REQUEST FOR PROPOSAL FOR

PORT PENN

Flooding Mitigation and Sea Level Rise Adaptation Study

Submitted to:
NEW CASTLE COUNTY

Submitted by:
Michael Baker INTERNATIONAL

September 23, 2015
September 23, 2015

John Gysling, P.E., CFM
Floodplain Administrator
New Castle County Government Center
87 Read’s Way
New Castle, DE 19720

Re: Port Penn Flooding Mitigation and Sea Level Rise Adaptation Study Phase I

Dear Mr. Gysling,

Michael Baker International (Michael Baker) is pleased to submit our proposal to the New Castle County Department of Land Use to provide support for the Port Penn Flood Mitigation and Sea Level Rise Adaptation study. Michael Baker has an experienced team of professionals whose qualifications comprise experience working with identifying and mapping hazards, analyzing risks and hazard mitigation policies and procedures for hazard-prone areas, defining community roles, formulating mitigation strategies to reduce future risk, and coordinating public involvement program development and implementation.

As your Project Manager, I will serve as your primary point of contact for all services provided throughout this study. I will lead a team of nationally recognized experts that offers credentials in all disciplines necessary to support this important study.

We are confident that you will find that Michael Baker offers many advantages to New Castle County for consideration on this important project. Having worked on projects of similar scope and nature, Michael Baker is prepared to lead the County and Port Penn through the risk assessment analysis, vulnerability assessment, and mitigation strategy development. Michael Baker conducted a coastal flood hazard and sea level rise mitigation analysis for the Delaware Department of Natural Resources and Environment Control that was the first of its kind in Delaware and included a detailed flood vulnerability assessment of at-risk properties as well as an in-depth economic analysis of potential mitigation options and resiliency measures.

We at Michael Baker truly value this opportunity to provide New Castle County with our proposal for consideration. We believe that the selection committee will recognize that the Michael Baker team brings years of experience and expertise to the table, and, more importantly, brings a reputation of excellent client service combined with proven experience to produce reliable results... every time. We appreciate your time and attention, and trust that our submittal conveys the sincere desire we have to serve New Castle County and Delaware. Should you require further information please feel free to contact me at your convenience.

Respectfully,
MICHAEL BAKER INTERNATIONAL, INC.

Paul Slonac, CFM
Project Manager
PSlonac@mbakerintl.com
410.689.3488
FIRM Introduction

Michael Baker International, Inc. (Michael Baker), founded in 1940, provides planning, architecture, engineering, construction services, asset management, and asset renewal for a broad range of infrastructure in both the private and public sectors. Michael Baker is consistently ranked by Engineering News-Record among the top 8 percent of the 500 largest U.S. design firms. Michael Baker currently employs more than 6,000 employees in over 100 offices. As a leader in flood hazard modeling/mapping, risk assessment, hazard mitigation, disaster response, floodplain management and water resources planning, Michael Baker has provided these services to local, state, and federal clients nationwide for over four decades. Specifically, flood risk assessment, coastal engineering, mitigation, community engagement, and resiliency planning staff are recognized national industry experts.

Our team is at the forefront in protecting the environment and critical infrastructure from sea level rise hazards. Our experience includes nationally recognized studies related to sea level rise impact analysis, coastal risk and vulnerability assessment, impacts on storm water system capacity, resiliency planning, mitigation planning, and risk communication and outreach. Some past projects include: a flood hazard and sea level rise mitigation analysis for Delaware Department of Natural Resources and Environmental Control (DNREC), climate change impact assessments New York City area airports and the World Trade Center complex for the Port Authority of New York and New Jersey, and a sea level rise assessment for Prince George’s County, Maryland.

Team Organization

The Michael Baker team consists of staff from several areas of expertise within the firm. Our experts will provide project management, community outreach, and report development, with supporting services that include sea level rise analysis and mapping tools to identify deficiencies and data gaps and to recommend solutions to remedy those deficiencies. Descriptions of our team's management structure and team members are provided in this section.

Project Team

Our team provides broad expertise and experience in resiliency and environmental planning shaped by our in-depth background in flood risk assessment, resiliency planning, community engagement, transportation planning, and climate action plan (CAP) implementation necessary to accomplish this project. An organization chart of key staff is provided below.

<table>
<thead>
<tr>
<th>New Castle County</th>
</tr>
</thead>
<tbody>
<tr>
<td>Michael Baker Team</td>
</tr>
<tr>
<td>Paul Slonac, CFM</td>
</tr>
<tr>
<td>Project Manager</td>
</tr>
<tr>
<td>Linthicum, MD</td>
</tr>
<tr>
<td>Karin Ohman</td>
</tr>
<tr>
<td>GIS Lead/Asst. PM</td>
</tr>
<tr>
<td>Alexandria, VA</td>
</tr>
<tr>
<td>Carver Struve, CFM</td>
</tr>
<tr>
<td>Hazard Mitigation Lead</td>
</tr>
<tr>
<td>Alexandria, VA</td>
</tr>
<tr>
<td>Mark Osler</td>
</tr>
<tr>
<td>Engineering Lead</td>
</tr>
<tr>
<td>Alexandria, VA</td>
</tr>
<tr>
<td>Jane Merconi, AICP</td>
</tr>
<tr>
<td>Outreach Lead</td>
</tr>
<tr>
<td>Philadelphia, PA</td>
</tr>
</tbody>
</table>
As **Project Manager, Mr. Slonac** has managed complex projects with multiple components, including planning, engineering, and outreach, for more than 15 years. He has collaborated with multifaceted project teams with technical experts from multiple firms, offices, and locations, and coordinated with municipalities, agencies, and stakeholders in order to ensure the successful completion of important endeavors and deliverables on time and within budget. Mr. Slonac is dedicated to providing exceptional client service through continuous coordination, project meetings, schedule and budget monitoring, and providing senior level oversight. Mr. Slonac will work with New Castle County to determine that products meet the required deadlines and coordinate with task leaders to deliver complete compliance.

