboration.
- Community engagement: facilitated 25 stakeholder meetings, and 15 planning committee meetings.
- Engineering site visits, data collection and asset risk assessment where over 500 assets
- Preliminary engineering to develop project profiles
- Planning committee engagement to select >100 projects for funding from a $300MM program.
- Developed 16 region-specific reports to highlight 132 selected projects and 49 artistic renderings to support community engagement.

Ramboll's engineering teams worked with regulatory and technical state experts to discuss the vast array of engineering project profiles and potential Natural and Nature Based Solutions and Blue-Green Infrastructure projects for water and wastewater projects, transportation projects, ports and marinas.

Ramboll is currently providing final design and bid services for several municipalities for REDI projects encompassing permitting and regulatory coordination, geotechnical, civil engineering, project management and stakeholder coordination for shoreline stabilization, stormwater management and infrastructure, and waterfront structure projects.

Ramboll developed 28 engineering reports providing design alternative analyses, recommendations, corresponding 10% designs, cost estimates and next steps to advance engineering and permitting processes and support fast track implementation of projects. These reports include engineering solutions for:

- Shoreline stabilization and Blue-Green infrastructure
- Barrier bar reconstruction
- Marina and public dock reconstruction
- Wastewater plant and pump station flood-proofing
- Sewer infrastructure design replacing septic systems
- Stormwater management systems
- State Parks improvement and trail development
- Roadway repair and reconstruction

Subsequent to the study phase of the program, Ramboll was retained to design several storm water pumping stations and modernization of the Town of Irondequoit Summerville WWPS to protect against flooding. A secondary and equally important aspect of the WWPS improvements is to increase flow through the sanitary collection system to protect basements from flooding. This project also includes a natural gas fire standby generator to power this station and a companion stormwater pumping station. Ramboll also performed high level evaluations of eleven wastewater pumping stations affected by elevated water levels for feasibility of the following measures:

- Harden structures & wells to reduce water intrusion
- Provisions for temporary power during flooding
- Hardening electrical systems against water damage
- Protection of sanitary sewers
- Pumping reliability to match elevated flows

Through this project, Ramboll developed a series of evaluation criteria that account for static water levels and FEMA flood criteria relative to long term disruptions. These criteria and methods can be scaled readily to other pumping stations and critical wastewater infrastructure.

PORT MILWAUKEE CAPITAL ASSETS RENEWAL PLANNING

Climate adaptation and resiliency for the future

CLIENT
Port Milwaukee

LOCATION
Milwaukee

PERIOD
2020-2021

FEE
$170,000

SERVICES PROVIDED
Asset assessment

Infrastructure inspection

Capital asset renewal plan

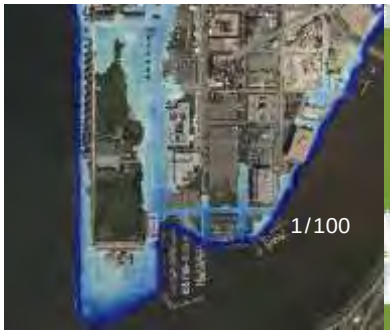
Coastal resiliency framework and alternatives analysis for asset protection

A team of experts from Ramboll are delivering a multidisciplinary approach to the creation of a capital asset renewal plan that features innovative monitoring techniques, long-term sustainability, and climate resiliency. Late in 2020, Port Milwaukee engaged Ramboll to develop an asset renewal plan for the strategic maintenance and replacement of port facilities and infrastructure. Over the last several years, the port has experienced not only an increase in annual tonnage across its docks and cruise ship activity, but also an expansion of services such as its pending agricultural commodity transload facility.

With no existing asset management plan in place, the port recognized that a long-term strategic plan for asset renewal would be key to successfully achieving its goals and positioning the port for future growth. Major categories of assets managed by Port Milwaukee include terminal buildings, warehouses, dock walls, piers, roadways, rail system, utilities, and equipment such as cranes, vessels, and fleet vehicles.

Leveraging local and global expertise, we are addressing the following key aspects of the port's asset renewal needs:

- Our strategy started with a thorough and well-documented inspection and assessment of the port's assets through multiple workshops with port leadership and staff to refine and deepen our understanding of their objectives and existing asset information.
- We are using UAS (drone) survey-based services as part of the baseline conditions assessment. The ability to tap into our UAS team enabled us to conduct an aerial tour of the port, provide high-resolution and high-accuracy mapping, and create 3D models of the area all available on demand. This data helped us guide decision making and recommendations, conduct condition assessments, and facilitate stakeholder communication.
- Through our inspection and condition assessments, we determined replacement costs, maintenance requirements and remaining useful life of the port's assets. The team presented our findings to project stakeholders, including port tenants, customers and operators.
- We are now developing the capital asset renewal plan, which will include a 10-year infrastructure renewal budget and maintenance schedule.
- We will also include a coastal resiliency framework and alternatives analysis that allows for the implementation of climate adaptation and resiliency measures throughout the life of the port.



BUSINESS CASE FOR LIVEABLE SHORELINES

Conceptual blue-green masterplan for climate resilience accompanied by a cost-benefit analysis to identify feasible socio-economic protection level

CLIENT
Department of Energy and Environment (DOEE), Washington D.C.

LOCATION
Buzzard Point, Washington D.C.

PERIOD
2017-2018

FEE
$170,000

SERVICES PROVIDED

Integrated planning and design

1D-2D hydraulic and overland flood modeling
Climate risk reduction modeling

Co-benefit simulation
Cost-Benefit Analysis

Renderings
Workshops and communication material

The Buzzard Point neighborhood in South East DC is about to go through a tremendous period of development and investment along the shoreline. The Climate Ready DC Plan identified this area as one of the most vulnerable to climate change impacts in the city. Much of the proposed development sits within high flood risk zones.

On behalf of the Department of Energy and Environment, Washington, DC, Ramboll is providing a comprehensive analysis of the impacts inflicted by storm surge, sea level rise and cloudbursts to the area and a strategy to minimize those impacts on future development through an integrated blue-green infrastructure masterplan. Strategies under consideration include a liveable shoreline, raising terrain in lower lying areas combined with protection measures on the shoreline and conveyance and retention of stormwater during cloudburst events. Both single and multiple defense lines were considered and stormwater and riverine measures are coordinated to ensure a flexible solution for the entire area.

Ramboll developed a hydrodynamic model simulating both drainage and coastal flooding under current climate conditions and those anticipated in 100 years. Ramboll proposed recommendations on climate change factors and feasible levels of protection for testing through the modeling process.

The output from the hydraulic modeling was used in a spatial climate risk model to simulate the reduced socio-economic costs over time.

A spatial simulation of the benefits of a blue-green infrastructure masterplan guided the development of the masterplan. Benefits were prioritized by stakeholders, and goals and key performance indicators were integrated with other ongoing planning in the area.

Construction costs, O&M, reduced risks and socio-economic costs and benefits were assessed in a thorough Cost-Benefit Analysis (CBA). The CBA examined the long-term feasibility of each proposed alternative and the protection levels realized by each alternative, to assess their impacts on costs and benefits.

A key component of the project was the stakeholder coordination across agencies, USACE, developers, and other stakeholders, and the balancing of priorities and goals in an integrated and feasible design. Ramboll facilitated conversations on residual risk acceptance criteria, financing models and regional protection pathways.

The final output was a conceptual, integrated, Blue-Green Infrastructure resilience masterplan accompanied by recommendation on protection levels for storm surges (1/500 year storm surge in 2100) and extreme rainfall events (1/100 year rainfall in 2100) for Buzzard Point.
The summary can be read here:
buzzard-point-report-executive-summary.pdf (ramboll.com)

3D model of the integrated resiliency plan for Buzzard Point

BLUFF STABILIZATION AND PROTECTION ON THE GREAT LAKES

Developing creative approaches to improve coastal resilience

CLIENT
Lake Bluff Community

LOCATION
Huron, NY

PERIOD
2014-2016

FEE
$30,000

SERVICES PROVIDED

- Program management
- Community engagement
- Shoreline stabilization
- Hydrodynamic and hydrology assessments
- Nature-based engineering design
- Construction bid support and construction management

On behalf of the Lake Ontario Lake Bluffs community, Ramboll designed a shoreline stabilization system that would and protect an eroding bluff that was threatening property and homes. The Lake Bluff Site consists of a drumlin located along the southern shore of Lake Ontario just east of Sodus Bay and west of the Chimney Bluffs State Park, in New York State. The area served as a campground in the late 1800s and currently is the location of dozens of summer cottages. The shoreline's geomorphic progression is nearing early maturity, and as such, the topographic projection of the Lake Bluff drumlin has been decreasing in surface area by more than 60% over the last 100 years (more than 300 feet of shoreline). As the Lake Bluff size has decreased due to the erosive forces of the Lake and increasingly severe weather events, the cottage owners have been forced to continuously move their cottages back to the point where they are now limited by the lack of real estate. This has caused property owners to take action to stabilize and minimize the erosion of the bluffs.

Ramboll used natural and nature-based innovations combined with stone armoring to control natural forces impacting the 100 foot high, almost 45º angle bluff. Those forces included waves, wind, groundwater, and rain. Geosynthetics, blown on compost material, and the installation of a shoreline irrigation system were utilized stabilize the bluff ecosystem, while an armor stone revetment was used to protect the toe of the stabilized bluff. This project demonstrated the use of natural and nature-based features for bank (bluff) stabilization, and may be used as an example for other shorelines experiencing similar bluff failure and erosional issues.

The goals of the project were to control wave, surface water, and wind erosion, as well as the perched seasonal groundwater that contributed to sloughing and destabilization. Ramboll developed a system design included both onshore and offshore armor stone revetments, implementation of groundwater mitigation controls, and an upper bluff stabilization system along the 900-foot-long by 100-foot-high bluff.

The revetment, constructed of a stone system, served as the first phase if stabilization, by protecting the bluff's toe. The revetment was designed to handle the lake's mean high water level with a 100-year wave run up. More than 10,000 tons of armor stone were placed along the base of the bluff, with each stone weighing one to two tons. The crest height was designed to be about 4.5 feet above mean high water level of Lake Ontario.

In addition to the revetment, the upper portion of the bluff was regraded and vegetated with a veneer cover system that was designed to resist erosion caused by wind and rain. The veneer cover system consisted of a seeded compost applied over a coconut fiber koir mat.

Localized slope failures occurred following the spring thaws in 2010, 2011, 2012, 2013, and 2014. These failures were primarily caused by groundwater seepage from a perched water table in the steep upper slope of the bluff. When saturated with water, the glacial till becomes a wet fluid mud with little or no structural integrity. Groundwater recharge mitigation was implemented to lessen groundwater impacts. The mitigation efforts consisted of installing a French drain system along the top of the slope and diversion of roof drains and surface water flow away from the top of the slope. Slope failure remediation was accomplished with additional riprap stone and fresh coverings of seeded compost.

The constructed shoreline remediation system has the rate of bluff recession from about 2 to 3 feet per year to less than 0.1 feet per year. lessons learned from this project are to control the ground water and/or springs that can reduced destabilize the fine-grained bluff soils, and account for extreme long term floods and water The main levels for wave run up elevations.

SPIRIT LAKE: ST. LOUIS RIVER/U.S. STEEL SUPERFUND SITE

CLIENT
US Steel, via JW Brennan

LOCATION
Duluth, MN

PERIOD
2020-present

FEE
$560,000

SERVICES PROVIDED
Program management

Preliminary and detailed designs

Reporting

Sediment and aquatic habitat feasibility studies and corrective measures analyses

Coordination with State (MPCA) and federal (USEPA GLNPO) agencies under the Great Lakes Legacy Act (GLLA) volunteer remediation program

The former Duluth Works was operated by US Steel as an integrated steel mill consisting of coke production, iron and steel-making, casting, rolling and roughing, hot and cold-finishing, galvanizing. Operations began ca. 1915 and ceased in 1979.

Ramboll's project team member, Todd Renville, assumed the role of Project Manager at a prior firm in 2013 and continues his role on the project to this day. His responsibilities include:

- Directing on-going operation and maintenance (O&M) of land-based remedies in accordance with the project Record of Decision (ROD) and 2013 Five-Year review
- Response action planning, transactional support, and Superfund delisting support for a former material storage area
- Investigation of various petroleum release areas assigned by the MPCA's Petroleum Remediation Program (PRP)
- Remedial Investigation/Feasibility Study/Remedial Design (RI/FS/RD) within portions of the site planned for a future sediment remedy.

