

## Michael Baker Builds Resiliency Practice on Flood Risk Expertise

*Firm's clients range from small towns to FEMA and NYC*

From small townships to large cities and regional transit and transportation agencies, from FEMA to the Transportation Research Board (TRB), **Michael Baker International** serves a broad range of public sector clients with planning, design and engineering work that integrates climate change risk assessments and adaptation strategies.

The privately owned firm of approximately 6,000 staff was ranked 13th in 2016 for Transportation revenues by ENR. ENR also estimated its 2015 revenues at \$509 million, with 50% of that income from transportation work. Michael Baker's expertise with climate change adaptation is rooted in decades of flood risk management work, including a 40-year history of performing flood risk assessment and management projects for FEMA. "We're one of FEMA's trusted contractors, providing consultant support around analysis and communication of flood risks, both riverine and coastal," said Mark Osler, associate vice president within the firm's Water business line.

"We go from the big picture, trying to understand what Mother Nature is doing and when—and assigning probabilities to certain extreme events—to hydraulic analyses of floodplains and helping communities to understand the data and prioritize actions they can take," said Osler.

Forty years ago, there was little if any awareness among floodplain managers, planners and transportation engineers of how climate change could change flood elevations. Over the last 10 years, Osler and his colleagues have seen "a marked shift toward agencies and communities wanting to know not only what their present-day risks are but how future

conditions may change that risk. Climate resiliency planning and design support is now clearly its own market," said Osler.

Working out of the firm's Alexandria, Va., office, Osler manages a staff of civil and environmental engineers and hazard mitigation specialists who work regionally and nationally. Nationwide, he estimates that roughly 40 full-time employees are working on climate resilience across Michael Baker's engineering, planning, architecture and urban design practices.

Climate change adaptation is "very much viewed as a growth business that is still in its early stages," he said. "Starting with our firm's senior executives, there is high visibility within Michael Baker on the impacts of climate change on our engineering, architectural and planning business lines."

A current project for the TRB is a study on incorporating climate change, risk and resilience into hydrologic design procedures for transportation infrastructure. "Future conditions will impact both the operations and missions of DOTs and port authorities," said Osler, casting the TRB study as a step toward "improving the design standards that we as a professional community use to create the built environment." Michael Baker is a sub-consultant to **Kilgore Consulting and Management** on the \$750,000 project; additional team members include Desert Sky Engineering and Thompson Hydrologics.

As is the case with other firms in the climate change resiliency and adaptation field, Michael Baker's work in this arena saw a marked increase following Hurricane Katrina and Superstorm Sandy when entire regions faced the challenges of rebuilding and planning for their future. The firm has worked with ten Louisiana Parishes to understand their post-Katrina vulnerabilities and develop standards for design of levees and other built infrastructure.

## Adapting to climate change brings hard choices

In the Northeast, a wide range of climate change vulnerability assessments and adaptation planning projects followed in the wake of Sandy. Many of them are still in the conceptual stages as the challenge of adapting the dense Northeastern coastline to account for projected sea level rise and storm surges is formidable.

Jersey City, NJ, the town of about 260,000 wedged between the Hudson and Hackensack rivers, saw 40% of its land area inundated during Sandy. Michael Baker headed a team of local government staff and experts from Stevens Institute of Technology and Rutgers to write a white paper on adaptation scenarios.

The paper examines adaptation strategies such as elevating roadways that would function as levees, constructing new earthen berm levees and concrete levees with boardwalks and bikeways on top of them. The 14 foot crest elevation reflects the inundation that occurred during Sandy plus 31 inches of future sea level rise by 2050, reflecting the New York City Panel on Climate Change's 90th percentile projection for 2050.

Most of the alternatives identified for Jersey City have big impacts on existing access, mobility and aesthetics—a common problem with adaptation strategies for coastal cities, as noted in the page-one overview and elsewhere in this edition. The Jersey City paper uses photo simulations to show, for example, how a 6 ½' wall topped by a busy street would impact access to and alter the ambience of Trump Plaza Residence, at 55 stories, the tallest residential building in New Jersey.

## Transit agencies plan for future Sandys

A transportation agency that was highly impacted by Sandy was the **Port Authority of New York and New Jersey**. PANYNJ also owns and operates the

World Trade Center, which is not only a site of national historical and emotional importance but also a key transit hub for New York City and a facility that was inundated during Sandy.

Within four months of being impacted by Sandy, PANYNJ hired Michael Baker to identify present and future vulnerabilities to flooding and evaluate and develop flood resiliency projects across the WTC site, according to Michael Baker's website and PANYNJ's board minutes.