**Team Collaboration and Coordination**

The Michael Baker team draws upon the proposed staff’s broad expertise and experience to provide the necessary management and technical guidance for the Port Penn Flood Resiliency Assessment. Our experts have worked on numerous projects with relevant components and tasks that required extensive collaboration of firm resources as well as close coordination between offices, clients, and stakeholders. We have managed and contributed to numerous climate action plans, vulnerability assessments, and other sustainability and resiliency projects within Delaware, New Jersey, New York and throughout California. Relevant project experience includes an analysis of coastal flood impacts to seven Delaware Bay communities for DNREC and our staff members have also managed the New Castle County Physical Map Revisions for FEMA. We pride ourselves on attracting and retaining exceptional project managers and technical experts.

**Approach**

**Understanding of the Project**

New Castle County wishes to actively plan for sea level rise, flooding, and storms so it can protect key physical assets in the Port Penn community. Michael Baker understands that the County would like to build on its resilience work by conducting a vulnerability assessment, identifying key assets at risk within the community, identifying priority planning issues and evaluation criteria to select strategies that reduce vulnerabilities, and producing a report that summarizes this process.

In 2012, Michael Baker conducted a **coastal flood hazard and sea level rise mitigation analysis for DNREC** in seven coastal communities similar to and near Port Penn: Pickering Beach, Kitts Hummock, Bowers Beach, South Bowers Beach (Kent County), and Slaughter Beach, Prime Hook, Broadkill Beach (Sussex County). This study was the first of its kind in Delaware and included a detailed flood vulnerability assessment of at-risk properties as well as an in-depth economic analysis of potential mitigation options and resiliency measures. In Port Penn, we will follow a similar process to the DNREC project. Using publicly available flood mapping and guidance documents such as the Flood Insurance Study (FIS) that merges tidal data and storm surge data with shoreline delineation (effective February 2015), and other available information, the team will assess sea level rise impacts taking into consideration shoreline topography and bathymetry, tidal amplitude, and storm events. The sea level rise vulnerability assessment will focus on assets identified, selected, and prioritized by the project team including major infrastructure, residential and business properties, and facilities.

The Michael Baker team has the technical skills and planning expertise necessary to interpret existing information and use existing models to assess impacts to local assets while leveraging previous planning efforts. We have firsthand experience supporting local government staff in the County, DNREC and FEMA Region III. This experience will be
supplemented with our engineering assessments of existing sea level rise mapping tools and analysis of potential impacts to critical facilities, communities, and other key assets, as identified by the project team.

Technical Approach

Task 1: Existing Conditions Assessment and Stakeholder Meeting

The Michael Baker team will identify how local infrastructure and natural areas have been impacted historically by tides and storm events, which will allow the assessment to focus on and identify assets of primary concern.

1.1 Identify stakeholders

The first step of the process will be to identify a comprehensive group of stakeholders. We will work with NCC staff to identify and organize a diverse group. Michael Baker has assisted numerous counties in the Mid-Atlantic Region with updates of their local hazard mitigation plans. As part of the plan update process, Michael Baker assists the counties in identifying a variety of stakeholders that would have an interest in the project or may be impacted by the project.

The Michael Baker team will communicate the stakeholder information via a spreadsheet that will include contact information for each stakeholder and indicate whether the consultant will make the initial contact or expects NCC staff to make initial contact. The stakeholder list will be a living document that will be expanded throughout the course of the project as additional stakeholders are identified or contacts at stakeholder organizations change, and can be used as a resource for future NCC outreach endeavors.

1.2 Conduct stakeholder kick-off meeting

Michael Baker understands the importance of maximizing stakeholder input and local knowledge for an existing conditions assessment. We have experience with a variety of different innovative outreach techniques from ongoing projects including the Federal Emergency Management Agency (FEMA) Community Engagement Risk Communications (CERC), a nationwide public outreach contract that the Michael Baker team is currently engaged on. For the initial stakeholder meeting, the Michael Baker team will distribute tools to begin to gather information that is necessary for our analysis. The tools may be completed in the meetings or after the meetings and submitted via email or fax. These tools to be distributed include:

- **Hazard Identification and Review Form:** This form allows stakeholders to comment on the past occurrences of flood hazards in the community and to provide input on the most vulnerable areas and infrastructure.
- **Capability Assessment Survey:** This form asks representatives to assess their planning, regulatory, administrative, technical, fiscal, community resiliency, and political capability. The survey collects information from stakeholders on topics such as what tools/programs they have in place (zoning regulations, plans, etc.), what staff and personnel they have to assist with mitigation (planners, grant writers, etc.), and what financial resources are available (grants, etc.).

Jane Merconi, the Michael Baker team’s Outreach Lead, is the current FEMA Region III CERC Lead. She serves as the primary FEMA outreach contact for all communities in New Castle County.
1.3 Synthesize available information and work completed in New Castle County

The Michael Baker team will use the resources recommended in the RFP, our knowledge of ongoing coastal flood hazard analyses, stakeholder input, and past work with the County to develop a clear understanding of existing framework and resources. We will review regional and local planning frameworks for additional support.

