

# DREDGING UP THE FUTURE

**SEDIMENT FROM BALTIMORE'S SHIPPING CHANNELS  
IS AN IMPORTANT KEY TO THE ONGOING  
TRANSFORMATION OF ITS URBAN LANDSCAPES.**

BY KIM O'CONNELL

ABOVE  
A trench excavator  
moves earth at the Cox  
Creek Dredged Material  
Containment Facility, one  
of several repositories  
for sediment removed  
from Baltimore harbor  
shipping channels.

MAHAN RYWIEL ASSOCIATES

## COX CREEK



### ABOVE

From left, Brian Davis; Isaac Hametz; Qing Li; Madelyn Hoagland-Hanson; Xiang Huang, Student ASLA; and Marian April Glebes assess dredge at Cox Creek.

ON A HUMID DAY IN JULY, a large, undeveloped expanse of land outside Baltimore was dry and cracked, looking more like the famed Racetrack Playa at Death Valley than a little-known waterfront landscape in the mid-Atlantic. The air was perfectly still, the gray earth matching the hazy, overcast sky. Only two things intruded on the Rothko-esque scene—a bulldozer methodically digging a trench to funnel out water and a group of people stomping, kneading, and making brown balls out of a nondescript pile of dirt.

The dirt in question was dredge material—sediment removed from shipping channels to keep them navigable. The people were gathered at the Cox Creek Dredged Material Containment Facility (DMCF), located about a half hour southeast of Baltimore's Inner Harbor in the upper Chesapeake Bay, and led by Isaac Hametz, the research director for the Baltimore-based landscape archi-

tecture firm Mahan Rykiel Associates. Joining Hametz were four graduate landscape architecture interns, Jingting Li of Auburn University, Madelyn Hoagland-Hanson of the University of Virginia, Qing Li of the Rhode Island School of Design, and Xiang Huang, Student ASLA, of Washington University in Saint Louis, as well as the environmental artist Marian April Glebes, and Brian Davis, a Cornell University landscape architecture assistant professor who is part of the Dredge Research Collaborative (see "The Dredge Underground," *LAM*, August 2014). Mahan Rykiel has engaged in many community-oriented projects throughout downtown Baltimore, particularly its waterfront, and was midway through a summer intensive workshop focusing on the possibilities of designing with dredge.

"The Port of Baltimore generates a lot of economic return for this region," Hametz says. "Therefore, they're willing to grapple with the potential of this



### LEFT

Seed ball success: A mosaic of sprouting seed balls made from dredge material.

### BOTTOM

One small seed ball has big implications for the future of design with dredge.

material. They're interested in remediating the negative effects of this city's industrial past."

At Cox Creek, the group was charged with creating seed balls—combining the dredge with seeds and rolling them into about two-inch-diameter balls to see how closely the dredge performed like typical soil and whether it could be handled or delivered to the public in an accessible way. It was a messy affair, with one person mixing the dirt with water and seeds in plastic buckets, testing various ratios to get it right, while others stomped and ground up the dredge with their boots (like vintners working their grapes) to make it malleable and easier to mix. Others simply rolled up an arsenal of seed balls. (Hametz, whose dark beard and

glasses give him a professorial air that is quickly tempered by his lighthearted demeanor, clearly enjoyed throwing a few seed balls to determine their smash quotient.)

"We were working with a material that really hasn't been utilized much in traditional landscape applications, and we're also subject to things like budget constraints, public perception, and so on," Hoagland-Hanson says. "We really had to get creative with our suggestions."



Three weeks later, to the team's excitement, many of those seed balls would sprout, further expanding the possibilities of dredge. But it's just one small part of a much larger puzzle.



**COX CREEK**



**D**EALING WITH DREDGE MATERIAL is a massive logistical, financial, and environmental challenge for the Port of Baltimore—one that also has ramifications for sustainability, resilience, and social justice. An average of 1.5 million cubic yards of sediment are dredged from the harbor every year, comprising a major portion of the roughly five million cubic yards removed from the whole bay channel system, which allows for the safe passage of the many vessels that serve the Baltimore shipping industry. As Maryland's most populated city, Baltimore has always been grittier and more industrial than, say, nearby Philadelphia or Washington, D.C. Much of its industry has been oriented toward the water; indeed, the view from the city's famed Inner Harbor is still dominated by the massive Domino Sugar plant, which has operated there for 95 years. The city toils under the shadow of a lingering racial divide that was heightened by the 2015 death of Freddie Gray while in the custody of Baltimore police. It's a city that has been grappling with its identity in several ways. Increasingly, landscape architecture—and specifically designing with dredge—has an important role to play in that process.