Ramboll has provided design and engineering support at over 10 Areas of Concern (AOCs), working within the volunteer remediation framework of the Great Lakes Legacy Act (GLLA). Under the GLLA, RI/FS/RD activities prepared under Mr. Renville's direction targeted terrestrial areas of the project that continued to contribute to sediment impairments within the St. Louis River estuary.

Leading engineering and remediation under a voluntary sediment remediation program

The studies and engineering design were executed in partnership with the USEPA's Great Lakes National Program Office (GLNPO) as part of a larger effort to address beneficial use impairments within the St. Louis River Area of Concern (SLRAOC). An outcome of the RI/FS process was the selection of a preferred remedy that included dredging and complete removal of sediment exceeding acceptable MPCA human and ecological risk standards, partial removal and capping of impacted sediment posing a lower ecological risk and monitored natural attenuation (MNA) of low risk impacted sediment.

All dredged material is proposed to be consolidated within the project limits in three Confined Disposal Facilities (CDFs). Other design elements included capping of a former concrete disposal area (connected to the adjoining Atlas Cement Plant Site), hydraulic modeling associated with re-alignment of a storm water conveyance stream extending through the former coke plant settling basin, in-situ stabilization of tar seeps and hazardous lead areas, and habitat improvements within the proposed areas of disturbance.

Ramboll maintains an active role in the project, supporting the construction team that is implementing the preferred remedy. Current project activity includes completion of a post-design investigation that is intended to collect supplementary geotechnical and contaminant distribution data to aid in engineering design and refine St. Louis River estuary dredge prisms.

COLORADO EMERGENCY WATERSHED PROTECTION

Conceptual blue-green masterplan for climate resilience accompanied by a cost-benefit analysis to identify feasible socio-economic protection level

CLIENT
Department of Natural Resources – Colorado Water Conservation Board

LOCATION
Larimer, Boulder, Weld, Jefferson, Clear Creek, and El Paso Counties, Colorado USA

PERIOD
2014-2016

FEE
$850,000

SERVICES PROVIDED
Master Planning

Project Design

Biological Surveys

Oversight of Site-Specific Plant and Seed Collection and Increase

Developed 60% Designs

Reviewed 30%, 60%, 90% Designs

Restoration Oversight

Implementation

Project Closure, Monitoring, and Adaptive Management

To address the devastating effects of the September 2013 floods to Colorado's Front Range, the USDA Natural Resource Conservation Service (NRCS) partnered with the Department of Natural Resources (DNR) Colorado Water Conservation Board (CWCB) and the US Department of Housing and Urban Development (HUD) Community Development and Block Grant Disaster Recovery (CDBG-HR; DOLA) to implement Phase 2 Flood Recovery program through the Emergency Watershed Protection Program (EWP).

EWP Colorado focused on the holistic integration of multi-disciplinary teams to innovatively address flood recovery challenges and build true resiliency into resulting projects. Project criteria prioritized the protection of life and property, while uplifting ecological functions and services such as hydrology, hydraulics, scour control, sediment transport and accumulation, and increased ecological complexity by improving habitat.

Through CWCB and Local Watershed Coalitions, our Team served as the Lead Restoration Ecologists for the project's Technical Assistance Team. Our responsibilities included: (1) key native vegetation identification in local reference reaches; (2) oversight for the collection and increase of key site-specific plant materials through the Colorado State Forest Service; (3) development of 60% revegetation designs for 36 projects; (4) review project 30%, 60%, and 90% restoration designs for revegetation incorporation for 117 projects; (5) oversight of project implementation for all projects; (6) participation in project closure, monitoring, and adaptive management on behalf of the NRCS and CWCB and DOLA; and (7) led the CWCB Adaptive Management Team for Revegetation.

The project included extensive landowner outreach and interactions, volunteer planting oversight, and coordination with a broad diversity of stakeholders, including public agencies.

Following the 2013 floods, CWCB gathered a task force to develop guidance documents to assist project engineers, designers, and watershed coalitions in the design and permitting process. Members of our Team served on the task force and were co-authored or served as primary authors for the development of a bioengineering manual and revegetation matrix. The Living Streambanks Bioengineering Treatments gives guidance for the use of bioengineering treatments in stream projects. The interactive restoration matrix was developed for use during the design process. The matrix assists designers in the selection of plants for use in project revegetation and bioengineering throughout the State of Colorado based on either key plant characteristics such as root form and successional stage or site characteristics such as elevation, location, and hydrology.

3. RESUMES

EDUCATION

Bachelor of Science, Mining Engineering, University of Wisconsin – Platteville

CERTIFICATIONS

Professional Engineer - WI

Industrial Wastewater Treatment Works Operator - IL (site specific)

ASFE Fundamentals of Professional Practice

ASTM – Property Condition Assessments, Phase I ESAs

YEARS OF EXPERIENCE

30

James Hutchens, PE

SR. MANAGING CONSULTANT

Jim Hutchens has over 30 years of environmental project management experience. His responsibilities have included budgeting, scheduling and technical quality assurance/quality control (QA/QC) for subsurface investigations, site characterizations, feasibility studies and remediation system designs. Media of concern include sediment, groundwater, surface water and soil. Contaminants of concern include polychlorinated biphenyls (PCBs), dioxin, petroleum contaminants and chlorinated solvents. He has also been involved with regulatory agency negotiations for investigation and closure requirements on hundreds of contaminated sites. Jim has developed regulatory and permitting strategies and assisted in negotiations between government agencies and industry regarding compliance, investigation and remediation requirements. Jim has been active in brownfield redevelopment projects, including providing assistance with grant applications, conducting initial site assessments, identifying redevelopment opportunities and negotiating site-specific closures based on future site use.

FEATURED PROJECT EXPERIENCE

Redevelopment of 250-acre Multiple Lakefront Properties - Oak Creek, WI, Brownfield Redevelopment and Remediation, Bluff Stability - For several years, the City of Oak Creek has been working toward clean-up and redevelopment of its Lake Michigan shoreline. Most of these properties have been idle for many years and have been preceded by many more years of environmental damage due to the historical industrial use of the properties. Ramboll's efforts have included review of site conditions, identification and cost estimates of remedial alternatives. Ramboll has also performed the design and construction bid documents and contractor oversight for reshaping and relocating near bluff soils along Lake Michigan as part of the project to the north. The plan reduced the potential for erosion of contaminated fill into the lake. The area was then regraded for future development into a ribbon park with bike path located at the top of bluff. In addition, Ramboll staff prepared various documents needed for City Council approval and public meeting presentations.

Kalamazoo River Superfund Site - Kalamazoo, MI - Ramboll has provided technical and strategic consulting support to Weyerhaeuser, one of the multiple PRPs for the Kalamazoo River Superfund Site. Weyerhaeuser owns a former paper mill property that was one source of PCBs found in sediments within the Kalamazoo River. Ramboll provided remedial design and construction oversight support for an emergency action that was conducted adjacent to the landfill site. Ramboll also prepared an emergency action design, coordination, and oversight for removing PCB-impacted sediments and near water residuals along 2,600 feet of river bank. TSCA material was segregated from non-TSCA waste and managed separately. All sediment was removed to an upland treatment area where it was dewatered, stabilized and characterized for disposal. The banks were graded to a stable slope that minimized loss of valuable upland area and addressed closure or reconfiguration of existing outfalls. The reshaped banks were stabilized with a combination of engineered rip rap, mesh reinforcement and selected vegetation. The activities also included extensive turbidity monitoring of upstream and downstream water quality under the oversight of state and federal agency representatives.

ADDITIONAL PROJECT EXPERIENCE

- Project Manager Site Investigation – Sediment and Shoreline Assessment, Duluth, MN
- Project Manager Investigation, Feasibility Study and Design – Creek Entering Lake Erie, Toledo, OH
- Lake Michigan Shoreline assessment, design and construction oversight Milwaukee, WI
- Emergency Action Construction Activities adjacent to a closed landfill including the removal of PCB-contaminated sediment from the river channel, shoreline protection design, and installation and erosion control of the landfill slope, Plainwell, MI
- Design and Contractor Bid Specifications for hydraulically dredging and sand capping of a section of urban canal. Portage, WI.
- Bluff Stabilization design and construction oversight, City of Oak Creek, WI
- Investigation, Feasibility Study, Design and Construction Oversight – Sediment Removal and Shoreline Restoration, Plainwell, MI

RAMBOLL

EDUCATION

Bachelor of Science, Geology, University of Wisconsin-Eau Claire

Master of Business Administration, University of St. Thomas

CERTIFICATIONS

Professional Geologist, PG – MN

40-Hr Initial HAZWOPER Health and Safety Training

8-Hr HAZWOPER Refresher Training

8-Hr HAZWOPER Site Supervisor Training

MN Construction Site Management

MN Design of Construction SWPPP

YEARS OF EXPERIENCE

30

Todd Renville, PG

PROJECT PRINCIPAL

Todd Renville has focused much of his professional career on programs that support development of large-scale transportation and public works projects. He possesses expert knowledge of environmental compliance related to large-scale construction programs through his work as an Environmental Compliance Manager (ECM) on numerous Design-Build (DB) projects managed in collaboration with the Minnesota Department of Transportation's (MnDOT's) Office of Construction and Innovative Contracting (OCIC) and Office of Environmental Stewardship (OES). Mr. Renville has managed compliance programs that have encompassed all elements of environmental regulations affected by construction, including air quality, cultural resources, floodplain encroachment/work in waters, groundwater, hazardous materials, noise, water quality, aquatic invasive species (AIS) and wildlife/vegetation. Mr. Renville is certified in Minnesota for Construction Site Management and Design of Construction SWPPPs. Todd is currently a Gubernatorial Appointee to Minnesota's Clean Water Council and serves as Vice Chair to the committee.

FEATURED PROJECT EXPERIENCE

Project Manager/ Environmental Compliance Manager, TH 210 Reconstruction, Jay Cooke State Park, Duluth, MN - Mr. Renville was contracted through MnDOT District 1 to provide environmental oversight of all environmental elements associated with this $21.3M DB project. An extreme weather event in June 2012 caused severe slope instability and roadway damage to TH 210 within Jay Cooke State Park. The focus of this project was to correct slope instability at numerous locations and restore traffic to a roadway section that was closed since the June 2012 event. Mr. Renville was responsible for reviewing contractor environmental documents and completing oversight inspections related to National Pollutant Discharge Elimination System (NPDES) and SWPPP permit compliance, spills/hazardous materials management, cultural resources, noxious weeds, aquatic invasive species and wildlife impacts.

Project Principal, Munger Landing, Duluth, MN - Mr. Renville currently serves as a program Principal for ongoing investigation and feasibility study work occurring in the upland areas connected to the Munger Landing site. The upland areas of the project have been identified as contributing to sediment impairments within the St. Louis River Area of Concern (SLRAOC). Ramboll's near term scope of work involves investigating the distribution of polychlorinated biphenyls (PCBs) in an intermittent stream that discharges to the St. Louis River, evaluating the hydraulic/physical properties of the stream bed and larger floodplain area, performing risk characterization of potential human health and ecological impairments, and constructability reviews in advance of future remedies in the upland area.

Project Manager, St. Louis River/U.S. Steel Superfund Site, Duluth, MN - Mr. Renville assumed the role of Project Manager for the site in 2013 and directed: on-going operation and maintenance (O&M) of land-based remedies in accordance with the project Record of Decision (ROD) and 2013 Five-Year review; response action planning/transactional support/ Superfund delisting support for a material storage area; investigation of various petroleum release areas assigned by the MPCA's Petroleum Remediation Program (PRP); and Remedial Investigation/Feasibility Study/Remedial Design (RI/FS/RD) within portions of the site planned for a future sediment remedy. RI/FS/RD activities completed under Mr. Renville's direction targeted terrestrial areas of the project that continue to contribute to sediment impairments within the St. Louis River estuary.

The studies and engineering design were executed in partnership with the USEPA's Great Lakes National Program Office (GLNPO) as part of a larger effort to address beneficial use impairments within the St. Louis River Area of Concern (AOC). An outcome of the RI/FS process was the selection of a preferred remedy that included dredging and complete removal of sediment exceeding acceptable MPCA human and ecological risk standards, partial removal and capping of impacted sediment posing a lower ecological risk and monitored natural attenuation (MNA) of low risk impacted sediment. Construction of the preferred remedy began in 2020.