We will leverage existing data from the County as part of our assessment. The online, publicly available *New Castle County, Delaware Geographic Information Systems Map Viewer* contains highly detailed information about existing infrastructure in Port Penn, Delaware. Since this extensive dataset already exists in a GIS format, it will enhance the vulnerability and mitigation assessment portions of this project by allowing the Michael Baker team to take a closer look at the impacts of flooding on local infrastructure.

The new FEMA Flood Insurance Rate Maps and Flood Insurance Study, effective as of February 2, 2015, will serve as the basis for the coastal flooding and sea level rise mapping and the latest sea level rise policy guidance developed within DNREC’s Preparing for Tomorrow’s High Tide: Sea Level Rise Vulnerability Assessment for the State of Delaware, July 2012, will also be included as existing information. Local tide gage data, from the National Oceanic and Atmospheric Administration (NOAA) Tides & Currents will also be used.

After reviewing existing information and data, the Michael Baker team will conduct a field study to examine the problems in-person, take field measurements, and fill any existing gaps in infrastructure information. This will also be an opportunity for the Michael Baker team to gain a better understanding of the site and look for potential mitigation options and resiliency measure, such as relocation sites for vulnerable infrastructure and areas of the existing dike that need repair or reconstruction.

Based on all the information gathered through the stakeholder meeting and website, review of existing data, and field study visit, the Michael Baker team will develop an Existing Conditions Assessment for NCC. This assessment will be an intermediate submittal and will become one section in a final document for NCC containing all three task combined into one final report.

**Deliverables**

- **Public Meeting** for stakeholders to seek their input.
- **Task 1 Intermediate Submittal** summarizing existing conditions in Port Penn.

**Task 2: Coastal Flooding and Sea Level Rise Vulnerability Assessment**

The Michael Baker team will map future flooding conditions to assess vulnerability of infrastructure to sea level rise. Based on the mapping analysis, areas of key concern will be identified and prioritized.
2.1 Map present day and future coastal hazards with sea level rise

In order to determine what infrastructure are at risk to coastal flooding, coastal flood elevations must be mapped in Port Penn. For this investigation, the Michael Baker team proposes to map tidal cycle high, 10-yr storm surge, and 100-yr storm surge elevations for the present day, future year 2045 (+30 years), and future year 2090 (+75 years) using one sea level rise scenario from the DNREC 2012 report, chosen based on discussion between the Michael Baker team and NCC staff. These mapping scenarios are simply a suggestion for NCC. Final timescales, flood frequencies, and sea level rise rates will be determined after further dialogue with NCC staff and will be tailored to meet their needs. The data sources to be used this analysis are outlined in the table below:

<table>
<thead>
<tr>
<th>Data Source</th>
<th>Contents</th>
</tr>
</thead>
<tbody>
<tr>
<td>NOAA local tide gage records</td>
<td>Mean Higher High Water (MHHW) level experienced over the tidal cycle at Port Penn. This elevation will be used to create present day and future MHHW flood maps.</td>
</tr>
<tr>
<td>2015 FEMA Flood Insurance Study</td>
<td>10-yr and 100-yr storm surge elevations. These elevations will be used to create present and future 10-yr and 100-yr flood maps.</td>
</tr>
<tr>
<td>2012 DNREC sea level rise estimates</td>
<td>Low, moderate, and high sea level rise rate estimates. Michael Baker will work with NCC to choose an appropriate sea level rise scenario. The rates associated with the chosen scenario will be used to map future year flood maps for the MHHW, 10-yr, and 100-yr floods.</td>
</tr>
</tbody>
</table>

The resulting maps for each scenario will include locations of key infrastructure. The maps will be included as an appendix in the Vulnerability Assessment section and final report. Additionally, the flood elevation GIS data shown on each map will be provided to NCC staff and can be incorporated into their databases and made available publicly on the New Castle County, Delaware Geographic Information Systems Map Viewer website.

2.2 Determine and prioritize infrastructure vulnerabilities

Based on the coastal flooding elevations and extents determined in Task 2.1 and using infrastructure data from the results of the Existing Conditions Assessment, at-risk infrastructure, or assets, will be identified. In addition to identification, Michael Baker will use a Prioritization Framework with input from NCC staff to determine the most vulnerable assets based on, but not limited to, the following categories:

- **Criticality of the asset** – for example, a fire station is more critical than a residential house.
- **Impacts of the asset on other assets** – the dike, for example, protects much of the infrastructure landward of it from flooding.
- **Frequency of flooding** – assets flooded during higher frequency floods are more vulnerable.
- **Depth of flooding** – low-lying assets will be flooded to higher depths which results in more damage.
- **Adaptive capacity** – for example a historical structure is more expensive to flood proof or elevate than a modern home due to special requirements to preserve the historic elements.

The Prioritization Framework will rank vulnerable assets and the rankings will be used in Task 3 when determining mitigation options for Port Penn. The flood mapping and prioritization will comprise the Vulnerability Assessment intermediate submittal and a section of the final report.

**Deliverables**  
Task 2 Intermediate Submittal summarizing infrastructure vulnerability in Port Penn.

**Task 3: Mitigation Options, Resiliency Measures, and Summary of Findings**

The Michael Baker team will develop mitigation options and resiliency measures to assist Port Penn in adapting to sea level rise and storm surge flooding.