Recent decades have seen Baltimore's waterfront shift more toward tourism and service industries, too, exemplified by the fact that an old harbor-front cannery now houses the Baltimore Museum of Industry. While part of that shift is owed to the enormous success of the Inner Harbor shopping and entertainment district and Baltimore's professional sports teams, as well as significant institutions such as Johns Hopkins University, one can't ignore the impact of Kevin Plank, the Maryland-born founder of Under Armour sports apparel, headquartered in Baltimore. Plank's real estate company, Sagamore Development, recently opened the luxury Sagamore Pendry Baltimore hotel in the city's gentrifying Fells Point neighborhood, where guests can sip poolside cocktails within view of the Domino Sugar sign. Plank's current venture is the \$5.5 billion Port Covington project, a mixed-use, work-where-you-live mini-city within a city, whose landscape architecture and habitat are being designed by Landworks Studio and Biohabitats, respectively. Although the city

generally welcomes Plank's high profile and tax dollars, the mogul has his critics, too, who say that Sagamore developments too often occur without considering community input, history, and context as much as they should—further dividing a city that needs all the unity it can get.

Overarching the city's complex urban issues is its relationship to the Chesapeake Bay and its watershed. The bay is a complex estuarine environment whose watershed is the largest on the Eastern Seaboard, supporting hundreds of species of birds, mammals, amphibians, and fish, not to mention traditional water-based ways of life. Yet the bay has long been a threatened

**ABOVE**  
Innovation and design are expanding possibilities for dredge facilities like Cox Creek.

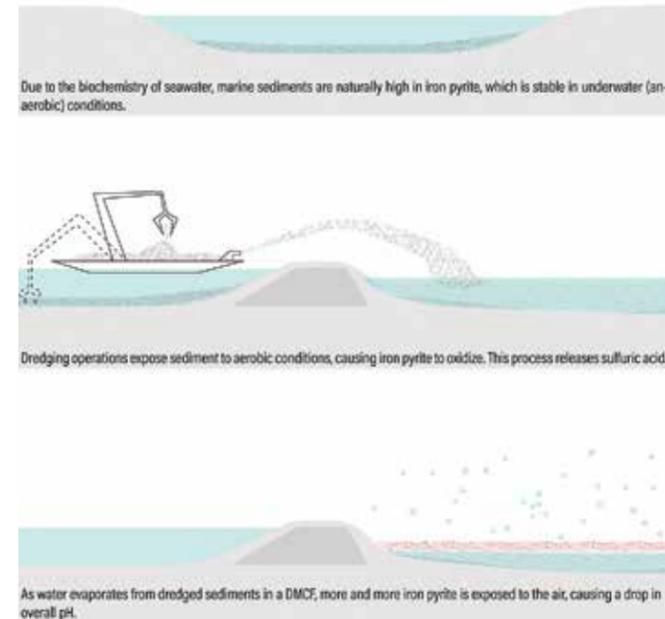
**LEFT**  
The Swan Creek Mitigation Wetland at Cox Creek contains high and low marsh and saltbush habitats.



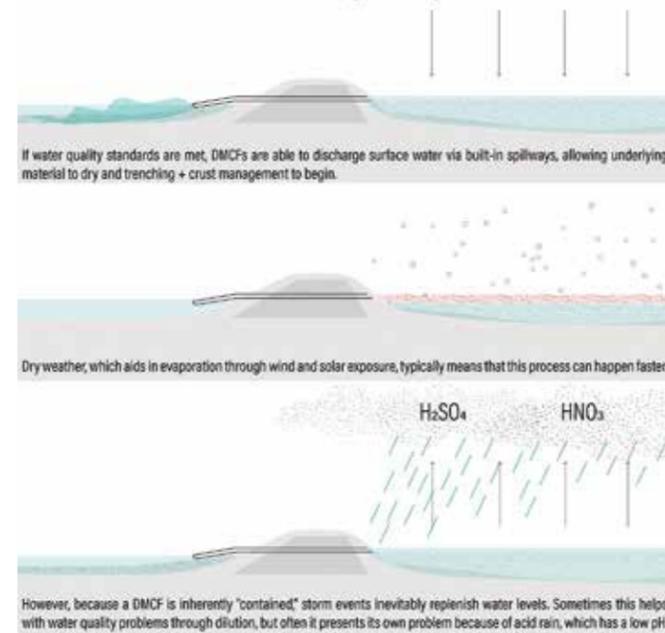
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WATER + SOIL QUALITY: ACID SULFATE FORMATION



WATER QUALITY: RETAINING (STORM)WATER



environment, suffering from pollution, habitat loss, overharvesting, industrial contamination, and climate change. Tangier Island, located farther south in Virginia, is literally sinking due to sea-level rise, for example.

With Superstorm Sandy a not-yet-distant memory in the Northeast and areas along the coast still recovering from the devastating 2017 hurricane season, Baltimore understands all too well that to be a waterfront city is to be a vulnerable one.

**I**N RESPONSE, MAHAN RYKIEL is just one of several Baltimore landscape architecture firms that are now working to revitalize downtrodden areas of the city, reconnect neighborhoods, and improve resilience. Some recent examples: The multidisciplinary firm Design Collective revitalized an otherwise barren plaza near the Inner Harbor into a sustainably designed green mecca. Poole Design created a visually rich urban park as part of the historic Union Mills redevelopment, which converted a former mill into a mixed-use housing complex. And Flaura Teeter Landscape Architects reimagined a banal intersection near the Inner Harbor as one that made a stronger connection with the adjacent Federal Hill neighborhood, while reducing impervious paving and stormwater runoff.