ADDITIONAL PROJECT EXPERIENCE

- Project Manager – TH 53 Reconstruction/Miller Creek Drainage Improvements (Contaminated Materials Support), Duluth, MN
- Project Manager – I-35 "Mega Project" Contaminated Materials Support, Duluth, MN

RAMBOLL

EDUCATION

Bachelor of Science, Forest Physiology/Genetics, Colorado State University

Graduate Studies, Forest Physiology/Genetics, Colorado State University

CERTIFICATIONS

USDA Natural Resource Conservation Service Assistant

YEARS OF EXPERIENCE

30

Randy Mandel

PRINCIPAL

Randy Mandel is a leading ecology expert and brings over 30 years of experience specializing in the use of site-specific native plants, the integration of ecological and constructed systems, and the thoughtful incorporation of native flora and fauna to over 5,000 project sites throughout his career. He co-founded and managed Rocky Mountain Native Plants Company, one of the largest container native plant nurseries in the U.S., for over 13 years. He has authored over two dozen publications and works actively with sustainability and biodiversity projects worldwide. Additionally, Mr. Mandel is serving as a contributing subject matter expert on the integration of restoration plant materials into the upcoming US Army Corps of Engineers (USACE) Engineering with Nature Natural and Nature-Based Solutions International Guidance Publications.

FEATURED PROJECT EXPERIENCE

State of New York, Department of Environmental Conservation Lake Ontario Resiliency and Economic Development Initiative (REDI), Albany, NY – Addressed immediate and long-term coastal resiliency and economic development needs along the shores of Lake Ontario and the St. Lawrence River by providing designs for natural and nature based solutions and blue-green infrastructure projects for water and wastewater. Additionally, shoreline stabilization solutions, barrier bar reconstruction, state park and trail improvement, and roadway repair and reconstruction efforts have been provided. In addition to providing the aforementioned services, collaboration with several state agencies and ongoing community engagement is crucial to this project.

Division of Natural Resources – Colorado Water Conservation Board, Emergency Watershed Protection Program, Technical Assistance Team Lead Restoration Ecologist, Denver, CO – Led the charge to address the effects of the September 2013 floods to Colorado's Front Range by composing multi-disciplinary teams. Priority in this project was focused on the protection of life and property while uplifting ecological functions and services. Responsibilities included identification of key native plant species, oversight for collection of plant materials, revegetation designs, and review of restoration projects. Additionally, follow up with restoration implementation and participation in project closing.

ADDITIONAL PROJECT EXPERIENCE

- Manager/ Lead Scientist for Natural Resources Conservation Service, Great Lakes Region, Rose Lake Plant Materials Center, East Lansing, MI
- US Army Corps of Engineers, Engineering and Research Development Center, Engineering with Nature – Natural and Nature-Based Features Guidelines Contributing Author, Vicksburg, MS
- Lake Superior Wetland Delineation and Ecological Support for Copper Mine Closure, White Pine, MI
- State of New York, Port Bay Engineering Report, Wolcott, NY

EDUCATION

Bachelor of Science, Civil Engineering, University of Missouri-Columbia

Master of Science, Civil Engineering, University of Missouri-Columbia

CERTIFICATIONS

Professional Engineer
MO, CO, WY

YEARS OF EXPERIENCE

27

David J. Heinze

SENIOR MANAGING CONSULTANT

David Heinze has 27 years of experience in environmental engineering, with a focus on site investigation and remediation. His expertise ranges from performing and managing initial due diligence through subsurface investigations and remedial actions at complicated sites under a variety of state and federal programs, including large Superfund remedial investigations and remedial actions. He has experience in the investigation and remediation of former mining sites, and has managed wastewater treatment plants at former mining sites for the removal of metals-contaminated water. He has provided expert witness testimony in matters involving the distribution, fate and source of soil and groundwater contamination. In addition, he has significant experience in the management of stream-bank stabilization and ecosystem restoration projects.

FEATURED PROJECT EXPERIENCE

Stream Restoration, Estes Park, CO, Biotechnical Engineering Design and Construction Lead Designer and Project Manager - On September 13, 2013, a one-in-500 year flood event ravaged the St. Vrain River near Lyons, Colorado. The flood devastated the watershed causing loss of life and millions of dollars in damage to homes, personal property, highways, infrastructure, and habitat. The intent of the project was to "promote overall watershed recovery and resiliency by restoring stream function and re-establishing connections between stream reaches and their associated floodplains, to protect values at risk, homes, businesses and infrastructure" (USDA, 2016). The approximate 7,400' reach was restored to protect life and property and improve the overall aquatic habitat and ecological function of the river by increasing the complexities of hydraulic habitats. The design and construction included removing flood deposited material, increasing the cross-section of the channel in places to increase conveyance and lower the water surface elevation during high flow events, adding pools-riffles, the use of root wad toe structures, channel reshaping to form bankfull benches, construction of an overflow channel, habitat and roughness rock placed in the channel and along the banks and a detailed revegetation plan for the different hydrologic zones.

Shoreline Stabilization Project, Cargill Watkins Glen Salt Facility located at the southern end of Seneca Lake in Schuyler County, NY, Lead Designer and Project Manager - Historically, fill was placed on the east side of the facility, a channel was dredged along the eastern side of the site and an approximately 660' wooden bulk head wall was constructed around the eastern and northern end of the facility. In order to stabilize the shoreline and remove the effect of the vertical structures, reduce wave energy, prevent further erosion and increase habitat around the facility, Ramboll designed an angled rock face to cover and protect the wooden and stone walls. The New York State Department of Environmental Conservation (NYSDEC) conducted an inspection following completion of the work and commented that they were "very pleased with the final grade and amount of toe stone that was placed along the existing sea walls. Beautiful work!"

ADDITIONAL PROJECT EXPERIENCE

- Project manager to design and perform construction management for stream restoration activities at the Ward Superfund Site at the Raleigh/Durham airport in NC
- Project manager for the development of natural stream channel stabilization alternatives to improve water quality discharges through an approximately 2,000 lineal foot segment of a tributary to Dardenne Creek in St. Peters, MO (Homestead Estates)

RAMBOLL

EDUCATION

Bachelor of Science, Civil Engineering, University of South Carolina

CERTIFICATIONS

Professional Engineer
PA

YEARS OF EXPERIENCE

28

Dreher Whetstone, PE

PROJECT MANAGER

Mr. Whetstone's geotechnical engineering experience includes visual inspections of earth fill and concrete/masonry gravity dams, engineering analysis/design of dams, shallow and deep foundations, braced excavations, earth retaining systems, earthen embankments, and pavements. He has served as the project manager on large and complex dam rehabilitations, many which have required FEMA grant application support for design and construction. He has performed pavement failure, foundation settlement, grouting, seismic/liquefaction evaluations, pile drivability analysis and pile load tests. Mr. Whetstone has been routinely involved with construction oversight and geotechnical "troubleshooting" evaluation on wide variety of projects including buildings, highways, airports, and marine structures. He is often called upon to make construction site visits to evaluate problems related to soil stability, earthwork construction, and groundwater intrusion. He has monitored installation of deep foundation systems including driven piles, drilled shafts, micropiles, and auger-cast piles.

FEATURED PROJECT EXPERIENCE

Bluff Stabilization and Shoreline Protection, St. Francis, WI - Task Manager for design and construction of bluff stabilization and shoreline protection structures for a commercial property on the shore of Lake Michigan in St. Francis, WI. Provided design, engineering, and construction phase services for an anchored steel sheet pile wall for stabilization of an eroding 40-foot bluff and heavy riprap at the toe of the wall system for shoreline scour protection. Additional work included calculation of design wave heights and runup, evaluation of bluff recession, and determination of design bluff recession rates with factored long-term trends in lake levels and wave action.

Rochester REDI-Grant Projects, City of Rochester, NY - Geotechnical Task Manager for continuation of the NYS REDI program for the City of Rochester. Project consists of various shoreline improvements along the West side of the Genesee River directly south of the Port of Rochester. Improvements to the East side of the river consist of flood protection structures, modifications to the Summerville WWPS and construction of a stormwater pump station for use during flood periods. Ramboll performed an evaluation of alternatives for the various flood protection structures and pump station modifications and is providing full design services and assisting with construction administration.

ADDITIONAL PROJECT EXPERIENCE

- Water Treatment Plant Flood Resiliency, Passaic Valley Water Commission, NJ, Geotechnical Engineer
- Harwood's Mill Dam, Newport News Waterworks, (FEMA Grant) VA, Managing Engineer
- Baxter Raw Water Basin Dike and Pier 264 North Rehabilitation, Philadelphia, PA, Philadelphia Water Department, Project Manager
- Inspection of Lake Alice Wildlife Management Area Dams, Chazy, NY, Geotechnical Engineer
- Dobisky Center and Municipal Marina, City of Ogdensburg, NY, Geotechnical Engineer

EDUCATION

Master of Science, Civil & Environmental Engineering – Water Resources, Clarkston University

PhD, Civil & Environmental Engineering – Water Resources, Clarkson University

CERTIFICATIONS

Professional Engineer
OH, NY, PA

Certified Flood Plain Manager (CFM)

YEARS OF EXPERIENCE

14

Ahintha Kandamby, PhD, PE, CFM

SR. CONSULTANT /SR. HYDRAULICS MODELER

Dr. Kandamby is a lead hydraulics and hydrology modeler with extensive experience in developing and working with hydrodynamic models in riverine and coastal projects. Dr. Kandamby's experience in hydrodynamic modeling includes riverine and coastal flooding and erosion assessments, simulation of tidally influenced rivers and FEMA flood insurance study development. He is experienced in the simulation of tropical and extra-tropical storms. He has performed 2-D and 3-D coupled cohesive and non-cohesive sediment transport simulations and has studied riverine and coastal morphology, riverine CFD modeling of complex flow scenarios, hydraulic jump simulations, dam design-related hydraulics, and break-water structure designs. His expertise in hydrology modeling including calculations of rainfall run off, probable maximum precipitation, gridded rainfall and Rain-on-Grid modeling simulations.

FEATURED PROJECT EXPERIENCE

Sauquoit Creek Stream Bank Stabilization & Flood Mitigation, NYS Empire State Development Corporation, Whitestown, NY, NYSDEC, Lead Hydraulics Engineer - Hydraulics and hydrology modeling, hydrologic and hydraulic analysis including the root causes of open water and ice jam flooding, evaluated mitigation alternatives, 1D and 2D mixture of cohesive and non-cohesive sediment transport modeling and erosional potential analysis. A CFD model was developed to simulate the sediment transport and design of cross-vanes and flood-benches to minimize flooding and erosion. The parameters were then selected and be used in the project design of a stable channel that reconnects to the adjacent floodplain, reduces sediment transport, and lessens the flooding impacts to adjacent properties from higher frequency storms. worked with stakeholders to identify priority projects to advance to design phase.

Hydrodynamic and Sediment Transport Study of Existing Conditions and Restoration Alternatives at Rattlesnake Island, New England Interstate Water Pollution Control Commission (NEIWPCC) and NYSDEC, Coxsackie Cove, Greene County, NY, Lead Hydraulics Engineer (1D and 2D) - The project objectives were to conduct hydrodynamic and sediment transport modeling given three dike alternatives (existing, partial (50%), and complete removal) and two discharge scenarios (one-year storm, Hurricane Irene).2-D Surface development using surveyed LiDAR point cloud data, 2-D hydrodynamic model development, coupled hydrodynamics and mixed sediment transport simulations (cohesive and non-cohesive), long-term sediment transport simulations for 30-day outcome predictions, engineering assessment reports, client meetings and final project presentations.

ADDITIONAL PROJECT EXPERIENCE

- Fairmount Dam Rehabilitation Project, Philadelphia, PA, Philadelphia Water Department, Lead Hydraulics Engineer/CFD Engineer
- Flat Rock Dam and Manayunk Schuylkill Canal Intake Structure and Spillway Improvements, Philadelphia, PA, Philadelphia Water Department, Lead Hydraulics Engineer and Senior Modeler
- Potomac Creek Dam Nos. 1 & 2 – Spillway Design and Sediment Transport Analysis, VA Dept of Conservation and Recreation, Lead Hydraulics Engineer/CFD Engineer

RAMBOLL

EDUCATION

Bachelor of Science, Geology and Environmental Health, Illinois State University

Master of Science in Engineering, Geotechnical/Geoenvironmental Engineering, Arizona State University

CERTIFICATIONS

Professional Engineer
WI, IN, IL, AZ, CO

Professional Geologist
AZ

YEARS OF EXPERIENCE

30

Frances Ackerman, PE, PG

SME/TECHNICAL MANAGER

Frances Ackerman is a professional engineer and professional geologist with nearly 30 years of experience, focusing on geotechnical engineering and water resourc es. She has managed and performed geotechnical and hydrogeological site investigations in diverse geologic settings for private and public clients. Her technical expertise includes geotechnical characterization and analyses to support water resources, power, transportation, and environmental projects, including specific technical expertise in slope stability analyses and numerical seepage modeling. Ms. Ackerman serves as an Associate Editor of the Association of Environmental and Engineering Geologist's peer-reviewed journal, Environmental & Engineering Geoscience

FEATURED PROJECT EXPERIENCE

Bluff Repair Final Design and Construction, St. Francis, WI, Project Manager and Lead Geotechnical Engineer - Planning, design, and construction of an erosion protection system along the Lake Michigan shoreline. The project scope included topographic surveys, geotechnical investigations, preliminary and final designs, and preparation construction documents. Ramboll also provided procurement and construction phase services. The system consists of a shoreline rock revetment and an anchored sheet pile retaining wall with a secondary deadman anchor wall.