3.1 **Identify mitigation options and resiliency measures**

The Michael Baker team will lead development of a comprehensive and creative set of adaptation measures for Port Penn. We have extensive experience working with local communities and other government agencies to identify structural, natural, and nature-based solutions that reduce the consequences of sea level rise, flooding, and storms. Mitigation options and adaptation strategies will be drafted to address the vulnerabilities identified by the project team, be cost effective, be consistent with adopted policies and plans, and be actionable.

Based on the results of the Prioritization Framework, the most vulnerable assets will be given higher priority when determining mitigation options and resiliency measures for the community. The infrastructure datasets from the New Castle County, Delaware Geographic Information Systems Map Viewer will serve as a basis for determining what mitigation options are most appropriate for each vulnerable asset.

The Michael Baker team will examine mitigation and resiliency strategies using a holistic approach. We will recommend mitigation options and resiliency measures to reflect the needs of the community over individual asset requirements when applicable. For example, the dike is a high priority vulnerable asset. Because the dike protects many lower priority assets, reconstruction and improvement of the dike system is a mitigation option that will enhance coastal flood resiliency throughout the community; whereas individually flood proofing assets landward of the dike only solves coastal flooding issues for that asset and does not protect surrounding assets.

3.2 **Determine costs of proposed options**

Once a comprehensive set of mitigation alternatives and resiliency measures are compiled, cost estimates will be completed for each
option. These costs will be approximate estimates for general infrastructure. For example, an average cost estimate will be given for dry floodproofing a residential structure, detailed costs to dry floodproof a specific building with specified dimensions will not be estimated. In addition to the cost estimates, a qualitative discussion of the benefits and drawbacks of each mitigation measure will be summarized in the Mitigation Options and Resiliency Measures section of the final report.

3.3 Conduct public and stakeholder workshop

A second meeting will be held at the end of the analysis to obtain feedback from the public and stakeholders about the project and report. The public workshop presentation will present the results of the study and ask for feedback from the stakeholder group. Michael Baker will also present examples of our past work for the County and Port Penn that could be provided to advance mitigation action; one example is a pilot study completed for the District of Columbia for a full Plan integration review to advance mitigation action. Stakeholder remarks will be gathered using a process similar to Task 1.2, with a **Flood Mitigation and Sea Level Rise Adaptation Feedback Form**. This form will allow stakeholders to comment on the study and the recommended mitigation options and resiliency measures. Feedback from stakeholders will be incorporated into the Mitigation Options and Resiliency Measures of the final report.

**Deliverables**

**Presentation** for public workshop and stakeholders.

**Final Report** including Task 1 and 2 intermediate submittals as well as Task 3 section describing mitigation and resiliency options and stakeholder feedback.

Task 4: Grant Coordination Support

New Castle County staff will lead grant coordination with Delaware Coastal Programs for this project. Meeting coordination, quarterly progress reports, and cost match reports will be submitted to Delaware Coastal Partners by NCC staff. The Michael Baker team does not anticipate much involvement on this task, except to support NCC staff as a regular part of project management for the project.

**Deliverables**

Quarterly reports *(completed by NCC staff).*

Match documentation *(completed by NCC staff).*

Management Approach

The Michael Baker team believes that ongoing communication is essential to ensuring the project moves forward, stays within budget, and achieves the County’s goals and objectives. We believe in a collaborative planning approach where each team member is actively engaged in and understands all project goals and objectives. The team is committed to managing this project from October 2015 through March 2016 and anticipates that key project staff will remain for the duration of the contract term. Project Manager Paul Slonac is located in our Linthicum, Maryland office with close proximity within the region to NCC and Port Penn, DE. Assistant Project Manager Karin Ohman will act as a backup for our project manager if he is unavailable (e.g., due to vacation, illness, or a personal emergency).

The Michael Baker team has extensive experience tracking project schedules and anticipating changes that it needs to accommodate to ensure all project goals and objectives are met and the highest quality work products are delivered. Each week, key staff develops and submits a work to the internal team lead who reviews and approves it to ensure schedules can be met. In the event of any project scheduling changes, the Michael Baker team will work proactively with NCC staff to identify the best option for moving forward and staying on schedule.
# Project Schedule

The Michael Baker team’s project schedule outlines the key components of the study, organized into a calendar that will keep the team on track.

<table>
<thead>
<tr>
<th>Task</th>
<th>October</th>
<th>November</th>
<th>December</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Coordination</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Task 1:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.1 Identify Stakeholder</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.2 Conduct Stakeholder Kick-off Meeting</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.3 Synthesize available Information</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Deliver Existing Conditions Report</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Task 2:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.1 Map Present Day and Future Coastal Hazards with Sea Level Rise</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.2 Determine and Prioritize Infrastructure Vulnerabilities</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Task</th>
<th>January</th>
<th>February</th>
<th>March</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Coordination</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Task 3:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.1 Identify Mitigation Options and Resiliency Measures</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.2 Determine Costs of Proposed Options</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.3 Conduct Public and Stakeholder Workshop</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Deliver Final Report on Mitigation and Resiliency Options</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Qualifications

The Michael Baker team delivers innovative solutions for coastal hazards related to flooding from storm surge, wave hazards, storm water, and sea level rise. We have extensive experience with the following:

1. Conducting existing conditions assessments to determine at-risk infrastructure,
2. Quantifying vulnerability of communities under present day conditions and future year conditions impacted by sea level rise, and
3. Developing mitigation options and resiliency measures, and weighing the cost versus benefit of each possibility, to help communities adapt to current and future coastal flooding risk.