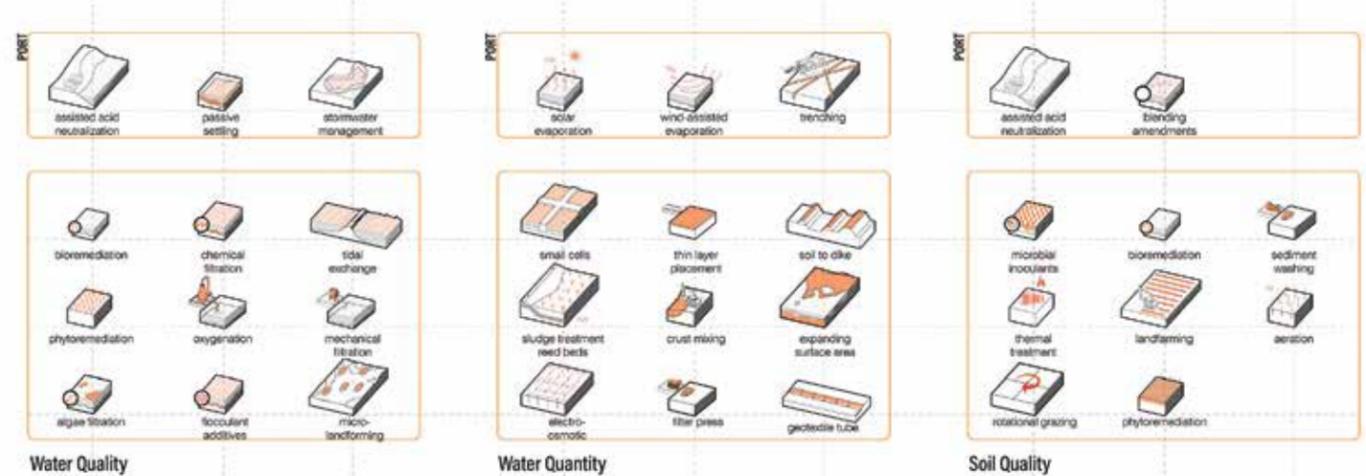
**ABOVE**  
This Hart-Miller Island schematic examines how water and soil can be treated or reused.

**BELOW**  
Options for water and soil include thin layer placement and bioremediation.

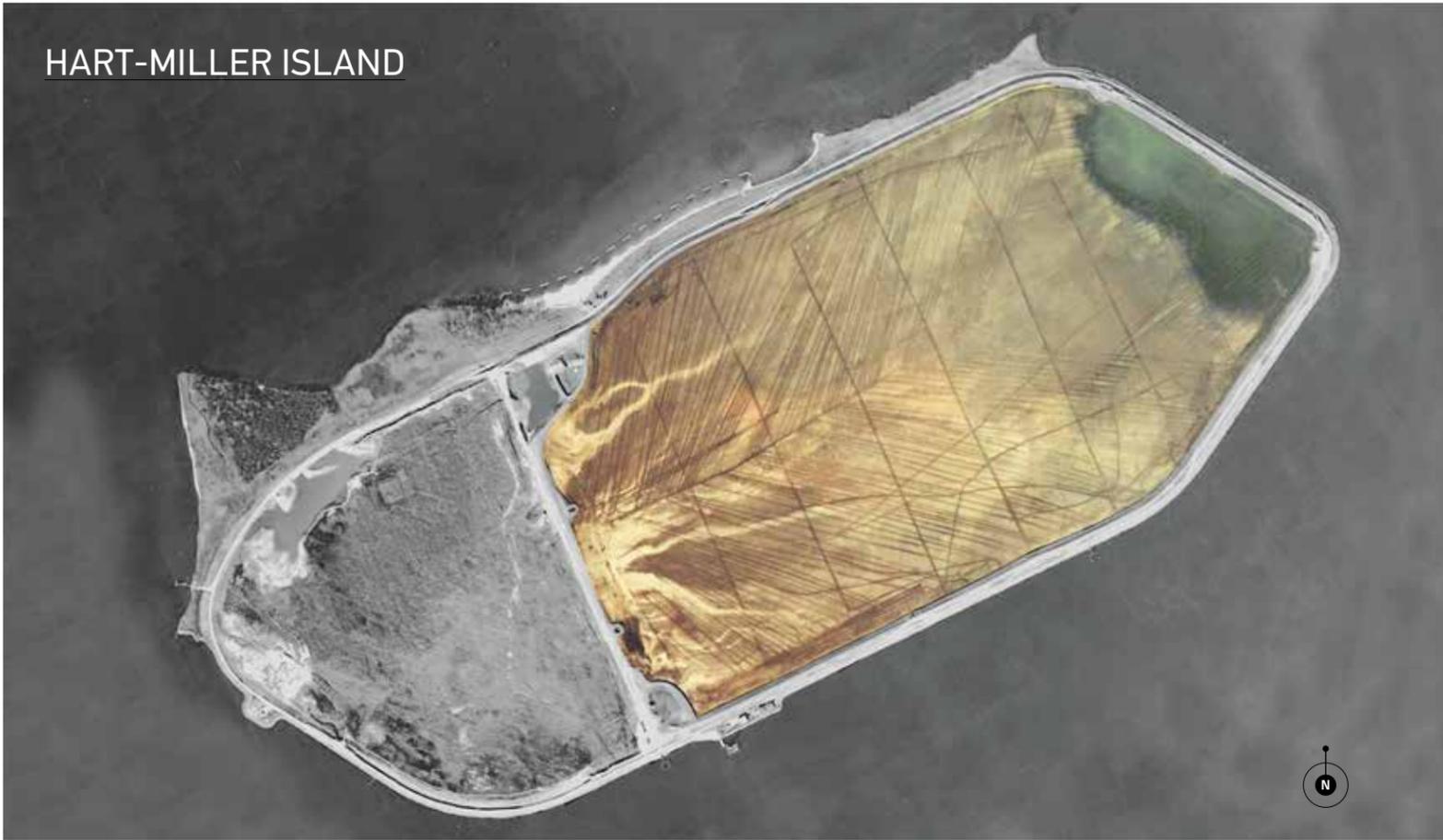
Strengthening connections is particularly important to Mahan Rykiel, whose president, Richard Jones, has been vocal about the need for designers to improve trust and dialogue with communities of color in particular. Jones is the son of a German mother and an African American father, and he experienced the palpable inequality between the parks of his mother's homeland versus the New Jersey haunts where his father grew up. That