Remediation and Bluff Stabilization for Future Redevelopment, Mount Pleasant, WI, CNH Industrial America LLC, Lead Geotechnical Engineer - Remediation for a 1,000-ft long shoreline protection and bluff stabilization consisting of a combined sheet pile wall and stone revetment. Ramboll provided services supporting characterization and remediation of a predominantly vacant 100-acre former industrial parcel adjacent to Lake Michigan in Racine County, WI. Remediation for the site included bluff stabilization and capping to facilitate redevelopment of the property and achieve case closure under state regulations. Shoreline protection work completed included design, permitting, and construction of over 1,000 ft of combined steel sheet pile wall and stone revetment system.

ADDITIONAL PROJECT EXPERIENCE

- TransCanada PCB - ANR Pipeline Environmental Remediation, St. John, IN, TransCanada Pipelines Limited, Task Manager and Lead Geotechnical Engineer
- Taylor Springs Dam Inspection, Temporary Siphon System Design and Construction, Taylor Springs, IL, LePetomane XXV, Project Manager and Lead Geotechnical Engineer
- Tidal Study, Tacoma, WA, Simpson Tacoma Kraft Company
- Newtown Creek Treatability Study Design, Brooklyn, NY, Newtown Creek Group, Geotechnical Task Manager
- El Rio Buckeye Levee Design Concept Report, Buckeye, AZ, Project Manager and Principal Geotechnical Engineer
- Upper Gila Valley Arroyos Dam Structural Assessments, Grant County, NM
- Tempe Town Lake Dam Replacement, Tempe, AZ, Project Manager and Senior Geotechnical Engineer
- Miner Flat Dam, White Mountain Indian Reservation, Whiteriver, AZ, Senior Geotechnical Engineer and Geotechnical Task Manager
- Mechanically Stabilized Earth Retaining Wall Mitigation, City of Tempe, AZ, Lead Geotechnical Engineer

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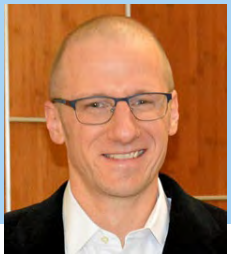


EDUCATION

Bachelor of Science, Master of Science, PhD, Ecology, SUNY College of Environmental Science and Forestry

CERTIFICATIONS

Professional Wetland Scientist

YEARS OF EXPERIENCE

16

Anthony S. Eallonardo, Jr.,PhD, PWS

SME/TECHNICAL MANAGER

Dr. Eallonardo is an ecologist leading large-scale, multi-disciplinary projects addressing areas of ecological restoration, water quality and climate resiliency. He was Ramboll's Natural Resources and Ecological Restoration lead on the Onondaga Lake Superfund cleanup program. He has also led up significant ecological restoration and planning projects including the evaluation of alternatives at Rattlesnake Island, restoration of wetlands at the Spicer Creek WMA in the Niagara River, the development of New York State's Comprehensive Invasive Species Management Plan and two fish habitat restoration projects in Areas of Concern associated with Lake Michigan.

FEATURED PROJECT EXPERIENCE

Lake Ontario Resiliency and Economic Development Initiative (REDI), NYSDEC and Office of General Services (NYSOGS), NY - Assisted in the management of a comprehensive program to engage with stakeholders, identified assets at risk of Lake Ontario flooding, developed preliminary project designs. Over 13 weeks, this fast-paced project included implementing over 40 community stakeholder and planning committee meetings, screening over 570 assets at risk of flooding and associated projects, developing preliminary designs for 132 priority projects, creating 49 artistic renderings of select projects and providing overall program management and robust stakeholder engagement. As a part of this project Dr. Eallonardo, also managed the development of a coastal management manual for homeowners.

Spicer Creek Wildlife Management Area Habitat Improvement Project, NYSDEC and NYSOGS, Niagara River, NY – Currently working with NYSDEC to provide a predesign investigation, design and permitting of a 3000-foot-long wave attenuation system intended to facilitate the restoration of riverine wetlands adjacent to the WMA in Niagara River, NY. This project included extensive hydrodynamic and sediment flux modeling to evaluate the functioning of the restoration project. This work included the development of an EPA-approved Quality Assurance Project Plan.

Onondaga Lake Superfund Cleanup Program, Industrial Client, NY - Led design and construction services for ecological restoration of 400-acres of uncapped soda ash production tailings and other pollutants along the lake's southwest shoreline and Nine Mile Creek's shoreline. This project included the creation of a 20-acre shoreline wetland complex which allowed the client to meet compensatory wetland mitigation requirements and enhanced over 6,000 feet of the shoreline.

ADDITIONAL PROJECT EXPERIENCE

- Harmful Algal Bloom (HAB) Action Plan Development, NYSDEC and NYSOGS, NY
- Onondaga Lake Superfund Cleanup Program, Industrial Client, NY
- Submerged Aquatic Vegetation Mapping and Wetland Assessments in the St. Lawrence River Area of Concern (AOC) at Massena Akwesasne, NYSDEC and NYSOGS, Massena, NY
- Hydrodynamic and Sediment Transport Study of Existing Conditions and Restoration Alternatives at Rattlesnake Island and Coxsackie Cove, New England Interstate Water Pollution Control Commission and NYSDEC, Greene County, NY

RAMBOLL

EDUCATION

Bachelor of Science, Civil Engineering, Ohio State University

CERTIFICATIONS

Professional Engineer - WI

Shoreline Protection

YEARS OF EXPERIENCE

19

Craig Harley, PE

PROJECT MANAGER

Mr. Harley, PE has extensive experience working as a civil/environmental engineer on a diverse array of projects. He has worked as a private consulting engineer and facilities environmental engineer for the Department of Navy. His expertise as a civil engineer stems from a broad focus in water resources related projects encompassing work in municipal engineering, environmental engineering, and marine civil engineering disciplines. His project focus is in port and navigational engineering projects including bulkhead and revetment construction, jetty and breakwaters repairs, dredging, sediment management, and recreational waterfront development projects such as parks, boat launches, and fishing piers. Mr. Harley has successfully managed large multidiscipline engineering and construction projects and has managed all aspects of large civil engineering projects across the project life cycle including, identifying and securing project funding, directly coordinating with various stakeholder levels (including local, state, and federal elected officials to corporate board members and officers), alternatives analysis, design engineering, contracting and procurement, construction, and operation and maintenance.

FEATURED PROJECT EXPERIENCE

Capital Asset Renewal Plan, Port Milwaukee, Project Manager - Ramboll is currently providing planning services to Port Milwaukee for the establishment of a Capital Asset Renewal Plan (CARP) that comprehensively addresses deficiencies in port facilities and infrastructure and establishes a maintenance and replacement schedule. The CARP serves as a tool for Port Milwaukee to strategically plan significant improvements to port facilities and develop funding strategies for long-term asset repair and replacement. The CARP provides a high level, long-term action plan for asset renewal for a 50-year period and considers key factors influencing asset renewal planning at the port including the port's goals, stakeholder input, and long-term trends in coastal conditions and infrastructure resiliency to those conditions. For this project Mr. Harley serves as the Project Manager and provides lead technical support for condition assessment and renewal planning for dockwall and building structures. A key part of this project is the assessment of impacts of projected high and low Lake Michigan water levels on the port's facilities to support strategic asset renewal planning.

Bluff Stabilization and Shoreline Protection, St. Francis, WI - Lead engineer for design and construction of bluff stabilization and shoreline protection structures for a commercial property on the shore of Lake Michigan in St. Francis, WI. Provided design, engineering, and construction phase services for an anchored steel sheet pile wall for stabilization of an eroding 40-foot bluff and shoreline protection at the toe of the wall system for scour protection. Additional work included calculation of design wave heights and runup, evaluation of bluff recession, and determination of design bluff recession rate which factored long term trends in lake levels and wave action.

ADDITIONAL PROJECT EXPERIENCE

- CNH Industrial Lakeside Property Shoreline Protection Barrier, Mount Pleasant, WI
- Car Ferry Dock Facility Improvement Design, Manitowoc, WI, Project Manager and Lead Engineer
- Breakwater Improvement Project, City of Port Washington, WI, Project Engineer / Project Manager
- Lakeshore State Park Quiet Basin Fish Habitat Improvements, University of WI, Marine Engineer

RAMBOLL

EDUCATION

Bachelor of Science, Civil Engineering, Drexel University

Master of Business Administration, St. Joseph's University

TRAINING

MCACES MII Basic (USACE approved estimating system

YEARS OF EXPERIENCE

36

James Quinn

CONSTRUCTION ENGINEERING MANAGER

Mr. Quinn offers over 35 years of experience in the design, development, and construction of complex civil engineering works, including water resource infrastructure and marine facilities, general building and historic preservation, aviation, rail transit, and roadway and bridge transportation projects. His experience includes safety audits, quality control administration, site assessments, engineering design, constructability reviews, cost estimating, value engineering, scheduling, project management, payment requisitions, SBA and DBE compliance, failure investigations, and dispute resolutions. Mr. Quinn utilizes his experience in deep foundations; protection of excavations; temporary cofferdams; control of marine and water resource structures; heavy civil construction; and engineered risk evaluations to develop cost-effective design solutions on a wide variety of dam and reservoir capital improvement projects. His responsibilities on project oversight and design-build assignments include team selection and supervision of technical staff and subcontractors to ensure timely project completion, satisfactory fiscal performance, and client satisfaction.

ADDITIONAL PROJECT EXPERIENCE

- City of Philadelphia Water Department, Flat Rock Dam and Manayunk Schuylkill Canal, PA
- City of Jersey City, Boonton Reservoir Dam, Boonton, NJ
- Tennessee Valley Authority (TVA), Stress and Stability Assessment of Normandy Dam, TN
- Rome Barge Canal Waterfront Village Redevelopment, City of Rome, NY

FEATURED PROJECT EXPERIENCE

Grundy Foundation, Bulkhead Rehabilitation Project, Bristol, PA, Project Manager – Design and construction of an anchored steel sheet pile bulkhead in a location inaccessible by conventional equipment. The access restriction was solved by precasting concrete dead men anchors in the equipment facility and installing the units with the marine equipment.

City of Philadelphia, Belmont Reservoir Reconstruction, Philadelphia PA, Project Manager – Performed a constructability review and provided cost estimates for the planning phase for the Belmont Raw Water Basin reconstruction project. Performed construction management oversight on the $20 M+ project. The project includes bulk and selective demolition, steel sheetpile cofferdam with multiple walers and tie-back anchors, structural concrete with rock anchors, subgrade preparation, soil/cement slope protection, and water process piping improvements.

Utica Harbor Redevelopment, Utica, NY, Project Manager –Managed the design development for an anchored steel sheet pile bulkhead wall to replace an early 1900's structurally deficient concrete seawall, as part of the Harbor revitalization program.

Schuylkill River Development Council, Tidal Schuylkill River Master Plan, Philadelphia, PA, Project Representative – Multi-discipline team engaged to assess the past, present, and future use of the area encompassing the east and west banks of the Schuylkill River from the Art Museum to the confluence with the Delaware River. A comprehensive master plan was generated based on contingent stakeholders, residential and commercial real estate interests, manufacturing facilities, utility corridors, and transportation channels.

Delaware Dikes Improvement Program, New Castle, DE – Performed project pre-planning alternative reviews and provided cost estimates to address deficiencies in a group of levees (Army Creek, Broad Marsh, Buttonwood, Gambacorda, and Red Lion Dikes) that protect New Castle County from overtopping the Delaware River. Project elements include clearing and grubbing, excavation and embankment, replacement of riprap shore protection including stone bedding and geotextile fabric, reconstruction of aggregate and bituminous roadways, and reconstruction of stabilized vegetated slopes.

