

**REBUILD
BY
DESIGN**

GRASSROOTS REGIONALISM

**Resiliency Building in Low- and
Medium-Density Lowland Communities**

Interboro Partners

Apex

Bosch Slabbers

Center for Urban Pedagogy

David Rusk, Innovative Housing Institute

Deltares

H+N+S Landscape Architects

IMG Rebel

NJIT Infrastructure Planning Program

Palmbout Urban Landscapes

Project Projects

RFA Investments

TU Delft



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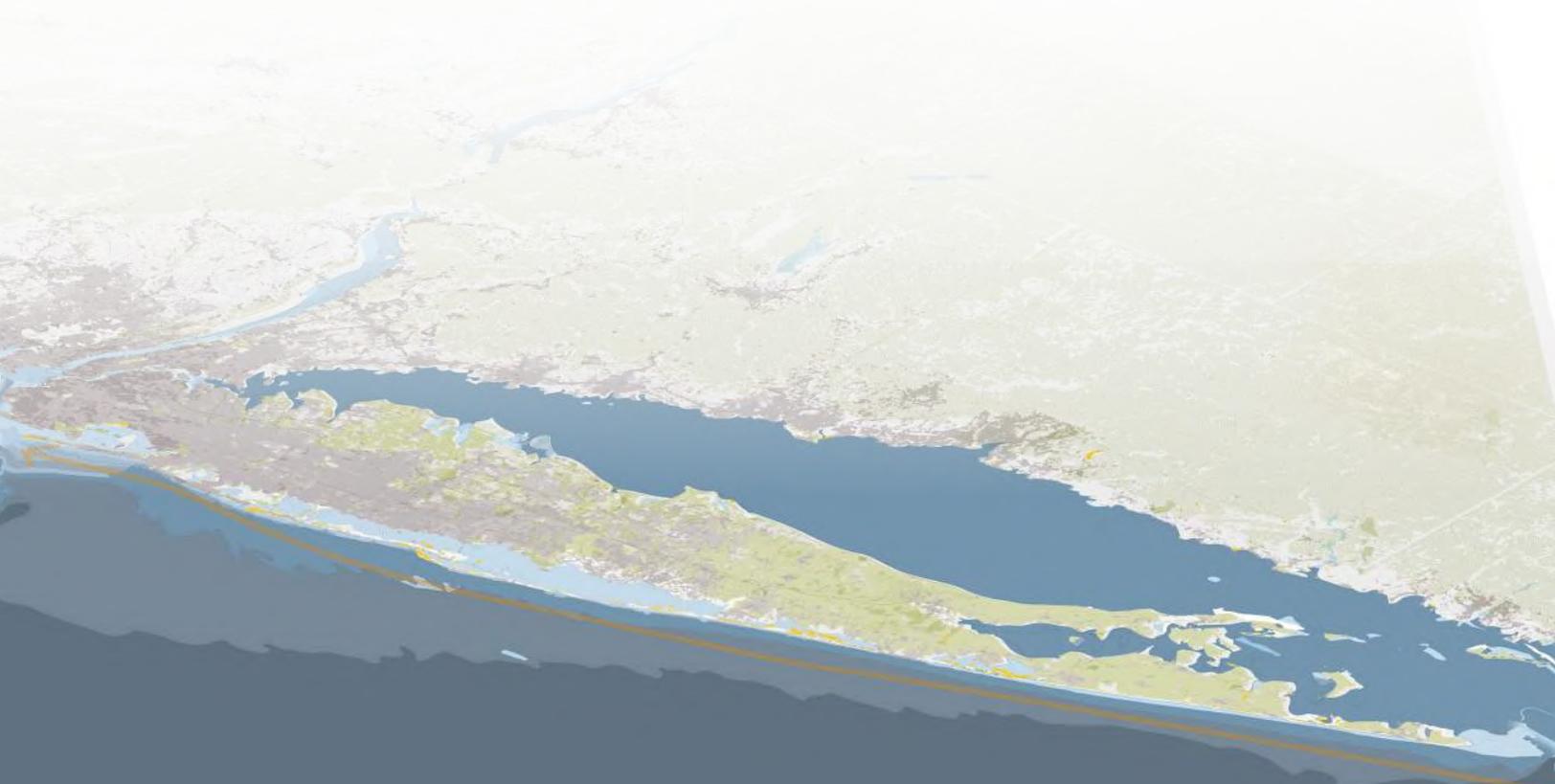


Introduction

As we approach the one year anniversary of Hurricane Sandy, most of the communities that were damaged by the storm are still recovering, struggling to determine where and how to find the resources to rebuild, adapt, or move on. Unfortunately, most communities are as vulnerable today as they were before Sandy hit. How do we as architects, planners, and policy makers ensure that our projects help those who need help the most? How can we ensure that our projects are maximally impactful?