sensibility informs much of the firm's work now, such as the recently completed Eager Park, a 5.5-acre city park that bridges the gap between the Johns Hopkins medical complex and a residential area on Baltimore's East Side. The new park includes a terraced and flat lawn, an amphitheater, a state-of-the-art playground, and community gardens—and most important, it was created with community input.

CATALOG OF DREDGE PROCESSING TECHNOLOGIES



# HART-MILLER ISLAND



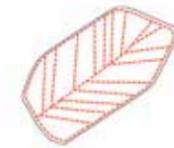
TRENCHING PHASE: 1



TRENCHING PHASE: 2



TRENCHING PHASE: 3



TRENCHING PHASE: 4



**LEFT** Although clearly engineered, the north dike of Hart-Miller Island is profuse with wildflowers and a scenic waterfront landscape.

With the city so focused on revitalization, Jones hopes to develop new opportunities for certain neighborhoods, including lower-income areas, to get reconnected to a waterfront from which they have long been cut off by industry. To this end, the firm has also redesigned Rash Field in the Inner Harbor, currently an austere collection

of quasi-Brutalist beach volleyball courts, with a more naturalistic scheme, including a meandering circulation path and spaces for native species such as butterflies, and envisioned a master plan for the Baltimore Museum of Industry that makes a vital connection between this industrial area and the waterfront. “Baltimore had, in some

ways, lost its family connection as it oriented its waterfront for tourists,” Jones says. “But we wanted to create spaces for everyone.”

Where does dredge material fit into this equation? The answer, according to Hametz, is “many more places than you would think.”

**A**BOUT 14 MILES EAST of Baltimore’s Inner Harbor lies a natural landscape that, in certain places, looks remarkably wild, with osprey guarding their kill in the treetops and herons alighting by small pools of water. This is Hart-

**ABOVE** Moisture management practices at Hart-Miller Island rely on a series of trenches to funnel out water.

**LEFT** A portion of Hart-Miller is now a state park that includes a popular public beach.



Miller Island, an 1,100-acre restored landscape in the upper Chesapeake Bay. Accessible only by boat, the island is managed through a partnership between the Maryland Department of Natural Resources, the Maryland Environmental Service, and the Maryland Port Administration. A trail leads visitors from the boat dock through an undulating landscape of marshes, grasses, and small stands of deciduous and pine trees. Only in the more open sections of the island does it become clear that this is actually an engineered landscape created largely out of dredge material.

Hart-Miller is the result of an early 1980s construction effort that merged the remnants of two existing islands and created an elliptical perimeter dike so that the island could become a repository for dredge. The island is now closed to new dredge, so the port has only a handful of designated containment facilities at its disposal, including ones at Cox Creek and Masonville (which handle harbor dredge material), and Poplar Island (which accepts Chesapeake Bay dredge), and remaining capacity is a concern. In 2016, the port unveiled a

new initiative called Sediment to Solutions: Channeling Innovation, to seek creative opportunities to reuse dredge and increase the region’s disposal and reuse capacity. The idea to innovate around the use of harbor dredge actually dates back to 2001, when the state of Maryland banned open water disposal of the sediment. After some fits and starts, the effort has now gained buy-in from the port and several public-private partners.