City of Philadelphia, Belmont Reservoir Reconstruction, Philadelphia PA, Project Manager – Performed a constructability review and provided cost estimates for the planning phase for the Belmont Raw Water Basin reconstruction project. Performed construction management oversight on the $20 M+ project. The project includes bulk and selective demolition, steel sheetpile cofferdam with multiple walers and tie-back anchors, structural concrete with rock anchors, subgrade preparation, soil/cement slope protection, and water process piping improvements.

RAMBOLL

4. PROPOSAL WORK PLAN

4. PROPOSAL WORK PLAN

4.1 Project Understanding

This work plan describes Ramboll's understanding of the scope of work in response to RFP 21-AA1 6, *Coastal Infrastructure Resilience Research & Assessment*. Work under this project entails providing the City of Duluth with practical solutions to address sand erosion and bank failures and corresponding infrastructure risks along the North Shore of Lake Superior, from Brighton Beach to the French River, and select areas in the St. Louis River Estuary and select areas on Minnesota Point. Infrastructure risks may include impacts to storm and sanitary conveyance systems, water utilities, and transportation infrastructure. The objectives of this project are to identify and demonstrate economically feasible methods for reducing shoreline erosion and failure and to provide data and recommendations, including asset protection, that could be used in similar situations and locations along the lakeshore.

Ramboll's approach to developing an efficient and appropriately scaled shoreline risk assessment starts by completing a thorough and well documented assessment of the shoreline including City, St. Louis County, and State-owned assets. An initial step in this process is to meet with City of Duluth personnel to refine our understanding of the objectives and gain deeper understanding of existing shoreline condition and asset information.

The Study Area identified in the RFP included the following

1. North Shore Scenic Drive Segment #1: Length: 8.7 miles Jurisdiction: St Louis County, as owner of County State Aid Highway 61: Vulnerable Public Infrastructure: Road, stormwater, sewer, and wayside infrastructure located close to coastal bluffs. Associated Private Property: Homes that, at present, may only be accessed via North Shore Scenic Drive.
2. North Shore Drive Segment #2: Length: 4.5 miles Jurisdiction: City of Duluth: Vulnerable Public Infrastructure: Road, stormwater, sewer, potable water, and wayside infrastructure located close to coastal bluffs. Associated Private Property: Homes that, at present, may only be accessed via North Shore Scenic Drive.
3. Isolated Coastal Assets: Utility lift stations at 60th Avenue East and 23rd Avenue East: Jurisdiction: City of Duluth: Vulnerable Public Infrastructure: Lift stations Associated Private Property: None
4. Park Point South: Jurisdiction: City of Duluth: Vulnerable Public Infrastructure: Road, boat access, and parking lots. Associated Private Property: None

These projects are technically complex and require an advanced understanding of the physical environment including storm impacts and local geology, along with permitting requirements and stakeholder perspectives. The City of Duluth is uniquely interested in natural and nature-based features and green engineering infrastructure projects. Projects likely will require solutions that blend "green" and "gray" engineering features to optimize habitat and promote long-term resiliency.

Our Midwest-based Team, with leadership in Minnesota and work experience in Duluth, is intimately aware of the sensitivities and the beauty of Duluth's coastline. We will balance the level of detail of our inspection to provide an efficient and reliable assessment of the shoreline and associated assets.

Our approach to developing a coastal resiliency framework for the City of Duluth is detailed below.

This project element speaks directly to our expertise in supporting a number of other clients situated in the Great Lakes, throughout the US, and globally where climate adaptation planning and resiliency measures are being incorporated into their waterfront projects.

4.2 Proposed Scope of Services

The project is divided into three major tasks, aligned with the RFP. Following a kickoff meeting, Ramboll will implement the following tasks:

a) **Shoreline Risk Assessment:** Conduct a risk assessment for coastal erosion and flooding
b) **Feasibility Study:** Develop potential mitigation remedies for vulnerable assets
c) **Grant Application:** Provide pre-disaster mitigation grant application support

4.2.1 Kickoff meeting

Following award and contracting procedures, a kick-off meeting will be held to ensure that all parties have a clear understanding of the project scope and schedule. The kickoff meeting provides an important opportunity for the Ramboll Team and the City of Duluth representatives to get acquainted and for Ramboll to better understand the City's priorities. In our experience, building trust amongst all project team members ensures project success and highly effective outcomes. While we hope to be able to conduct the kick-off meeting in person, the COVID-19 pandemic may require an on-line meeting. As an international company, Ramboll is well-versed and practiced with working collaboratively across national and international boundaries on a virtual basis and will work with the City to adjust accordingly. During this unprecedented time, Ramboll policies and protocols help ensure the health and safety of its employees. Those policies and protocols will be implemented, particularly with respect to site visits, field work, and client visits. The kickoff meeting reaffirms the scope, schedule, and budget that the City of Duluth and the Team will use for the duration of the project. As goals and objectives are clearly communicated, they can be fully realized and implemented.

4.2.2 Shoreline Risk Assessment

Ramboll will conduct a risk assessment for coastal erosion and flooding along the shoreline of Lake Superior in the vicinity of the City of Duluth, extending from Brighton Beach to the French River, and including select areas in the St. Louis River Estuary and on Minnesota Point. The risk assessment will include the following tasks:

- Develop **shoreline erosion estimates** using deterministic and probabilistic methods incorporating hydraulic modeling, historic trends and climate change forecasts, lake level variability, and coastal storms with different intensities and frequencies. The erosion model will address the importance of local bedrock and glacial geology, coastal geomorphology, and hydrogeology.
- Identify **critical public infrastructure assets**, including utility infrastructure, flood or retaining walls, and public gathering spaces, roadways, and pedestrian/bike trails, vulnerable to shoreline erosion and wave hazards.
- Conduct a **Visual Condition Assessment** of critical assets that are not buried or submerged.
- Develop a **risk matrix** for all assets assessed including current condition, likelihood of failure, and consequence of failure.
- For critical infrastructure assets, **prioritize** the removal and replacement/relocation, upgrades, or fortification based on risks.
- Assess the **functional and financial consequences** to assets over time if no action is taken.

Ramboll will develop shoreline erosion estimates using deterministic and probabilistic methods incorporating hydraulic modeling, historic trends and climate change forecasts, the potential variability of the lake levels and coastal storms with different intensities and frequencies. Erosion models will address the importance of local bedrock and glacial geology, coastal geomorphology, and hydrogeology. Using US Army Corp of Engineers (USACE) and US Geological Survey (USGS) published and predicted future flood levels for Lake Superior and topographic levels of the shorelines, we will review the resilience of the existing shoreline in future years during flood events.

Modeling

The Ramboll Modeling Team will collect the best publicly available bathymetric data to develop a surface for the numerical coastal modeling. The National Oceanic and Atmospheric Administration (NOAA), National Center for Environmental Information Great Lakes Bathymetry program (https://www.ngdc.noaa.gov/mgg/greatlakes/greatlakes.html) maintains gridded bathymetric data for the area in question. Wind, wave and stage information will be obtained from the NOAA Great Lakes Environmental Research Laboratory (GLERL: https://www.glerl.noaa.gov/data/) for the station nearest to the project site.

A numerical costal hydrodynamics 2-D model, using the MIKE-21 or comparable platform, will be used to model the ~7-mile shoreline from Brighton beach to the French River. The numerical coastal model will derive the near shore wave heights and water levels due to the wind effects. Data from NOAA GLERL sites will be used to populate the required model data. The shoreline sediment grain size distribution will be repurposed from published reports. If reports are not available, sediment sampling may be recommended for testing at select locations within the project site.

Ramboll will develop shoreline erosion estimates using deterministic and probabilistic methods incorporating hydraulic modeling, historic trends, climate change forecasts, and the variability of the lake levels associated with coastal storms of different intensities and frequencies

The model will be executed for the baseline hydrodynamic and sediment transport conditions taking the existing bathymetry and data into account. The proposed condition simulation builds upon the baseline by adding the geometry of proposed resiliency measures to the baseline surface and executed for the same wind, wave, and stage conditions. This approach will address the assessment of costal erosion and flooding along the shoreline and provide the adequate wave heights and flood water levels.

The information from the coastal hydrodynamic modeling can be used to evaluate the status of flooding and flood damages to critical public infrastructures. This information should be sufficient to develop a Risk Matrix to identify the likelihood of failure and make any high-level decision.

If the project requires more detailed flooding information and modeling an additional more focused and localized 2-D flood modeling may be recommended using the USACE HEC-RAS. The HEC-RAS models will use the information already derived from the MIKE-21 (or comparable) costal modeling and re-run the inland hydrodynamics with more detailed information such as First Flood Elevation (FFE) of critical structures considered. These simulations can derive more detailed information of localized flooding and flood damages at more granular level assisting to make more informed decisions.

Infrastructure Surveys

Ramboll is aware that the City of Duluth is focused on understanding the successes and challenges of establishing and maintaining robust *Natural and Nature-Based* coastal resilience solutions. Our Team has extensive experience in designing and implementing nature-based solutions and monitoring such solutions to understand their longevity and the conditions in which they thrive.

Development of potential mitigation remedies for vulnerable assets begins with a clear understanding of erosion forces, shoreline risks, and mitigation needs. Ramboll will develop maps of shoreline areas based on shoreline erosion potential, existing infrastructure, and existing and planned future uses.

These maps will include impacted shoreline and critical infrastructure and mitigation needs. We are aware that some performance goals may appear to conflict with others such as restoring nature and attenuating flooding, while also enhancing economic development. Based on our experience, we believe there are ways in which seemingly varying resilience services can be aligned to provide multiple benefits, such as a shoreline area that both offers flood protection services and social cohesion, and potentially increases property values within the surrounding neighborhood.

Ramboll has extensive experience in designing and implementing nature-based solutions and monitoring such solutions to understand their longevity and the conditions in which they thrive.

The identification of critical public infrastructure assets, including utility infrastructure, flood or retaining walls, and public gathering spaces, roadways, and pedestrian/bike trails, vulnerable to shoreline erosion and wave hazards, includes careful assessment of the following features:

- **Dockwalls:** For inspection and assessment of waterfront infrastructure including bulkheads, seawalls, revetments, quay structures, and floating structures, Ramboll will adhere to the standards of practice described in ASCE Manuals and Reports on Engineering Practice No. 130: *Waterfront Facility Inspection and Assessment*. Ramboll will perform a routine (Level I) inspection of waterfront facilities which generally includes a visual/tactile inspection of topside and above water components of the structures. As with the building structures, the inspection could be supplemented with drone imagery to optimize the in-person inspection of waterfront facilities, which will use a boat for access. Below water assessments are not included in this proposal. Specific areas will be identified during the initial inspection where below water inspections may be needed to sufficiently determine condition and remaining useful life. For those locations, Ramboll with work with the City to identify appropriate measures.
- **Structures:** A visual inspection will be performed on above ground shoreline features maintained by the City or County. Intrusive methods of inspection such as removal and replacement of wall sheeting, floor decking for exposure of structural members will not be performed. Access to roof areas, small spaces, or other locations will be limited to those that can be accessed safely without the need for ladders, hoists, or other access equipment. We understand that the City will be obtaining aerial drone photography prior to the execution of the project, which will be used by Ramboll as part of this assessment.

Based on the format of the drone flyover, Ramboll may be able to use this information to upload to RamView360, a Ramboll designed software that provides a "Google Streetview-like approach" to sharing and exploring aerial imagery. The City, or other relevant stakeholders will be able to explore the shoreline and understand their site infrastructure with greater clarity. This is a collaboration tool that provides remote users a greater understanding of the site layout.

- **Fencing:** We will record the location, type, height, and condition of fences. Fence records will be used in our asset survey, to group similar fence unit types together to demonstrate the diversity of the maintenance regime and where rationalization could be achieved to enable bulk-buying of future replacement and economies in the maintenance management of fencing.
- **Green Infrastructure and Public Spaces:** Green infrastructure and public spaces will be assessed for condition using standard methods. While a general assessment of park and green landscape conditions is possible, focus will be on damage associated with natural forces, including storms, flooding, and wave energy. Historical aerial photographs, if available, may be used to quantify decades-long erosion processes and rates, comparing them to more recent phenomena. Assessment will include evaluation of opportunities for enhancement and habitat uplift through integration of Engineering with Nature and Nature-Based Solutions. Consideration of ecological improvement for habitat and inherent features will be prioritized for these areas.
- **Pavement and Roads:** Pavement and roads will be assessed using the Pavement Surface Evaluation and Rating (PASER) method developed by the University of Wisconsin-Madison Transportation Information System. This widely used method provides for an efficient means of assessing and rating surface condition of pavements to support planning for maintenance and repair needs as well as improvements. The inventory of roads will be divided in logical sections and a PAVER rating applied to each section. When developing strategies for pavements, Ramboll will look for opportunities to identify specific loading and wear conditions associated with activities that lend themselves to an improvement or modification project that reduces long term maintenance costs. Additionally, level of service will be examined on roadway section for areas of improvement.
- **Utilities:** City and County assets in the utilities category are assumed to primarily include onsite electrical, sanitary, and storm drainage services outside the mains. The majority of these assets are expected to be buried, and therefore inspection and condition assessment will largely be driven by review of facility records regarding age and construction of the utility, and the rate of erosion as it approaches utilities. Above ground utility facilities will be visually assessed. Storm sewers and outfalls identified as City assets will be visually inspected as accessible. For this category, Ramboll has assumes that the City has sufficient records of subsurface utility locations to understand the utility age, construction, network, and connections, and that that information will be made available upon award.