We are pleased to present four design opportunities--each based on a different coastal typology--that offer a menu of options for vulnerable, low- and medium-income, low- and medium-density communities. While each design opportunity presents solutions for a particular place, it is our hope that each one offers solutions that may be applicable elsewhere.

In each design opportunity, we deploy what we call a “grassroots regionalism” that uses design to help grow an awareness about natural and municipal interdependencies.



Team

Our unique team combines the best of Dutch land use planning, environmental and coastal engineering, and urban water management with the best of American urban design, participatory planning, community development, engineering, and economic analysis and financial engineering. The Dutch contingent, which consists of design professionals who have extensive experience working together to adaptively plan coastal regions around the world, have envisioned, designed, and implemented some of the most important flood mitigation and management strategies worldwide. The American contingent, which consists of professionals in the fields of architecture, urban design, urban planning, coastal engineering, community economic development, governance, education, graphic design, and financial-economic advising, are recognized leaders in their fields and have an extensive track record working with communities to build resiliency.

Interboro Partners

www.interboropartners.net

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IMG Rebel

www.rebelgroup.com

NJIT Infrastructure Planning Program

architecture.njit.edu/academics/graduate/mip.php

Palmbout Urban Landscapes

www.palmbout.nl

Project Projects

projectprojects.com

RFA Investments

rfainvestments.com

TU Delft

www.tudelft.nl

Strategies

All of our design opportunities deploy the following strategies:

Towards a Grassroots Regionalism



Because planning and land use regulation in the United States is local, municipalities effectively have the power to chart their own courses, often without having to consider the consequences of their land use decisions for neighboring municipalities. But, of course, municipalities are interdependent and connected in innumerable ways. As a simple illustration, imagine two municipalities located on the same creek. The upland community's decision to zone for big-box retail means more impermeable surfaces. This will generate more stormwater runoff in the creek, which will result in an increased flood hazard for the lowland community. Is this fair?

Our system of "home rule" creates a barrier to the kind of regional decision making that is required to adequately address regional issues that don't respect municipal lines. These include environmental issues like stormwater management, pollution, and habitat preservation, but also social issues like transportation and housing. For example when municipalities aren't required to accept their fair share of a region's affordable housing, a small handful of municipalities become overburdened with affordable housing units.

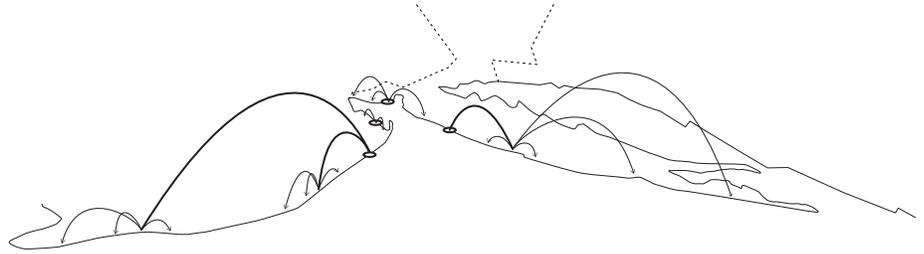
Regional decision-making is therefore required to create a built environment that is socially, economically, and environmentally sustainable and just. But how can regionalism be achieved when what's rational, comprehensive, and in the region's best interest and what's implementable, fair, and in the interest of any given municipality are two different things? A Mayor who campaigns on ceding authority to a larger unit of government is unlikely to get elected.

How do we help shift public consciousness? Our team has used the unique opportunity of this competition to develop what we're calling a "grassroots regionalism" that uses design to help grow consciousness about natural and municipal interdependencies. Our premise is that when it comes to regional decision-making, we have to work on the will in addition to the way.