“In 2014, we approved an environmental strategy with several action items,” says Kristen Fidler, chief of outreach, policy, and permits for the Port Administration. “Our short-term goal is small to medium demonstration projects. The long-term goal is to recycle 500,000 cubic yards of material a year by 2023.” Mahan Rykiel’s Design with Dredge workshop fits right in with both goals.

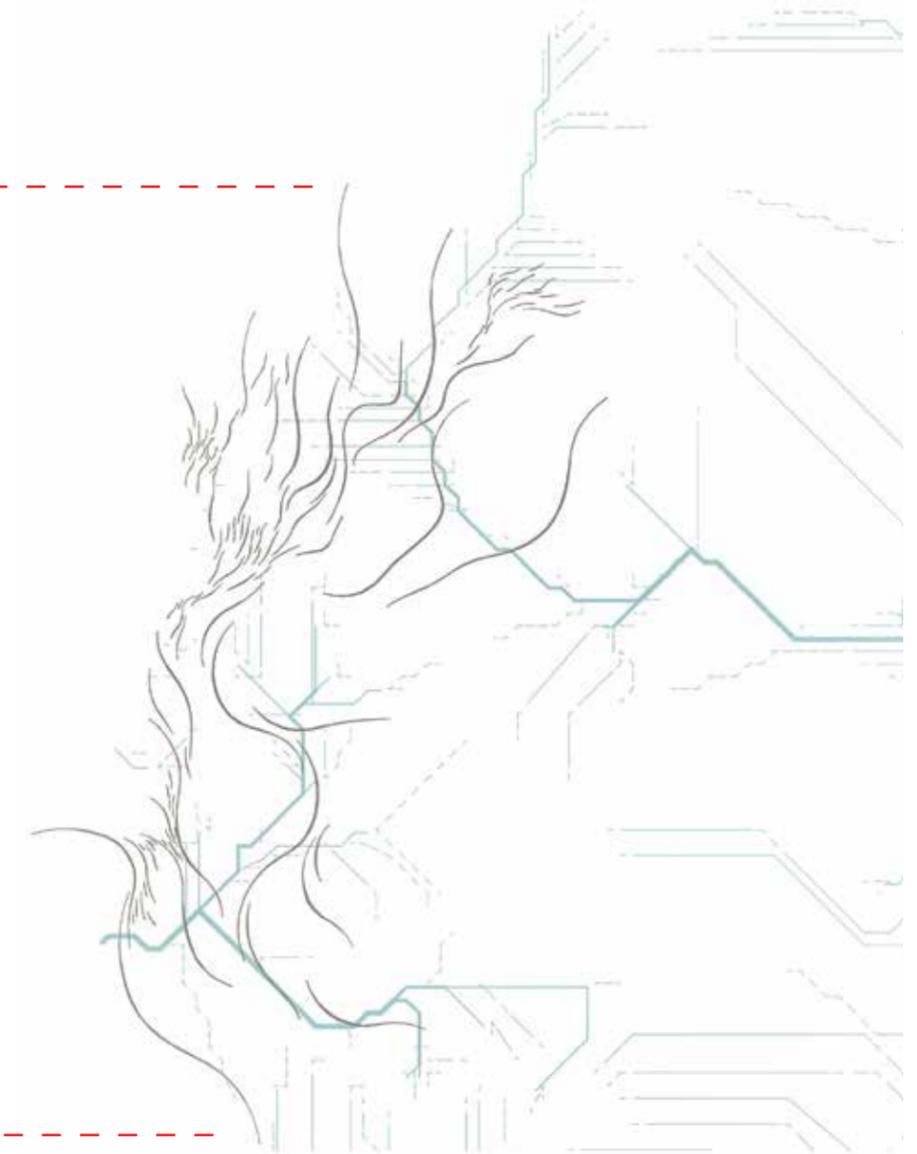
The primary problems with designing with dredge, according to Hametz, are perception and performance. Originating in an industrial urban area, dredge is often viewed simply as an environmentally questionable waste product—and 30