Task Deliverable

Ramboll will prepare and submit a report that summarizes findings, identifies challenges and quantifies coastal erosion risks, and identifies opportunities for improvement. The report will include the following elements:

- Visual survey results
- Hydrodynamic analyses and modeling results, quantifying erosion and wave energy and forces
- Shoreline risks, and risks to existing infrastructure elements

The report will include a matrix of structural and non-structural elements and their current conditions and long-term risks, including projected erosion rates and areas where enhanced protection is needed.

The report will be reviewed with the City of Duluth. Ramboll will present results of this task in a PowerPoint presentation to communicate our findings, seeking direct input from the City. That input will be integrated into the draft report, which will be revised following the City's review and input. The revised report will provide responses to comments and a revised report that includes a "clean" version and a redline-strikeout (RLSO) version showing changes that incorporate the City's feedback.

Task Assumptions

The following assumptions were used to develop the cost estimate for this task:

1. *Hydrodynamic model input*. Hydrodynamic modeling and shoreline erosion analyses require detailed data input measuring the physical environment. Such input typically includes bathymetry, water elevations and current information during normal and high-energy events (such events may include storms and high-winds or both), shoreline elevations (e.g., LiDAR), and geotechnical information (collected from shoreline geotechnical borings). For the purposes of this proposal, field activities to collect this information are not included, and it is assumed that this information is readily available upon award. If this information is not available, Ramboll will work with the City of Duluth to identify data needs and to propose field measurements to support the hydrodynamic modeling and shoreline erosion analyses.
2. *Model Framework*. The MIKE-21 or equivalent modeling framework (https://www.mikepoweredbydhi.com/) will be used. HEC-RAS modeling is not included in the estimate and may be included later if needed and valued to understand upland watershed impacts.
3. *LiDAR Survey*. The City is conducting a high-resolution LiDAR survey. Results of the survey will be made available to the project team, along with past historical surveys.

4.2.3 Shoreline Mitigation Feasibility Study

Ramboll will prepare a Shoreline Mitigation Feasibility Study (SMFS) to identify, quantify, and screen potential mitigation remedies for vulnerable assets in the project area. The SMFS will incorporate applicable design requirements to establish a fundamental understanding of shoreline mitigation alternatives. Consistent with the RFP, our approach will include the following elements:

- *A cursory map of shoreline areas impacted*. The maps will identify high risk public infrastructure. Impacted shorelines will be prioritized based on shoreline erosion potential, rates of erosion, and risks to critical infrastructure.
- Concept level drawings. Drawings will include highly or moderately impacted shoreline areas and critical infrastructure components, along with possible mitigation strategies for each respective shoreline area or element. Some strategies may encompass broad swaths of shoreline and multiple infrastructure components, while others may be highly specific, protecting specific elements. The maps will be prepared accordingly, to characterize and elucidate risk while also showing potential mitigation measures.
- Upon review of shoreline risks and shoreline mitigation measures with the City, Ramboll will develop Probable Construction/Removal/Replacement Costs for each alternative. These "FS-level" costs will be based on experience, local construction costs and experience, and the level of effort associated with each alternative.
- A Permit Matrix will be developed to identify permit requirements for the various mitigation alternatives.

- Public and stakeholder priorities will be assessed, working closely with the City and the Public Communications contractor. We recognize that there are multiple and varying interests in the condition, maintenance planning, and determining level of service of the City's shoreline. Soliciting input from all stakeholders will be key to development of an efficient and effective resiliency plan. Working with the Public Communications contractor, the evaluation of public and stakeholder priorities will assess public concerns with alternatives and the likelihood of public acceptance.
- Requirements for further engineering studies, environmental permitting, and historic property impacts will summarized.

Coastal resiliency alternatives may include:

- Demountable temporary flood defense structures
- Earthwork bunds
- Structural flood walls
- Raising of the quayside and paving to meet the flood defense level

Each of the options will also be considered in relation to the condition and usage and therefore whether the options should be implemented as part of future response or whether temporary invention is required. This will all be included in a risk matrix detailing current condition, likelihood of failure and consequences of failure.

The remedy evaluation also will promote Engineering with Nature (EWN™), by focusing on and promoting natural and nature-based features. Such features will focus on shoreline stability combined with offshore energy dissipation to reduce the natural energies and erosive forces associated with currents, waves, winds, and groundwater. In doing so, the proposed restoration will use advance innovative design approaches to shift the paradigm from solely employing hardened or grey remedies to a blend of sustainable green and grey approaches that increase resiliency despite changing shoreline conditions and lake water levels.

Unfortunately, traditional, hardened approaches remain common, such as steel piling, armor stone revetment, and concrete bulkheads / quays. Traditional approaches also may include utility relocation, if utilities cannot be protected. These remedies are still widely used within the Great Lakes basin, but often diminish or fail to provide any ecological value to fish and wildlife species.

The remedy evaluation will promote Engineering with Nature (EWN™), by focusing on and promoting natural and nature-based features, and combining green and grey infrastructure elements.

For these reasons, the Ramboll team will carefully evaluate innovative solutions that changes the thinking on how best to protect vulnerable assets, using solutions that are both nature-based in approach yet robust and resilient enough to stabilize the shore and adapt to future changing conditions. Some of the innovative approaches include the use of high-resolution remote sensing techniques and hydrologic modeling to inform every stage of the design, including under future conditions, as well as the creation of improved ecological function and services through an in-depth initial ecological survey. An ecological survey will provide a design baseline for how and where to incorporate appropriate site-specific native plant communities and other nature-based features for enhanced project biostabilization, resilience, and habitat both on and offshore.

Integrated Green/Gray Coastal Resiliency Approach

Ramboll will use an integrated approach that combines green and grey-solutions and associated best practices to protect critical infrastructure, restore habitat, and provide long-term resiliency. This integrated approach recognizes the need for some hardened infrastructure, while also recognizing the limitations of such infrastructure to provide habitat and aesthetic value. Green infrastructure methods under consideration may include:

1) Shoreline habitat nourishment paired with biostabilization measures such as native vegetation, root wad structures, and vegetated riprap to stabilize green spaces and provide habitat to native species (Figure 1).
2) Artificial reef structures (Figure 2) appropriately spaced along the shore to assist with wave-energy attenuation to reduce erosive forces along the coastline and provide fishery habitat and opportunities for recreational fishing. In addition to providing habitat, such structures can be used to attenuate wave energy during storm and high-wind events.

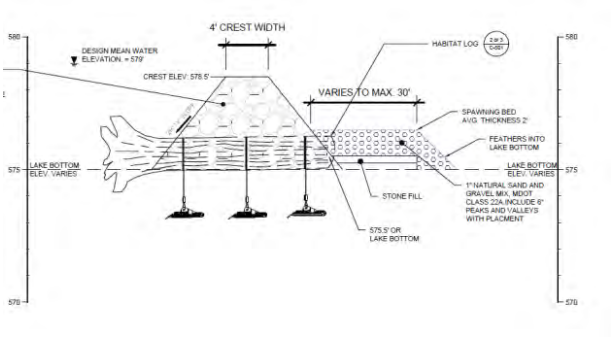


Figure 1. *Example nature-based, artificial reef structure providing shoreline protection as well as spawning habitat.*

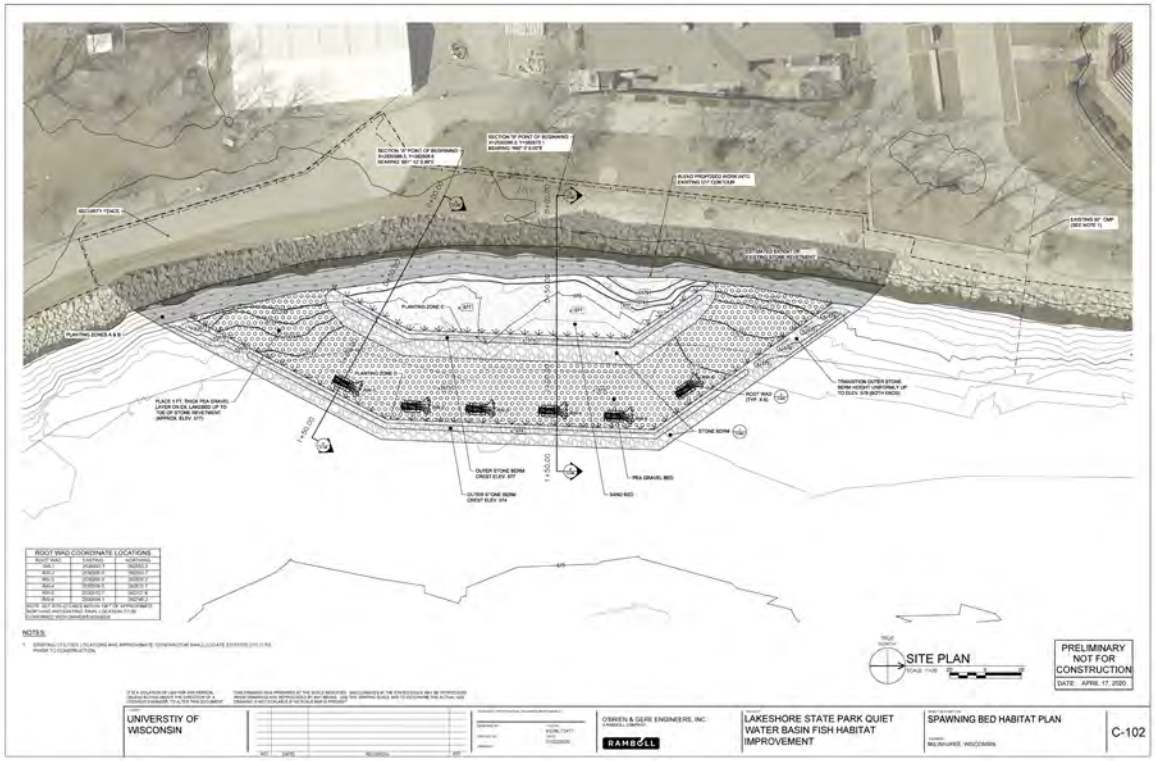
3) Living shorelines, such as modeled after the National Oceanic and Atmospheric Administration (NOAA) Systems Approach to Geomorphic Engineering (SAGE 2015) Natural Structural Measures for Shoreline Stabilization. See Figure 3 for examples.
4) Blending of inorganic (i.e., rock) and vegetated (e.g., tree or root wad structures) materials to provide added habitat when stabilizing the shoreline.

By using various methods in combination, the project design will result in a multiple lines of defense strategy supporting long-term habitat resiliency and critical-infrastructure protection.

Deliverable

The remedy evaluation process will include multiple deliverables, providing multiple opportunities for interaction with the City and other stakeholders.

Preliminary concepts will be developed and communicated graphically using PowerPoint or a similar format. This will allow Ramboll to communicate concepts to the City, including benefits and limitations of different technologies and where and how they may be applied to the areas of interest. We anticipate multiple iterations of the presentation approach, involving a preliminary, scoping discussion to exchange ideas, followed by a more formal presentation of remedy alternatives, culminating in a final presentation for City and Stakeholder reviews.