We did this in two ways. First, we identified instances in which what's right for the region could be tailored to help meet local needs and achieve local goals. Protecting the Bay Park Sewage Treatment Plant from flooding helps ensure that Bay Park's streets, waterways, and homes won't be inundated with unprocessed sewage, but it also ensures that the 500,000 Nassau County residents the plant serves will be able to flush their toilets. In our design opportunities, we have identified many such "win-wins." Second, we centered each of our design opportunities on a natural feature—a freshwater marsh, a bay, a creek, and a beach—that is inhabited by multiple municipalities. In each instance, unsustainable development practices have led to the erosion of the natural feature, undermining its ability to protect residents from severe weather events, as well as decreasing its recreational potential. In our design opportunities, we propose to leverage the inter-municipal connections that these natural features provide by restoring them in a way that simultaneously enhances them as regionally significant public spaces

How can we grow a consciousness about municipal interdependencies?

Prototypical, Catalytic



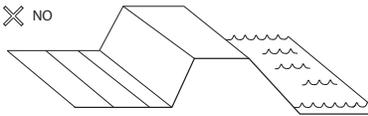
While each design opportunity can be implemented in one place, each offers solutions that may be applicable elsewhere.

As we approach the one-year anniversary of the storm, most communities are still recovering and struggling to determine where and how to find the resources to rebuild, adapt, or move. Unfortunately, most communities are as vulnerable today as they were before Sandy hit. How do we as architects, planners, and policy makers ensure that our projects will help those who need help the most? How can we ensure that our projects are maximally impactful?

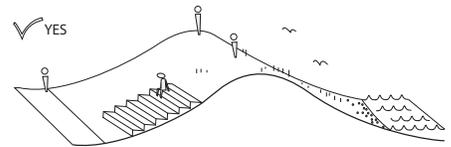
Toward this, we have identified design opportunities that are prototypical and catalytic. They are prototypical in that they address common problems. While each design opportunity can be implemented in one place, each offers solutions that may be applicable elsewhere. The design opportunities are catalytic in that each one can be conceived of as a concrete starting point that is capable of catalyzing other desired outcomes.

The Emergency and the Everyday

✕ NO



✓ YES

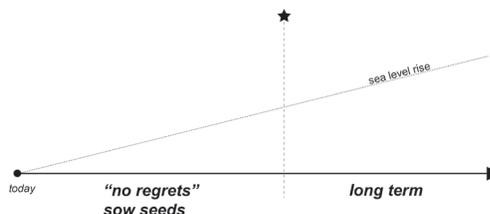


In our design opportunities, each and every investment in flood protection in one way or another improves everyday life.

Architecture that protects us from the occasional disaster (for example, a terrorist attack or a flood) too often requires us to sacrifice things we enjoy about everyday, non-disaster moments. The bollards, barriers, guard booths, and other anti-terrorist ephemera that started popping up around lower Manhattan soon after the 9/11 terrorist attacks might protect us somewhat from future attacks, but they also contribute to an environment that can feel unpleasant, hostile, and militaristic.

In our design opportunities, each and every investment in flood protection improves everyday life in one way or another. If we're going to build protective structures, we are going to add value to them so that they do more than merely protect.

Low-Risk, “No Regrets”

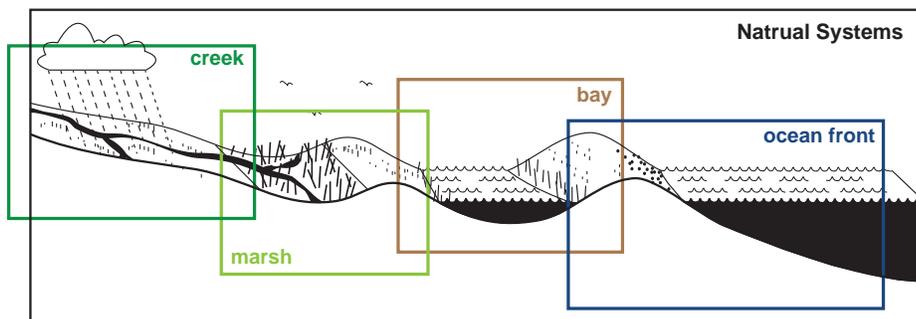


In our design opportunities, each and every investment in flood protection in one way or another improves everyday life.

Why did residents of Staten Island’s Oakwood Beach almost unanimously vote to retreat from their homes so soon after Hurricane Sandy? Prior to Sandy, Oakwood Beach was severely impacted by a nor’easter in 1992, a marsh fire in 2008, and Hurricane Irene in 2011. As one resident of 40 years put it, “[Sandy] was just like the last straw that didn’t even allow you to fool yourself into thinking it was OK to stay.”