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# HART-MILLER ISLAND

PLAN: MICROLANDFORMS

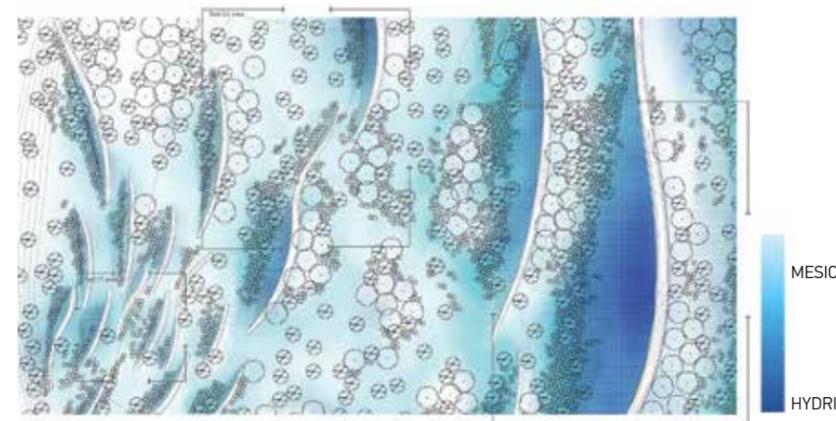


**ABOVE**  
Mahan Rykiel's plan for Hart-Miller Island includes creating a series of undulating microlandforms.

**RIGHT**  
This illustration of microlandforms suggests a greater range of management options for dredge sites.



MAHAN RYKIEL ASSOCIATES, THIS PAGE AND OPPOSITE



years ago during Baltimore's less-regulated industrial heyday, that was probably more valid. Today, dredged material from the harbor is mostly silt and clay and not hazardous, according to the port, thanks to regular dredging, less industry, and more environmental protections. Mahan Rykiel's dredge workshop, along with other outreach efforts by the Port Administration, was created to help change dredge's bad reputation, while demonstrating through a pilot project the social and environmental benefits of designing with dredge. Working closely with the port, the firm set out to deliver possible alternative locations and end uses for dredge material, doing a deep

**LEFT**  
Microlandforms require less equipment, smaller catchment areas for water, and greater opportunities for dynamic habitats and diverse planting palettes.

## HART-MILLER ISLAND

PLAN: VEGETATION



dive on one specific site to examine how best to use dredge material there, and then finally designing an installation or other means for public engagement with dredge material. (Perhaps one day dredge seed balls could be given out to home gardeners, for example.)

In August, the firm, along with the student cohort, presented their findings to the port, sharing with them a wide range of sites, both along the

waterfront and further upland, where dredge could be reused, including brownfields, vacant buildings, landfills, and other places. Using those sites would buy the port nearly 40 more years' worth of dredge containment capacity, according to the firm.

"Even if we buy them 40 more years, however, they still have to process it," Hametz says. "They still have to find ways to utilize that dredge material."

### ABOVE

Vegetation for the renewed Hart-Miller Island would include wetland, floodplain, upland, and meadow species.

### RIGHT

An illustration showing the surprisingly naturalistic landscape that is possible in this disturbed setting.



## TURNER STATION



**LEFT**  
Baltimore's Turner Station neighborhood has lacked a meaningful connection to its waterfront—something dredge could help improve.

**BELOW**  
Isaac Hametz points out the challenges along the waterfront at Turner Station's Fleming Park.

**R**IGHT NOW, the port uses a relatively limited palette of treatment options for improving water and soil quality and dealing with water quantity, such as neutralization (such as with lime), trenching, and soil amendments. Dealing with accumulating water is a major issue for dredge sites, hence the bulldozed trench at Cox Creek. Hametz's team identified many more treatment options, including phytoremediation, thin layer placement, microlandforms, and microbial inoculants.



The firm proposed putting some of these alternative options to the test at Hart-Miller. Historically, environmental engineers dealt with water through a series of herringbone trenches, which resemble the venation patterns of leaves in aerial photos but in practice are an unnatural and highly engineered solution to water quantity control. Instead, Mahan Rykiel suggested the creation of microlandforms in a pilot section of Hart-Miller,

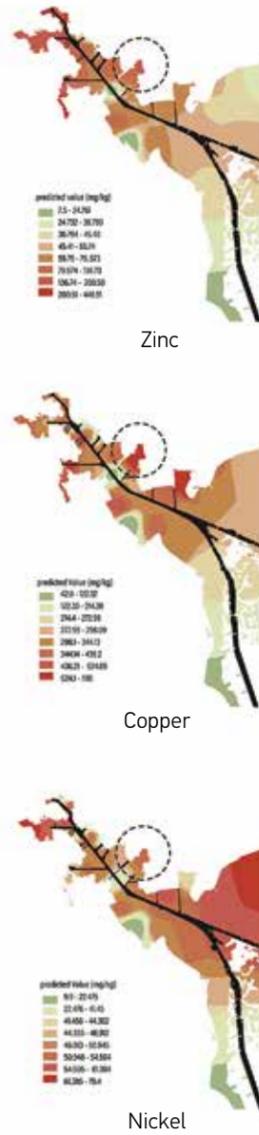
basically a series of curving small berms between a foot and a half and three feet high that would create mini-upland areas and wetter lowland areas. Instead of digging long trenches across the dredge containment cell, the firm suggested working with the existing site topography to take advantage of natural drainage patterns, which would streamline maintenance and probably cost less to manage. "It will create a relatively even