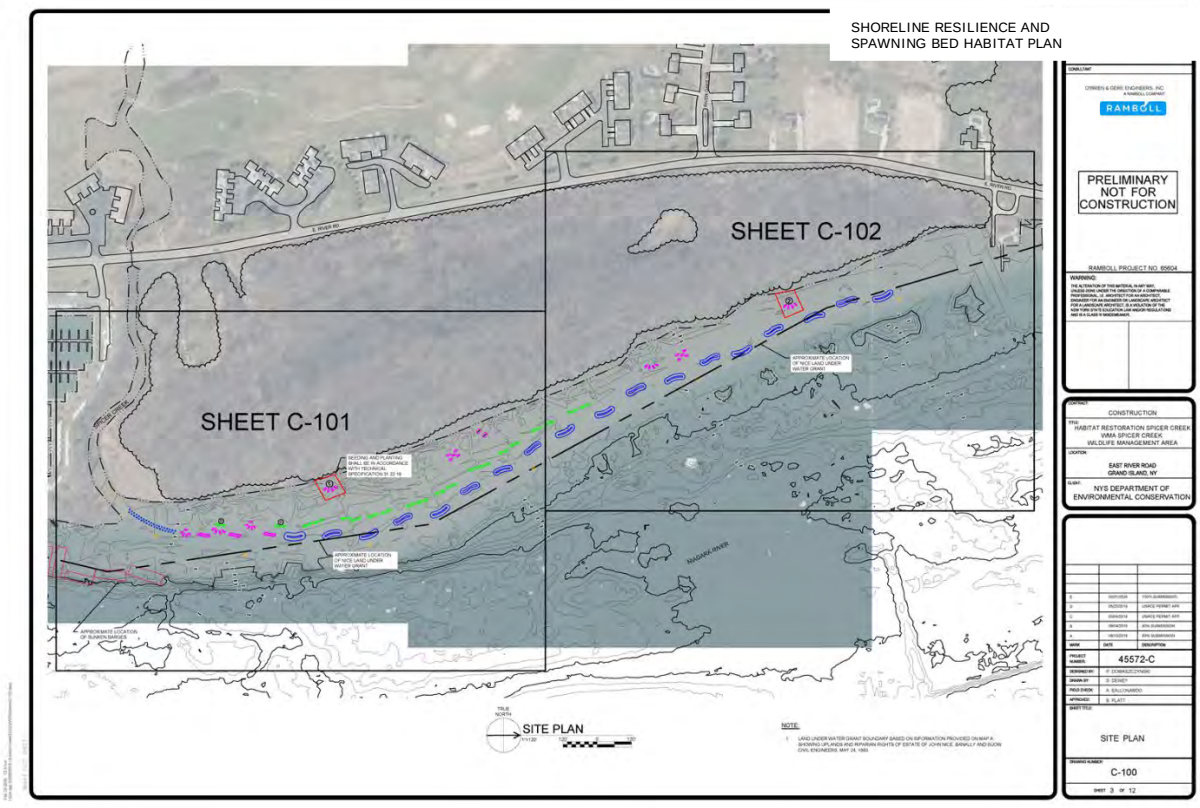


Figure 2. *Examples of reef-like structures promoting shoreline protection at two sites, in Lake Michigan Wisconsin (top figure) and in Spicer Creek New York (bottom figure).*

Figure 3. *Bank stabilization measures in a Midwest river, subject to annual high-water flooding events. Examples include (a-c) use of geosynthetic bags and deep-rooted native plants (e.g., willows), (d) shoreline landscaping to include a hardened bank combined with constructed natural on-land habitat, and (e-f) geoweb-stabilized soils combined with deep-rooted native plants.*

Once concepts are finalized with the City, Ramboll will prepare a SMFS Report that documents our findings. The SMFS will include conceptual designs of remedies and will consider the following outcomes: 1) the extent to which alternatives combine green and grey solutions to provide shoreline and infrastructure protection, 2) conceptual designs that restore the shoreline within the project area, 3) extent to which proposed remedies provide long-term resiliency against flooding, wave action, and other forces to protect infrastructure, habitat, and a popular tourist destinations while creating ecological uplift and improved provision of ecological functions and services.

The SMFS will systematically evaluate alternatives against pre-determined evaluation criteria Evaluation criteria, to be discussed with the City, may include the following:

- Long-term effectiveness and permanence
- Implementability
- Habitat uplift
- Operation and maintenance requirements
- Costs, including capital and maintenance costs

The analysis will consider that the proposed design plans provide long-term resiliency under high and low-water lake conditions, recognizing that the Great Lakes watershed is a dynamic system that must function under a range of water elevations.

The SMFS will conclude with one or more recommended remedy alternatives for evaluation by the City and other Stakeholders.

Assumptions

The following assumptions were used to develop the cost estimate for this task:

1. *Conceptual level designs*. Preliminary designs will have sufficient detail to evaluate remedy alternatives and costs.
2. *Cost estimates*. FS-level cost estimates will be produced to provide relative comparisons among alternatives and to allow the City of Duluth to budget for the selected alternative(s).
3. *Communications*. Ramboll will work hand in hand with the Public Communications contractor to solicit input from the public and other stakeholders, as directed by the City.
4. *Report reviews*. The SMFS will undergo one thorough review. Ramboll will submit a draft report, which will undergo City and Stakeholder reviews, followed by a "draft-Final" report. The purpose of the draft-Final is to allow for summary reviews to catch minor changes and does not involve a substantive technical review. After approval to finalize the SMFS, Ramboll will submit a final report.

4.2.4 Grant Application and Identification of Potential Funding Sources

The City of Duluth intends to apply for grants, likely including a FEMA Hazard Mitigation grant, to cost-effectively increase the resilience of coastal infrastructure given climate-driven increases in the frequency and severity of coastal storms and rising lake level on the coast of Lake Superior in St. Louis County, Minnesota. In addition to this grant program Ramboll will review various shoreline and/or brownfield grant programs to determine if other funding sources may be available to the City.

Ramboll's pre-disaster mitigation grant application support will include a proposed project description, and conceptual design drawings and a cost estimate for advancement of environmental permitting, design, construction and project management. The cost estimate will be modeled on requirements of a FEMA-level cost analysis for the preferred alternative(s). As such, costs will meet FEMA requirements as follows:

- Costs will be prepared by a licensed Professional Engineer or other estimating professional, such as a licensed architect or certified professional cost estimator who can certify that the estimate was prepared in accordance with industry standards.
- The cost estimate will include certification that the estimated cost directly corresponds to the repair of the agreed upon damage and the scope of the selected alternative(s).
- Costs will be based on unit costs for each component of the scope of work (SOW) and not a lump sum amount.
- Costs will contain a level of detail sufficient for FEMA to validate that all remedy components comply with the agreed upon SOW.
- Costs must be reasonable and as such will adhere to industry standards.

Ramboll also has experience with other granting institutions, including and not limited to the National Fish and Wildlife Foundation (NFWF) National Coastal Resiliency Fund (NCRF).[1] We have helped coastal municipalities win multiple awards through this funding mechanism and will bring our knowledge and experience of NFWF to this project. The goal of NCRF is to fund projects that restore, increase and strengthen natural infrastructure to protect coastal communities while also enhancing habitats for fish and wildlife. Combined green and gray infrastructure projects may be ideally suited to NFWF grants.

Deliverables

The deliverables for this task will include the following:

- Conceptual-level drawings for the selected remedy.
- A detailed cost estimate for the selected remedy, in accordance with the goals stated above.
- A completed grant application to a federal or other granting agency, as directed by the City and following discussions with the Ramboll Team regarding the ideal granting opportunity for the selected remedy.

Assumptions

1. Ramboll will prepare one complete grant application for the proposed remedy. If multiple grants are targeted, much of the original content may be leveraged for additional grants.
2. The grant will target one remedy, or a single group of remedies, targeting the length of the shoreline of interest.
3. Conceptual-level design drawings and details will be commensurate with FEMA requirements and requirements of the granting authority.
4. Cost estimating will be commensurate with FEMA requirements and requirements of the granting authority.

[1] For more information about NFWF, go to: https://www.nfwf.org/programs/national-coastal-resilience-fund.

4.3 Timeline

Adherence to the project schedule is one of the most important tools in maintaining project budget and success. Using the timeline provided below as a base, a more detailed resource loaded schedule will be developed when the project commences and in coordination with the discussions with the City of Duluth. The schedule will be maintained throughout the life of the project and will be updated when timeline change.

The following timeline includes project tasks and internal milestones for completion. These inputs form one of the management tools that enable our Project Manager to plan concurrent tasks and to handle key contract issues by knowing how and when they will impact the overall project. The timeline and following schedule will be used to evaluate schedule impacts, resources, and budget.

Proposed timeline for project tasks.[1]

Task	Target Completion Date	Duration
Project Award	June 1 2021	Assumed for proposal
Task 1-Project Kickoff	June 14 2021	2 weeks
Task 2 – Risk Assessment	September 1 2021	2.5 months
Task 3 – Feasibility Study	December 1 2021	3 months
Task 4 – Grant Applications	March 1 2022	3 months

[1.] The proposed schedule and task durations depend on several factors, including the extent of client and public reviews, client and stakeholder engagement, and data availability.

4.4 Project Staffing

Ramboll's plan for managing the project is based on the following fundamental principles:

- **Satisfy the client:** The deliverables comprise meetings, field activities, review of existing information, modeling and risk analysis, development of shoreline resilient remedy alternatives, and evaluation of those alternatives toward selection of an alternative. Ensuring clear understanding of the City of Duluth needs and priorities, as well as the technical challenges, is critical to overall Project success.
- **Communication:** Our goal is to maintain open communicate with the City, keep communication clear and simple. Communication is critical to controlling the Project schedule and taking actions rapidly to restore the schedule if problems arise. Ramboll will submit simple monthly progress reports as a means of keeping the City informed of progress and challenges. In addition, it is expected Ramboll and the City will communicate by phone or email on both a regular and an ad hoc basis. The Ramboll Project manager also will communicate weekly with members of the Ramboll project team.
- **No surprises:** When delegating work, the project manager will clearly communicate the expected outcome, number of hours available, and internal deadlines. In addition, team members will commit to communicating rapidly to the project manager and project owner about the Project risks, their potential impacts, and options for mitigation strategies and solutions. In response, the Ramboll project manager is committed to keeping the City similarly informed.

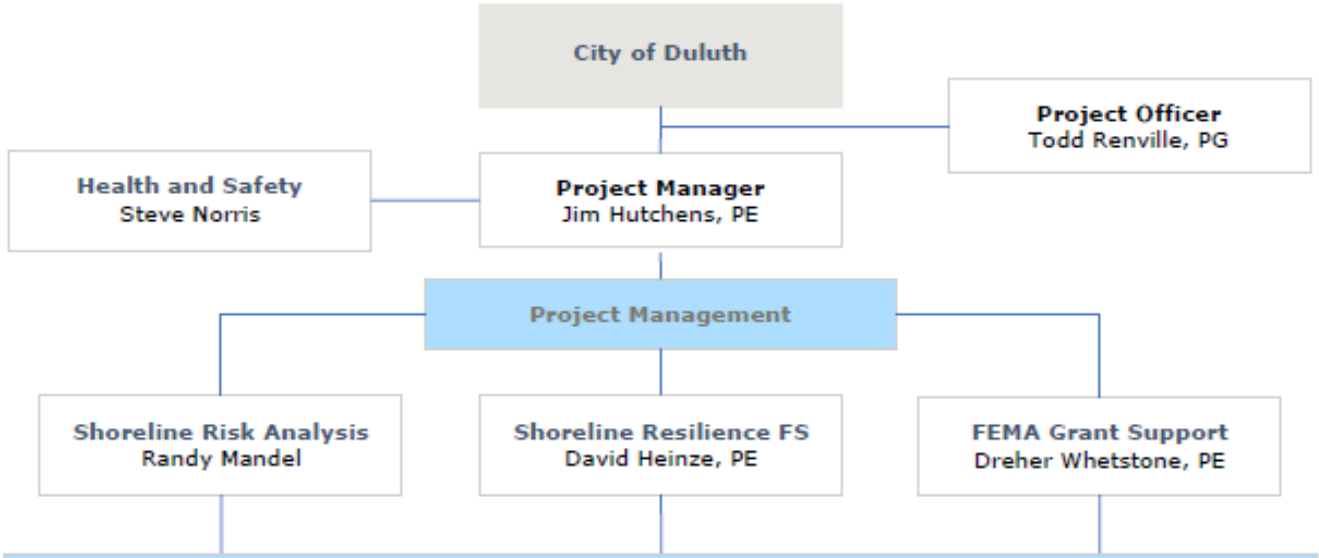
- **Clarity of Roles:** Clarity of roles and expectations is critical to our internal team coordination and our working relationship with our clients. Our Project Manager, Jim Hutchens, is perhaps the most fundamental of these resources. His responsibilities include:
  - Initiating a positive and communicative working relationship by organizing and facilitating an effective kickoff meeting that leads to shared understanding of the Project objectives, scope of work, and schedule
  - Serving as point of contact for the City and all members of the Project team for regular correspondence and decision-making
  - Tracking and managing budget, schedule, reporting, change orders, and invoices
  - Coordinating, preparing for, participating in, and documenting the Project meetings and ensuring follow up on meeting action items
- **Project Management Software:** Applying software resources, particularly Ramboll's accounting software, to ensure successful project management. Our accounting software, Maconomy, provides customized views that accurately track all employees' time, charges, and company expenses. A unique job number allows for the generation of detailed and current statements of all expenses and labor charges for each active contract. The system has components for all areas of the accounting process and facilitates the management of the overall project budget.
- **Zero Harm and Safety:** We aim for Ramboll to be a healthy, vibrant global workplace that allows employees to thrive and do their best work, while protecting their health and safety. Ramboll is committed to protecting the health and safety of all Ramboll employees by creating global, best in class safety awareness and culture where people embrace safety for themselves and others through the development of Ramboll's global strategic goals, processes and procedures. We focus on continual improvements to prevent personal injuries, work-related illness, and major accidents.