"Regional coastal storm surge models were linked with two-dimensional surface flow models to identify potential hazards at the WTC site," explains Osler. "An integrated sub-surface flooding model for all of the below-ground floors and passageways was then developed to assess the potential flooding conditions throughout the subsurface and develop strategies to mitigate impacts."

### **Climate shapes long-term comprehensive plans**

Planning is a major business line for Michael Baker, and Osler and his colleagues have incorporated climate science and evaluated climate change-related risks in long-term comprehensive plans, hazard mitigation plans and evacuation and shelter plans for many communities. "Our planning work is typically focused on front-end vulnerability assessments, which include transportation infrastructure," said Osler. "We've worked with more than 60 communities to address concerns about climate change."

The firm recently won a contract with the City of Norfolk, Va., to provide Urban Design & Planning Services. Norfolk is a member of the **Rockefeller Foundation's** 100 Resilience Cities initiative and any planning effort must be multidisciplinary. "The Hampton Roads region is second only to New Orleans, LA, as the largest population center at risk from sea-level rise in the country. The City appreciates that our team has transportation planning,

urban design and climate change expertise all under one roof," said Osler.

An extreme weather vulnerability study is also underway for the Pennsylvania DOT. "We are looking across their system, not at any particular action, but to assess their whole system's vulnerabilities today and in the future," he said. "We will be recommending design standards and internal operation procedures to use during severe weather events and this will set the stage for PennDOT to tackle these issues head-on."

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### *Climate resiliency planning and design support is now clearly its own market.*

- Mark Osler

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Michael Baker is currently leading preparation of an update to the General Plan and Local Coastal Program for the coastal community of Morro Bay in California. In September 2016, Michael Baker staff submitted an updated draft Community Vulnerability and Resilience Assessment, which outlined climate change risks, including coastal flooding and erosion, wildfires, droughts and landslides and surface flooding due to more intense precipitation. Michael Baker also ranked demographic and economic changes alongside climate impacts in a matrix of exposures (see chart).

To fund the project, including the consultant fees, the City set aside \$609,000 from its general fund and augmented this with a \$250,000 grant from the Ocean Protection Council (sea level rise assessment) and two grants totaling \$347,000 grant from the California Coastal Commission for the community's Local Coastal Plan update).

Michael Baker partnered with San Francisco-based coastal engineering firm **Moffatt & Nichol** for the Morro Bay plan, and local subcontractors include

**Central Coast Transportation Consulting**, RRM Design and Rincon Consultants. "We work hard to bring the right partners together and ensure that we provide the best service for the client," said Osler.

### **Local reputations matter**

In addition to technical competence, partners' local reputations are important. "The ideal teaming partner will understand the specific client, the geographic setting and the political dynamics at play, in addition to providing the required subject matter expertise," said Osler.

When it comes to finding partners with climate change expertise, academic climate science researchers with strong local reputations are sometimes brought in as partners by Michael Baker. "Not only do academics provide insights from the cutting edge of the research community, but these individuals typically have high profiles within the stakeholder community. Bringing them in as partners is beneficial to the work itself as well as in fostering trust in the work product which results."

Michael Baker was the managing partner for a six-year effort analyzing coastal flood risks along the entire shoreline of the State of California for FEMA—a "momentous challenge," summarized Osler. To assist with this work, Michael Baker partnered with the **Scripps Institution of Oceanography** of UC San Diego. "If you're talking about the ocean in California, there is immense value in bringing Scripps onboard the effort. They provide world class technical expertise and also increase the confidence of the communities and the client."

In terms of peer firms with climate change expertise and a similar range of front end design and engineering capabilities, Osler mentions **AECOM**, **Arcadis**, **Dewberry** and **Arup**. "There are also firms that are engaged with federal policy and planning including **Leidos**, **SAIC** and

ICF,” said Osler. “Those firms aren’t going to build the infrastructure, but they have excellent people and can help public sector clients wrestle with these problems at a policy level.”

Osler says local governments are at widely varying stages of the climate change planning continuum. “Clients that are forward looking are incorporating these variables into their long-range planning, and we help them make sure these future considerations are incorporated into capital improvement programs over decadal time scales,” he said. “Some folks are not quite as forward looking, so the projects are usually more of a one-off, often triggered by a grant opportunity. State and regional policies also plays a role in driving action such as in the state of California where jurisdictions are generally required to prepare local Climate Action Plans.”