We support clients within the Mid-Atlantic region, across the United States, and in locations as far away as Antarctica. Our team is uniquely qualified to assess sea level rise vulnerability of key assets identified, selected, and prioritized by the project team. We have firsthand experience working directly with DNREC as well as other key agencies, and local and state officials and staff throughout the State. As a contractor for DNREC, a FEMA Cooperating Technical Partner (CTP), we assisted the State and New Castle County in producing and distributing new floodplain mapping. The following sections outline our key projects and personnel that are relevant to the Port Penn Flooding Mitigation and Sea Level Rise Adaptation Study needs.

Relevant Work

Delaware Bay Flood Hazard and Sea Level Rise Mitigation Analysis

Michael Baker International supported the Delaware Department of Natural Resources and Environmental Control to evaluate coastal hazard mitigation alternatives for seven communities along the Delaware Bay shoreline. Michael Baker modeled coastal flood and erosion hazards due to sea level rise, assisted in the construction of a comprehensive property inventory, evaluated flood damage, erosion loss, and tax revenue impacts, completed structure valuations, and performed benefit-cost analyses for various mitigation alternatives. Michael Baker also used mobile LiDAR technology to collect roadway centerlines, digital images, and first floor elevation data for over 1,600 structures throughout the communities studied.

Michael Baker also supported delivery of six outreach meetings throughout the state as part of the client’s feasibility study to ascertain methods for addressing flooding along portions of the Delaware River. Economic analysis of potential structural flood risk management measures were provided for the Trenton section of the study area using the Hydraulic Engineering Center’s Flood Damage Reduction Analysis (HEC-FDA) for three with-project plans based on different flood barrier alternatives. Results from this project are being used to develop a strategic vision that reduces community vulnerability and minimizes future economic and natural resource impacts as a result of coastal hazards along the Delaware Bay.
Ocean County, New Jersey Hazard Mitigation Plan

Michael Baker provided a broad range of professional consulting services to develop the first-FEMA approved comprehensive hazard mitigation plan (HMP) for Ocean County. Michael Baker’s services included identifying and mapping hazards, analyzing risks and hazard mitigation policies and procedures for hazard-prone areas, defining community roles, formulating mitigation strategies to reduce future risks, and coordinating public involvement program development and implementation.

The risk assessment considered all possible natural and human-made hazards in the county, and the new HMP reflects Ocean County’s unique risks and vulnerabilities, including coastal and riverine flood risk, wildfire hazards, nuclear vulnerabilities, and potential terrorist threats. Because Ocean County has 45 miles of coastline and 198 miles of bay frontage, it was essential that the flood hazard profile address riverine and coastal flooding as well as climate change and sea level rise. Michael Baker’s coastal flood technical experts performed a thorough coastal analysis to identify vulnerabilities and potential losses.

Since this was Ocean County’s first HMP, Michael Baker worked to develop strong hazard mitigation goals and actions. Michael Baker compiled input from meetings, the public, and the steering committee into a final mitigation action plan, which listed each mitigation action; the responsible entity, community, or communities; each hazard and mitigation technique addressed; an estimated cost; implementation schedule; and funding sources. The intent was to develop mitigation actions that are attainable and can be easily implemented over the next five-year cycle. The public also evaluated the mitigation actions to determine whether or not the actions are cost effective and will result in the desired impact.
Prince George’s County, Maryland Sea Level Rise Impacts Analysis

Michael Baker International developed sea level rise hazard maps for Prince George’s County, Maryland through a National Oceanic and Atmospheric Administration (NOAA) Coast Smart grant awarded to the County. Prince George’s County is subject to coastal flooding along both the Patuxent and Potomac Rivers. The County has a number of critical facilities located near the coast that may be impacted by coastal flooding in the future due to sea level rise.

Michael Baker mapped the present day Coastal Overlay Zone (COZ) in the County using FEMA map products for the 100-year flood. Michael Baker also determined best and high sea level rise scenarios for the 10-, 50-, and 100-yr planning horizons. Using these sea level rise values, six additional future year COZs were mapped along the Patuxent and Potomac Rivers. In addition to mapping the COZs, critical facilities within the County were mapped. Michael Baker worked with the County to determine which facilities are critical during a coastal flooding emergency. For facilities that were impacted by flooding under any of the present day or future year scenarios, a flood depth analysis for that facility was conducted.

The flood depth analysis serves as a vulnerability assessment of critical facilities for the County. Any facilities that are impacted by present day or future year coastal flooding will need a plan for hazard mitigation and adaptation.

World Trade Center Flood Hazard and Sea Level Rise Mitigation Analysis

Michael Baker International prepared a flood hazard evaluation and developed a comprehensive water intrusion protection plan for the new World Trade Center. Services included a complete flood risk assessment and analysis, sea level rise analysis, the development of hazard mitigation strategies, order-of-magnitude cost estimates, and stakeholder coordination. The study effort encompassed the National September 11 Memorial and Museum, a multistory transportation hub, 550,000 square feet of retail space, a 1,000-seat performing arts center and five new skyscrapers including the iconic One World Trade. The water intrusion protection plan is designed to protect all completed World Trade Center facilities from water intrusion under severe exposure conditions. The plan is based on a complete flood risk assessment and analysis, including thorough evaluations of site-wide and project-specific vulnerabilities, hazard mitigation strategies, and improvement alternatives to provide a level of protection that will allow the complex to maintain operations following a storm surge event and subsequent flooding, as witnessed during Hurricane Sandy in 2012. For the flood hazard evaluation, coastal storm surge models were integrated with two-dimensional land surface flow models to identify the potential hazard at the project site. An
integrated sub-surface flooding model for all of the below-ground floors and passage ways was then developed to assess the potential flooding conditions and develop strategies to mitigate impacts.