Project Team Structure and Management Experience

The graphic on the following page represents Ramboll's proposed project team organizational chart. Detailed in this subsection are the responsibilities and management experience of each person with a leadership role on the Project. Resumes for key team members are provided.

The team proposed to execute the project offers unparalleled experience in coastal engineering, soil mechanics, and construction cost estimation. We have teamed seasoned veterans with support staff to provide a cost-effective mix of talent.

The team proposed to execute the project offers unparalleled experience in coastal engineering, soil mechanics, and construction cost estimation. We have teamed seasoned veterans with support staff to provide a cost-effective mix of talent. Our resumes (limited to 10 people) and organization chart focus on experts in hydrology, geomorphology, soil mechanics and geology, coastal restoration, native plant dynamics and habitat, shoreline resilience engineering, cost estimating, and permit writing. Additional work will be performed by associate-level staff who can more cost-effectively implement portions of the project under the guidance, supervision, and mentorship of the experts represented in this Work Plan.



Technical Services

a) Risk Evaluation for Coastal Erosion & Flooding

Proposed Staff

Steve Norris (Infrastructure Assessment)
Ahintha Kandamby, PhD, PE, CFPM (Modeling)
Francis Ackerman, PE (Geotechnology)
Anthony Eallonardo (Ecology and Coastal Resiliency)

Scope

- Hydrology / geomorphology
  - hydraulic modeling
  - historic trend analysis
  - climate forecasting
  - lake levels analysis
  - coastal storms analysis
  - Geotech for local geology
- Critical infrastructure assets
  - Utility infrastructure
  - Flood or retaining walls
  - Public spaces
  - Roadways
  - Pedestrian/bike trails
- Visual Condition Assessment
- Financial assessment

b) FS for Potential Mitigation Remedies

Proposed Staff

Francis Ackerman, PE (Geotechnology)
Craig Harley, PE (Coastal resiliency)
Todd Renville, PG (Infrastructure, Constructability, MN)
Anthony Eallonardo (Ecology and Coastal Resiliency)
Randy Mandel (Ecology and Coastal Resiliency)

Scope

- Mapping
- Prioritization
- Alternatives analysis
- Preliminary engineering design and CAD
- Cost Estimating
- Permitting assessment
- Consideration of public and stakeholder priorities

c) FEMA Grant Application development support

Proposed Staff

James Quinn (Civil, Costing)
Craig Harley, PE (FEMA, Coastal Resiliency)

Scope

- Conceptual design drawings for selected remedy
- Cost estimate to advance environmental permitting, design, construction, and project management
  (The cost estimate must meet FEMA requirements)

Project Manager: Jim Hutchens, PE

Jim Hutchens is a Professional Civil Engineer based in Minnesota with 30 years' experience and will serve as Project Manager. In this role, he will serve as the primary point of contact with the City of Duluth, as well as with all Ramboll project team members. He will coordinate the execution of all project Deliverables, delegating work to ensure the scope is completed on time and on schedule. Mr. Hutchens' experience is particularly well suited to his role as Project Manager. He brings more than 30 years of environmental consulting experience focused on shoreline infrastructure projects, design, and construction management. He has extensive project management experience, in that he has managed numerous multidisciplinary environmental projects, including site characterization and feasibility studies, and unique construction projects.

Risk Assessment Lead: Randy Mandel

Randy Mandel will serve as the Site Characterization and Erosion Risk Assessment lead. In this role, he will direct a team of hydrologists, geomorphologists, geologists and geotechnical engineers to characterize current conditions at the Site and the potential for erosion and shoreline erosion rates. Mr. Mandel brings first-hand experience working on large and small shoreline and habitat restoration projects dealing with sediment erosion and habitat restoration and uplift.

Feasibility Study Lead: David Heinze, PE

David Heinze is a Professional Civil Engineer with over 20 years' experience in bank stabilization and shoreline stability. He brings extensive green and gray engineering design experience as well as experience in remedy implementation and construction management. His design experience includes state of the liners, cover systems, plant-based structural reinforcement, and combining green and gray engineering features.

Grant Applications: Dreher Whetstone, PE

Dreher Whetstone is a Professional Civil Engineer with over 25 years' geotechnical engineering experience that includes visual inspections of earth fill and concrete/masonry structures, and engineering analysis and design of dams, shallow and deep foundations, braced excavations, earth retaining systems, earthen embankments, and pavements. He has served as the project manager on large and complex dam rehabilitations, many which have required FEMA grant application support for design and construction. He has performed pavement failure, foundation settlement, grouting, seismic/liquefaction evaluations, pile drivability analysis and pile load tests. Mr. Whetstone has been routinely involved with construction oversight and geotechnical "troubleshooting" evaluation on wide variety of projects including buildings, highways, airports, and marine structures. He is often called upon to make construction site visits to evaluate problems related to soil stability, earthwork construction, and groundwater intrusion. He has monitored installation of deep foundation systems including driven piles, drilled shafts, micropiles, and auger-cast piles.

Health and Safety: Steve Norris

Steve Norris is a Managing Consultant in the Minneapolis, Minnesota office consulting on a variety of environmental-related projects. From site investigation to redevelopment and compliance matters, Mr. Norris works with a variety of clients to solve environmental issues. Drawing upon his experience as an United States Environmental Protection Agency (USEPA) Superfund Technical Assessment and Emergency Response Team (START) and Minnesota Pollution Control Agency (MPCA) contractor, his project experience ranges from investigating chlorinated contaminants in soil vapor across urban areas to remediating impacted soils as part of a Resource Conservation and Recovery Act (RCRA)/ Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)-listed sites, routinely bringing together diverse stakeholders to accomplish project objectives.

Mr. Norris will serve as the project Health and Safety officer, bringing his project and company-level Health and Safety training to the project. He provides local expertise, having worked on projects in Duluth Harbor and in the St. Louis River. Mr. Norris' resume is not provided, due to the 10-resume limitation per proposal.

Additional Support

Other staff supporting each of the three major tasks, including (a) Shoreline Risk Assessment, (b) Shoreline Management Feasibility Study, and (c) Grant applications and corresponding preliminary design and costing are identified in the organization chart. Their roles are shown in brackets, allowing the Work Plan reviewer to link their roles with their skills shown in their respective resumes.

ATTACHMENT 1 - BYRD ANTI-LOBBYING AMENDMENT CERTIFICATION

BYRD ANTI-LOBBYING AMENDMENT CERTIFICATION
(To be submitted with each bid or offer exceeding $100,000)

The undersigned, [Company] Ramboll US Consulting, Inc. certifies, to the best of his or her knowledge, that:

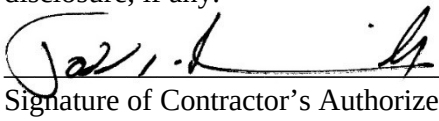
1. No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of an agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

2. If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form - LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

3. The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by 31, U.S.C. § 1352 (as amended by the Lobbying Disclosure Act of 1995). Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

The Contractor, [Company] Ramboll US Consulting, Inc., certifies or affirms the truthfulness and accuracy of each statement of its certification and disclosure, if any. In addition, the Contractor understands and agrees that the provisions of 31 U.S.C. § 3801 *et seq*., apply to this certification and disclosure, if any.



Signature of Contractor's Authorized Official

Todd Renville, PG, Principal

Name and Title of Contractor's Authorized Official

April 23, 2021

Date

COASTAL INFRASTRUCTURE RESILIENCE RESEARCH AND DEVELOPMENT RFP NO. 21-AA16

CITY OF DULUTH
COST PROPOSAL PROPOSAL
APRIL 29, 2021

HTTPS://RAMBOLL.COM

RAMBOLL Bright ideas. Sustainable change.

Project name	**Coastal Infrastructure Resilience Research and Development**
Client name	**City of Duluth**
Type of proposal	**cost proposal Proposal**
Date	**April 29, 2021**
Bidder/Tender	**Ramboll**

Ramboll
Suite 440, 4th Floor
Interlachen Corporate Centre
5050 Lincoln Drive
Edina, MN 55436

https://ramboll.com

April 26, 2021

Ramboll
Suite 440, 4th Floor
Interlachen Corporate Centre
5050 Lincoln Drive
Edina, MN 55436
https://ramboll.com

City of Duluth
Attn: Purchasing Division
City Hall, Room 120
411 West 1st Street
Duluth, MN 55802

Re: Coastal Infrastructure Resilience Research and Development – RFP No. 21-AA16

To Purchasing:

Ramboll US Consulting, Inc. (Ramboll), is pleased to offer this Cost Proposal in response to the above referenced request for proposal (RFP), to provide the City of Duluth with practical solutions to address coastal erosion and shoreline failures and corresponding infrastructure risks along the North Shore of Lake Superior, from Brighton Beach to the French River, and select areas in the St. Louis River Estuary and select areas on Minnesota Point. The objectives of this project are to identify and demonstrate economically feasible methods for reducing shoreline erosion and failure and to provide data and recommendations, including asset protection, that could be used in similar situations and locations along the lakeshore.

The Technical Proposal is offered under separate cover as identified in the RFP.

Thank you for considering Ramboll for this matter. If awarded this work, we look forward to supporting the City of Duluth with this project. Should you have any questions, please reach out to our Project Manager, Jim Hutchens, PE, at the number and/or email below. Ramboll looks forward to working with the City on this exciting project.

Yours sincerely

Jim Hutchens, PE
Senior Managing Consultant
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jlhutchens@ramboll.com

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THE CITY OF DULUTH MINNESOTA

Purchasing Division
Finance Department

Room 120
411 West First Street
Duluth, Minnesota 55802

218-730-5340
purchasing@duluthmn.gov

Addendum 1 to
Solicitation 21-AA16 RFP for Coastal Resilience Research and Assessment

This addendum serves to notify all bidders of the following changes to the solicitation documents:

1. For proposal planning purposes, the anticipated budget for this project is expected to be in the area of $300,000.

Please acknowledge receipt of this Addendum by including a copy of it with your proposal.

Posted: **April 9, 2021**

CONTENTS

1. PROJECT COSTS

Ramboll proposes to undertake the Scope of Work identified in Ramboll's response to RFP 21-AA16, *Coastal Infrastructure Resilience Research & Assessment*. on a time and material basis not to exceed the total contract amount of **Two Hundred Ninety-Four Thousand Five Hundred Dollars ($294,500)** inclusive of all travel and other expenses.

Ramboll will coordinate the project activities, including coordination with site contacts as needed.

If tasks beyond the scope of work provided in this proposal are identified, Ramboll will prepare cost estimate for the City of Duluth to complete such tasks on a time and materials basis, in accordance with the agreed upon business terms and conditions.

Ramboll US Consulting, Inc. Duluth Resiliency 2021 Rate Schedule US$	
Principal	230
Principal Consultant	230
Senior Managing Consultant	190
Managing Consultant	165
Senior Consultant 2	160
Senior Consultant 1	150
Consultant 3	125
Consultant 2	115
Consultant 1	110
Drafting	110
Support	90

1. Personal Vehicle – IRS Standard Mileage Rate (2021 - $0.56/mile)
2. Based on project needs, Ramboll may elect to rent a vehicle for field work. Typical vehicle rental rates based on our company preferred provider fee schedule are between $40 and $70/day. Gasoline is additional.
3. Other supplies/equipment will be rented as needed and the invoices will be passed through to the City with no mark-up applied.
4. Includes expendable sampling supplies, such as tubing, bailers, field books, nitrile gloves, bailer cord, and level D Safety protection supplies, which are purchased in bulk.
5. A 10% mark-up will be added to all Subcontractor services.