Osler agrees with some other consultants interviewed for this edition that denial or skepticism about climate science causes some government infrastructure managers to ignore or downplay future impacts. “Denial certainly exists. A more common challenge is a decision maker who lacks clarity with respect to potential

impacts specific to their organization’s mission. It is important to listen first and to meet them where they are on these issues,” he said. Denial or uncertainty are less common in coastal communities “that have been living with the impacts of sea level rise. As an issue of science, sea level rise is not contentious.”

“As consultants, it is important that we don’t bring pre-conceived answers and that we avoid speaking about existential risk or anything that’s too broad. We stay focused on goals of the community or mission of the organization and the potential impacts that climate change may present,” said Osler. “For people who manage infrastructure, this may be an entirely new problem for them to face. As a result, there is usually an element that we bring of raising understanding and capacity building inside an organization.”

“Finding room for a new priority is a real challenge for any organization, and quite often it’s equal to the technical and scientific challenges of adaptation,” said Osler. “Before people are willing to act, they must feel a sense of concern and urgency. Unfortunately, the human mind is highly skilled at justifying why we do not need to be concerned.”

“From optimism bias—bad things will happen somewhere, but not here—to simple procrastination—we will deal with it later—people and organizations consistently find it difficult to address risks,” said Osler. “These challenges are often compounded by the complexity of a system’s resilience needs. We are increasingly working to employ the concepts of social and behavioral sciences within our risk communication efforts to help meet these challenges.”

Setting specific goals can be helpful in achieving action. “We often challenge our clients to articulate a specific, measurable goal they might work toward,” said Osler. “An airport for example may wish to define a resiliency goal as the ability to take off and land airplanes within 24 hours of the passing of a hurricane and receding of storm surge from their runways. With this specific goal established, we can then work to identify which infrastructure are critical to achieving this goal and what must be done over its lifetime to protect it.” ☼

### Land Use Exposures, Vulnerability and Resilience, Morro Bay, CA

Assets	Demographics	Economics	Climate Change				
			Temp.	Wildfire	Drought	Flood	SLR
State-owned open space				○	○		○
Beaches							○
Coastal zone accommodations		○					○
Commercial fishing infrastructure			○				
Agriculture	○	○	○	○	○	○	
Housing stock	○		○				
RV parks						○	
The Embarcadero			○				○
Strip commercial		○				○	
Downtown	○	○					
Highway 1 commercial		○				○	
Hillside neighborhoods				○		○	

Source: Michael Baker, City of Morro Bay

Acclimatise	28, 32	Office for Metropolitan Architecture	5, 9
AECOM	1, 10, 12, 32	PIANC	26
Alaska Airlines	33	Platinum Aviation	33
AltAir Fuels	33	Port Authority of New York and New Jersey	11
Amec Foster Wheeler	1, 19	PWC	22
American Association of State Highway and Transportation Officials	2	Ramboll Environ	27
American Public Transit Association	8	Re:Focus Partners	4, 16
American Road and Transportation Builders Association	2	RMS	6, 17, 19
Amtrak	7, 17	Rolls-Royce	10
Arup	12	R.V. Anderson Associates	3, 22
Association of Ports and Harbors	26	Rockefeller Foundation	12, 17
Arcadis	12	Scripps Institution of Oceanography	12
Army Corps of Engineers	4, 8, 14, 31	Sensor Applications and Modeling for Atmospheric and Environmental Research	7
Atomic Energy of Canada Limited	10	Simat, Helliesen & Eichner	35
BDO	22	Skanska Koch	32
Boston Consulting Group	32	SAIC	12
CalTrans	24	SNC-Lavalin	10
CDM Smith	4, 14	Stanford University	30
CDP	30	Stantec	2
Central Coast Transportation Consulting	12	State University of New York	9
CH2M	2, 8, 32	Stevens Institute of Technology	9
C.H. Robinson Worldwide	32	Swiss Re	17
Cisco	19	Tetra Tech	3
CityMart	19	The Nature Conservancy	8
Colliers	32	Transportation Research Board	33
Copa Airlines	32	Trimble	19
Dewberry	1, 9, 12, 36	UNEP	30
Dragados Canada	19	USAID	30
Energy Solutions	10	Veolia	19
Engineers Canada	22	Wall Street Journal	3
ENR	2, 10, 11, 14	Watson & Associates Economists	22
Federal Aviation Administration	32	World Bank	30
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Inter-American Development Bank	3		
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International Civil Aviation Organization	33		
International Finance Corporation	30		
International Maritime Organization	26		
Jacobs	10, 19		
Kennedy Jenks	26		
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Kilgore Consulting and Management	11		
Kleinfelder	32		
KPMG	22		
Leidos	12		
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Nordic Development Fund	3		
NYC Transit	5		

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