**Sea Level Rise Impacts Assessment for New York City Area Airports**

Michael Baker International performed a comprehensive assessment of the impacts of climate change on four airports: John F. Kennedy International Airport (JFK) and LaGuardia Airport (LGA) in New York, and Newark Liberty International Airport (EWR) and Teterboro Airport (TEB) in New Jersey. Services included a flood hazard analysis, development of a critical infrastructure inventory, preparation of guidance on use of climate change projections, a climate change vulnerability assessment, a statistical evaluation of airport shutdown potential, and development of a climate adaptation strategy.

The effects of sea level rise and changing precipitation patterns on flood risk were investigated using regional climate projections developed by Columbia University Center for Climate Systems Research and the NASA Goddard Institute for Space Studies. Detailed modeling of the storm water system at each facility was conducted to identify system performance under future conditions of rising tailwater and altered precipitation patterns. The assessment included the development of a critical infrastructure inventory and evaluation of the effect of climate change projections on airport operations through the year 2055. The work concluded with the establishment of airport shutdown probabilities and a comprehensive analysis of climate adaptation alternatives.
Resumes

Paul Slonac, CFM (Project Manager)

Mr. Slonac has extensive experience with floodplain management and the National Flood Insurance Program (NFIP). He serves as a project manager and technical resource for Michael Baker’s Risk MAP contract with the Federal Emergency Management Agency (FEMA). His responsibilities include performing client coordination, project meetings, schedule and budget monitoring, and senior level oversight. Mr. Slonac has presented at several national and state conferences on topics related to the NFIP and floodplain management, and has taught several sessions of the CTP Special Topics E-241 class at the Emergency Management Institute. Mr. Slonac has held several leadership roles within the Maryland Association of Floodplain and Stormwater Managers (MASFM), including serving consecutive terms as the MASFM chair from 2011 to 2014.

Education: Master’s Certificate, 2007, Project Management, University of Pittsburgh, Katz Graduate School of Business; B.A., 2000, Geography, University of Pittsburgh; B.A., 2000, History, University of Pittsburgh

Licenses/Certifications: Certified Floodplain Manager, Maryland, 2001, US-00-00265

Highlighted Experience

Delaware Department of Natural Resources and Environment Control (DNREC), New Castle County, Delaware. Project Manager. Michael Baker assisted DNREC, a FEMA Cooperating Technical Partner, to improve and update coastal and flood hazard mapping. Michael Baker supported DNREC in producing and disseminating updated floodplain mapping. The project included three watersheds in New Castle County, Delaware. The project involved field surveys, floodplain mapping, production of non-regulatory products, and community outreach.

Maryland Department of the Environment (MDE), Baltimore County, Maryland. Project Manager. Michael Baker provided general technical support and quality control for the hydrologic validation and evaluation of the Jones Falls and Gwynns Falls watersheds. The goal of the task was to arrive at a consensus for the hydrologic methodology to be utilized in both Baltimore County and Baltimore City in coordination with MDE as well as city and County Staff. Michael Baker also provided project management support and coordination between MDE, FEMA Region III, Baltimore City and Baltimore County.

Maryland Environment Services (MES), Statewide. Project Manager. Managed Maryland’s State Model Floodplain Management Ordinance Outreach Program, including providing general NFIP support with Community Assistance Visits (CAVs), maintenance of FEMA’s Community Information System (CIS), and review of community floodplain management ordinances.

Community Engagement and Risk Communication (CERC), FEMA, Nationwide. Subject Matter Expert. Currently assists FEMA in collaborating with state and local entities to increase the public’s risk awareness, drive action to reduce risk, and help communities become more resilient when confronting natural disasters. Provides communications and messaging, advance partnerships with community organizations, public meeting support, and enhance existing public engagement opportunities.

Addressing Levees in the National Flood Insurance Program, FEMA, Nationwide. Technical Manager. Led the development of levee and policy procedures as part of a two-year assessment of FEMA's levee policy. Contributed to the development of the public relations message and strategy for announcing the revised policy to affected parties. Collaborated with federal agencies to develop the framework for a database of levee information.
Jane Merconi, AICP (Outreach Lead)

Ms. Meconi is a senior community engagement and communications practitioner and planner with extensive experience. Working with a wide variety of stakeholders, she strives to educate, communicate information, and build consensus around planning issues and empower individuals to be part of the planning process. Throughout her career, Ms. Meconi has also developed a particular expertise in Environmental Justice (EJ) and Title VI non-discrimination compliance, engaging diverse audiences, and social media engagement. Her interests include integrating equity into plans and programs and evaluating public participation programs.

**Education:** A.B., 1999, Growth and Structure of Cities, Bryn Mawr College; M.S., 2004, City and Regional Planning, Pratt Institute

**Licenses/Certifications:** American Institute of Certified Planners, 2006

**Highlighted Experience**

**Community Engagement and Risk Communications, FEMA, Eastern United States.** Community Engagement Manager FEMA Region III. Responsible for offering strategic thinking and project support for all facets of public engagement and participation. Assist FEMA Region III in collaborating with state and local entities to increase the public's risk awareness, drive action to reduce risk, and help communities become more resilient when confronting natural disasters. Provide communications and messaging, advance partnerships with community organizations, public meeting support, and enhance existing public engagement opportunities. Additional support includes disaster mitigation planning support, community outreach, preparation and dissemination of outreach materials, mitigation training for stakeholders, and liaison services to Region III and the larger Risk MAP program.