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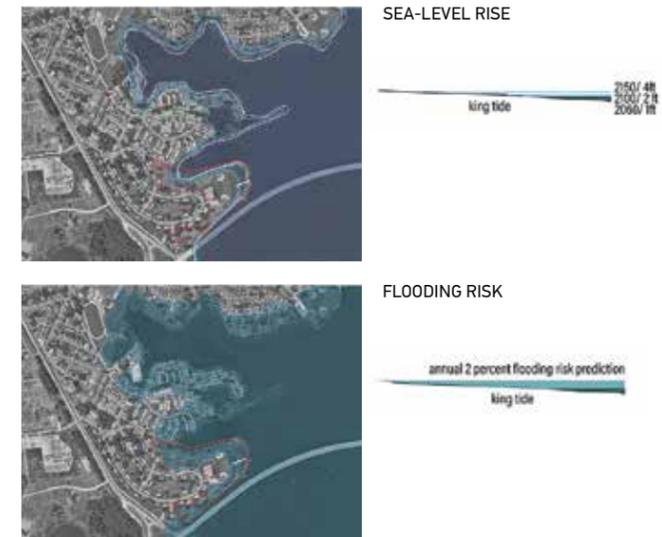
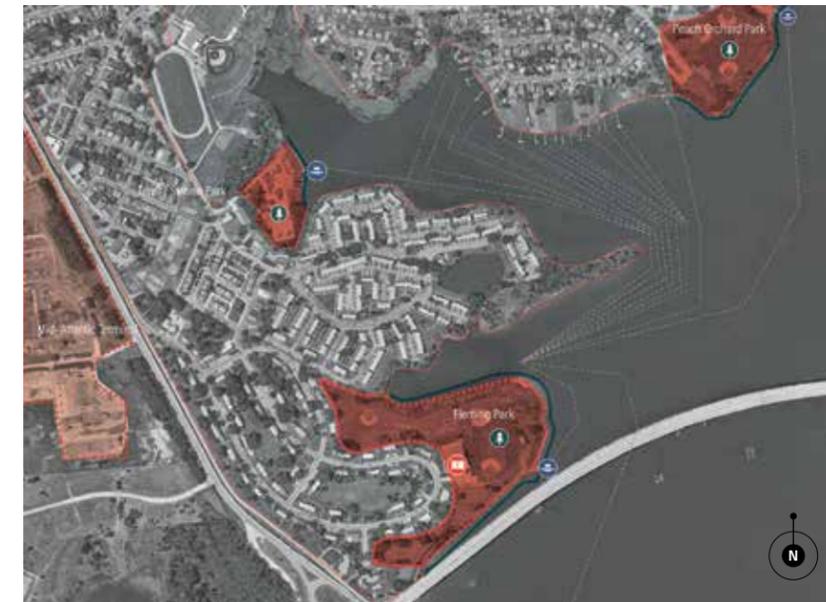
MAHAN RYKIEL ASSOCIATES

# TURNER STATION

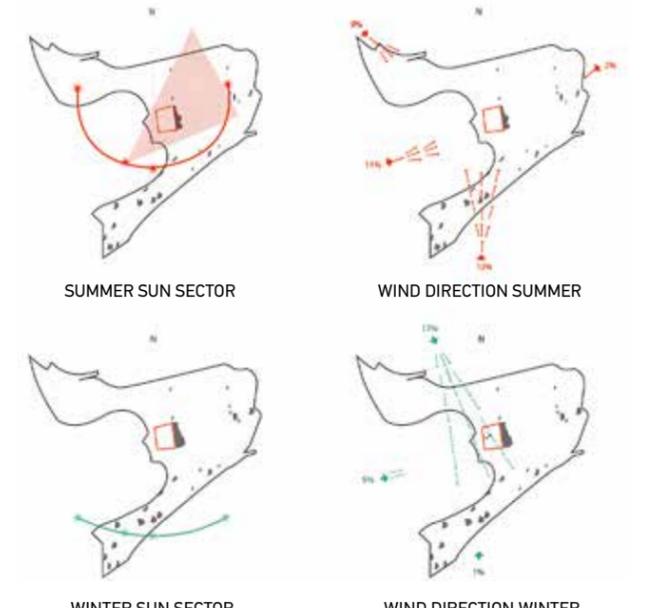
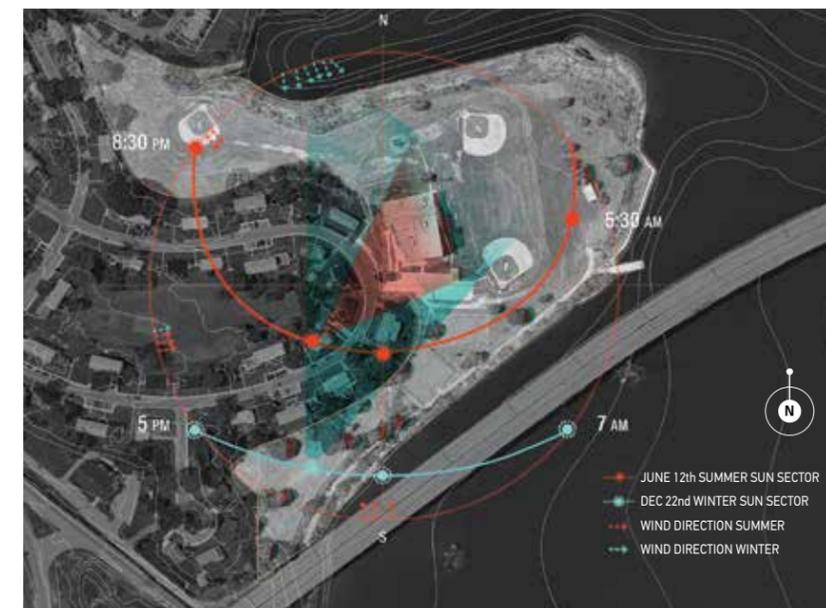
## PERIPHERY POLLUTION ANALYSIS