**Development and Execution of Title VI and Environmental Justice Program, Delaware Valley Regional Planning Commission (DVRPC).** Manager of Title VI Compliance, ensured that non-discrimination statutes were adhered to. Ongoing equity planning work to engage Environmental Justice (EJ) populations in MPO outreach, and to ensure that EJ populations were addressed in DVRPC planning and programs, including the Long-Range Plan and Transportation Improvement Program (TIP). Collaborated with colleagues on Coordinated Human Services Transportation Plan (CHSTP) programming, including reviewing regional applications for Section 5310 and Job Access and Reverse Commute (JARC) funding. With planning and GIS support, maintained the DVRPC Indicators of Potential Disadvantage (IPD) technical equity analysis. 2006-2015.

**Development and Execution of Public Participation and Engagement Programming, Delaware Valley Regional Planning Commission (DVRPC).** Developed MPO overall Public Participation Plan and developing unique communications and outreach strategies for individual programs and projects, such as the Long-Range Plan, Transportation Improvement Program, corridor studies, etc. Facilitated the Public Participation Task Force, a continuous forum for the public to participate in the regional planning process. Maintained a database of stakeholders, organizations, and members of the public. Coordinated and facilitated large-scale special events, social media programming, and other outreach events. 2006-2015.
Mark Osler (Engineering Lead)

Mr. Osler directs Michael Baker's national Coastal Science and Engineering Practice, and brings a technical background in the analysis of nearshore storm surge and wave hazards, sea level rise and climate change, coastal erosion, and shore protection design. He is experienced in the field inspection, design and rehabilitation of coastal structures, and numerical modeling of coastal environments. Mr. Osler currently serves as technical manager of the multi-year coastal hazard analysis efforts being conducted for FEMA in Region IV and Region IX. At FEMA’s request, he has served for more than six years as the co-chair for FEMA’s Coastal Workgroup, a national panel of experts who work together to guide FEMA’s technical and policy approaches to analyzing and managing coastal flooding risk. Mark is the only member of private industry to serve in this role.

**Education:** B.S., 1998, Civil Engineering, Lehigh University; M.S.C.E., 2004, Coastal Engineering, University of Delaware

**Highlighted Experience**

*Economic Analysis of Delaware Bay Shore Adaptation Alternatives, DNREC.* Project Manager. Managed the technical team conducting a comprehensive evaluation of sea level rise and coastal flooding mitigation alternatives including beach nourishment and strategic retreat for seven Delaware Bay communities. Performed a cost versus benefit analysis for these alternatives over a 30-year planning period. Provided expertise on physical treatment of beach nourishment and retreat alternatives under future conditions.

*World Trade Center Water Intrusion Protection Plan, PANYNJ.* Coastal Analysis and Hydraulics. Supported the PANYNJ in establishing a flood risk management plan and developing engineering designs for mitigation strategies at the World Trade Center in Manhattan, NY. Investigated storm surge elevations, supported development comprehensive mitigation strategy recommendations, and prepared a site-wide flood-risk management report. Analysis included future changes in water levels due to sea level rise over a 100-yr design window. Supported grant application documentation including benefit versus cost analysis for both present day and future conditions under various sea level rise conditions.

*Climate Change Impact Assessment at John F. Kennedy, LaGuardia, Newark, and Teterboro Airports, Port Authority of New York and New Jersey (PANYNJ).* Project Manager. Led assessment of the impacts of sea level rise and future changes in precipitation on the flood risk at New York City area airports. Guided the PANYNJ in selecting climate change projections for use in the study. Future sea level rise was used in an analysis of how rising tailwater would impact the efficiency of the stormwater system at each facility.
J. Carver Struve, CFM (Hazard Mitigation Lead)

Mr. Struve currently serves as the Technical Director for Hazard Mitigation and Emergency Planning and leads the technical execution of Michael Baker’s hazard mitigation practice in this role. He is also the Mitigation Planning Lead for the FEMA Community Engagement Risk Communications (CERC) nationwide outreach program. Mr. Struve is the former Maryland State Hazard Mitigation Officer (SHMO), and has extensive hazard mitigation planning, risk assessment, and mitigation grants experience.

**Education:** B.S., 1996, Urban Studies and Planning, Virginia Commonwealth University; M.S., 1998, Planning, University of Tennessee, Knoxville

**Licenses/Certifications:** Certified Floodplain Manager, 2005

**Highlighted Experience**

**Community Engagement Risk Communications (CERC), Nationwide, FEMA.** Technical Manager. Serves as the Mitigation Planning Lead for FEMA’s CERC program. Plays a part in leading this effort and achieving FEMA’s goals by providing integrated community engagement through planning and collaboration, building trust and awareness, activating and supporting local leaders and partners, introducing decision-making products, and building momentum.

**Program, Engineering, and Technical Support for the Risk MAP Program, Nationwide, FEMA.** Technical Manager. Provided program management and technical services for Risk Mapping, Assessment, and Planning (Risk MAP) Program in support of the National Flood Insurance Program.

**Development and Update of the State of Maryland Enhanced Hazard Mitigation Plan, Maryland Emergency Management Agency (MEMA), Project Manager.** Responsible for developing and securing FEMA approval of the State Hazard Mitigation Plan. Drafted most sections of the document, and integrated all sections into the plan. Developed Enhanced Plan component and received FEMA approval. Hazards addressed in the plan included flood, hurricane including storm surge, wildfire, dam failure, sinkholes, and radiological emergency.

**Flood Risk Reduction Plan, Prince George’s County, MD.** Project Manager. Managed project to reduce the risk of coastal flooding which negatively affects the County’s Coastal Overlay Zone (COZ) environment, critical facilities and population by identifying and mapping the COZ, analyzing flooding data, and developing a GIS base map to be used for further planning purposes.
Karin Ohman (GIS Lead/Assistant Project Manager)

Ms. Ohman is a Coastal Scientist with expertise in coastal hazard modeling, flood hazard mapping, and climate change. At Michael Baker, Ms. Ohman has engaged on a number of different coastal hazard and sea level rise vulnerability assessment projects around the nation as a technical assistant and technical lead. Her primary technical roles include coastal hazard analyses and mapping for FEMA Regions IV and IX, and sea level rise impacts analysis at the federal, state, and local level. Prior to joining Michael Baker, Ms. Ohman worked at the United States Geological Survey (USGS) Pacific Coastal and Marine Science Center. While at USGS, she supported coastal projects related to climate change impacts in Alaska and California.

Education: B.S., 2009, Geology, The College of William & Mary; M.S., 2012, Earth Science, University of California, Santa Cruz

Highlighted Experience

Prince George’s County, Maryland Sea Level Rise Impacts Analysis, Prince George’s County Department of the Environment. Technical Lead. Mapped 100-yr flood Coastal Overlay Zone (COZ) along the coastline of the County. Advised the County on sea level rise scenarios to use and mapped future year COZs. Analyzed the impacts of flooding on critical infrastructure in the County and completed a flood depth analysis of critical assets that were impacted by coastal flooding.

Flood Risk and Sea Level Rise Assessment for New York City Area Airports, Port Authority of New York and New Jersey. GIS Lead. Conducted coastal flood analysis and hazard assessment. Mapped flooding inundation, flood hazards, and flood depths for New York City area airports incorporating present day conditions and six sea level rise scenarios. Evaluated flood risk for critical infrastructure at each airport and assessed airport shutdown probabilities based on the inundation for these critical assets across each sea level rise scenario. Developed final report that included the risk and vulnerability assessments as well as potential mitigation strategies.

Risk Mapping, Assessment & Planning (Risk MAP) Coastal Studies, FEMA. Technical Lead. Provided technical assistance on FEMA Risk MAP studies in Georgia, Florida, and California. Conducted wave hazard modeling and analysis and flood hazard mapping. Contributed to final reports for FEMA.
Fee Estimate

The following fee estimate is broken down by task and is proposed as a lump sum. The scope of work desired by the County represents a significant undertaking which the Michael Baker team has taken every step towards accomplishing in the most cost effective manner. This fee estimate is presented in conjunction with the technical approach provided within this response and is contingent upon the assumptions listed. Through our project manager, Michael Baker is always interested in discussing the scope and fee in detail with the County to help ensure that the work performed is aligned with the needs of the County and the community of Port Penn.

<table>
<thead>
<tr>
<th>Task</th>
<th>Fee</th>
</tr>
</thead>
<tbody>
<tr>
<td>Task 1 – Existing Conditions Assessment and Stakeholder Meeting</td>
<td>$6,384</td>
</tr>
<tr>
<td>Task 2 – Coastal Flooding and Sea Level Rise Vulnerability Assessment</td>
<td>$12,320</td>
</tr>
<tr>
<td>Task 3 – Mitigation Options, Resiliency Measures, and Summary of Findings</td>
<td>$11,250</td>
</tr>
<tr>
<td>Task 4 – Grant Coordination Support</td>
<td>$0</td>
</tr>
<tr>
<td><strong>Total Fee</strong></td>
<td><strong>$29,954</strong></td>
</tr>
</tbody>
</table>

Optional Task 5 – Additional Flooding and Sea Level Rise Mapping
- Each additional sea level rise scenario $3,000 approx.
- Additional flood frequency interval (annual or other) $3,000 approx.

Assumptions

Due to the fixed nature of the budget for this project, some components listed in the RFP were limited in scope in our proposal. These components include the following:

- **Field studies** – we propose gathering field measurements as necessary but do not propose any physical or topographic surveys for this study.
- **Available data** – we propose using data from the New Castle County, Delaware Geographic Information Systems Map Viewer. Our analysis assumes that these data will be made available by NCC to the contractor in GIS format.
- **Coastal flood scenarios** – we propose using the tidal, 10-yr, and 100-yr flood elevations and eliminated the annual flood elevation from the analysis. We also limited the sea level rise estimates to one instead of three scenarios.
- **Flood sources examined** – we propose to analyze coastal flooding based on storm surge elevation, we do not include any wave hazard mapping. We also limited the scope to strictly coastal flooding and sea level rise since that is the main source of flooding in Port Penn. Therefore we do not propose examining riverine or storm water as part of this study.
- **Cost benefit analysis of mitigation options** – we propose a high level estimate of cost for each mitigation alternative and qualitative discussion of their benefits. We do not propose an in-depth analysis of costs versus benefits of mitigation alternatives for each asset.

The Michael Baker team is open to further discussion of these assumptions with NCC staff and we are willing to modify our proposed technical approach to best meet the needs of NCC. We also recommend including the above as additional future work with added budget.