## SHORELINE HAZARD ANALYSIS



## CLIMATE ANALYSIS



**ABOVE AND OPPOSITE**  
Deep analyses of the pollution breakdown, shoreline hazards, climate impacts, programming, and current vegetation at Fleming Park helped to inform the firm's proposal for its future.

moisture gradient across the landscape," Hametz says. "Water will slow down as it flows over it."

The team also examined how an urban residential site in particular could benefit from the use of dredge material. Hart-Miller Island has no permanent residents, but Turner Station is a historically black residential community in Dundalk, southeast of Baltimore, that is perhaps best known as the former home of Henrietta Lacks, the African American woman whose cells were taken without her knowledge and reproduced in the name of science, a story made famous by a best-selling book and television movie. "This whole area has been sandwiched by industry on all sides," Hametz says. "It's been marginalized and neglected."

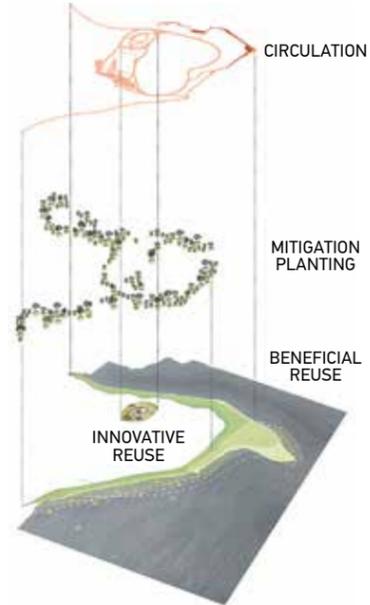
One primary gathering place for the neighborhood is the 20-acre Fleming Park, located on a point of

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# TURNER STATION

## DESIGN PROPOSAL



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COIR LOG

BOARDWALK PILE

SILT CURTAIN

HIGH MARSH DREDGED MATERIAL

LOW MARSH DREDGED MATERIAL

SUBSTRATE ZONE DREDGED MATERIAL

land right on the water. Although the park has a couple of baseball diamonds and a walking path, the land at the water's edge is thick with invasive plants, effectively barring community access to the water. Old pilings ring the site as well, and the park is at regular risk for flooding. In its proposal, the firm envisioned depositing a thin layer of dredge material at the water's edge that would improve the site's ecology in a number of ways: It would cap pollutants, restore the aquatic substrate for benthic organisms, remove invasives, and create a layered landscape with upland, marsh, and mudflat ecosystems. Furthermore, it would bolster the shoreline and thereby make it more resilient in the face of storms. The implications of this kind of work for downtown Baltimore, where still it's hard to get to the water's edge in many areas, and yet where a 100-year flood could have devastating impacts, are tremendous.

"It was a big deal for the port to get in bed with us at this early stage in the process and to recognize the value of applying landscape architecture to these issues," Hametz says. "But now they've asked us to develop a proposal to advance the work at Turner Station and Hart-Miller."

This fall, Hametz also collaborated with Brian Davis on a landscape architecture studio at Cornell to identify additional possible dredge sites. And in October, the port approved a 25-acre pilot project at Hart-Miller Island that will include parametric modeling, grading, and hydrodynamic modeling.

"We were so blown away by the firm's proposal, and really impressed," Fidler says. "It is the result of so much hard work and thought and synthesis of an enormous amount of information. We're really excited about exploring what the future could be for dredge, and we don't want to lose the momentum that's been built up."

"All of this has broad implications for the port," Hametz says. "Being able to process dredge material in a resilient way, and being resilient when a disaster like a flood comes, is so important. We're building a platform with the port and our partners to keep working on this in a pragmatic, practical way in advance of a catastrophe and to keep taking those real steps forward." •

KIM O'CONNELL IS A WRITER BASED IN ARLINGTON, VIRGINIA, WHO WRITES OFTEN ABOUT CONSERVATION AND SUSTAINABILITY FOR A RANGE OF NATIONAL AND REGIONAL PUBLICATIONS.

**ABOVE**  
At Turner Station, adding a thin placement of dredge would bolster the shoreline and improve habitat.

**OPPOSITE**  
A remade Fleming Park could include waterfront access, diverse and native vegetation, and improved ecology and resilience.