It’s easier to think that you’re “stronger than the storm” when your community hasn’t repeatedly experienced the brute force of nature. And in places that presently lack the resources or the will to move, it’s not feasible to insist on it. However, neither does it make sense to sink billions of public dollars into protecting land that people may eventually want to walk away from. Working with low-density communities therefore means hedging your bets somewhat. Our design opportunities are relatively low-risk, “no regret” propositions for the present that offer a mixture of adapt, move, and protect strategies.

Design for a Dynamic Landscape



In our design opportunities, we take into account interconnections within the natural system.

The landscape is continuously transforming. Knowledge of dynamic natural processes such as tidal movement, erosion, and sediment movements allows us to work with and anticipate on these transformations. If we take into account the various interconnections within the natural system, we can use these processes to our advantage, and can create a more safe, productive, accessible, and attractive landscape.

Sites

We decided to look at vulnerable, low and medium income, low and medium density communities, representing a diversity of natural systems.

Communities that are Vulnerable to Flooding

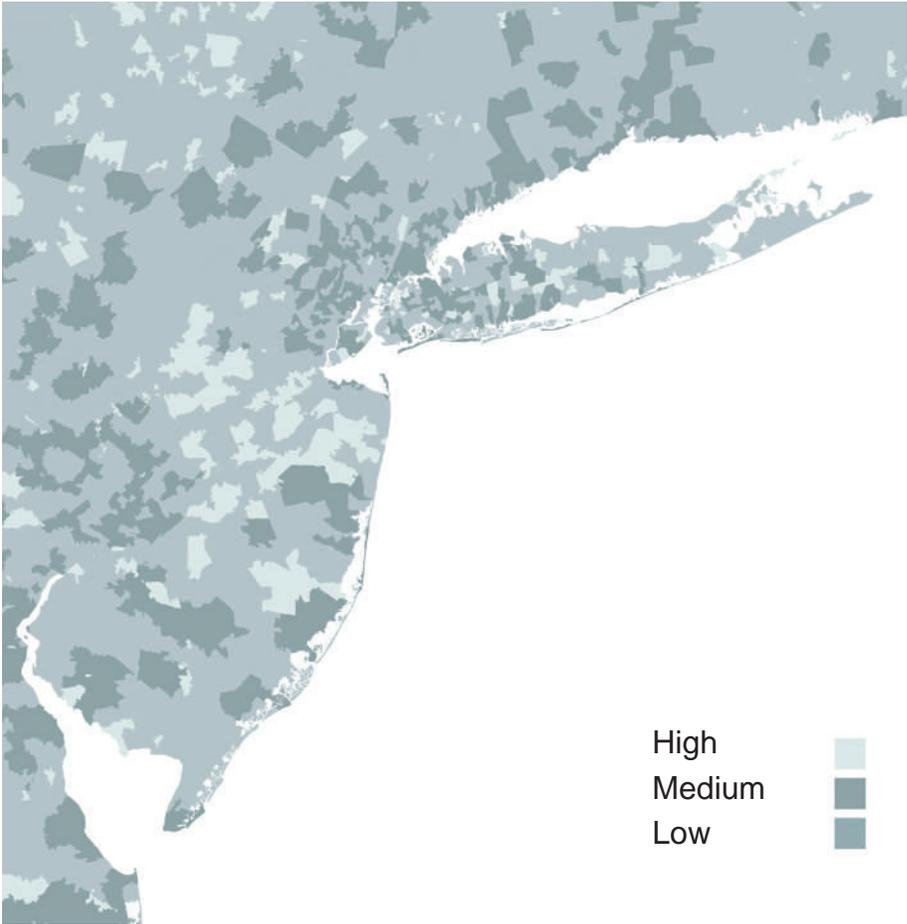


Sea level rise (SLR) is the 800-pound gorilla in the room. SLR is real. SLR is a Sandy-like storm surge in slow motion—an inexorable, month-by-month, year-by-year, decade-by-decade phenomenon that never creates a sense of immediate crisis, even as it contributes to the loss of natural habitat, renders our sewage and drainage systems ineffective, and of course increases the risk of future storms.

We have chosen a 6-foot SLR as our base standard. Why 6 feet? The New York City Panel on Climate Change sets forth four alternative projections for the 2090s: 10.4 to 23.4 inches by the International Panel on Climate Change (IPCC) plus local subsidence; 14.9 to 30.0 inches by the IPCC-adapted

Methods for the New York City Region; 22.6 to 33.7 inches by the Rahmstorf/Horton Method plus local subsidence; and 48 to 70 inches by the Rapid Ice Melt-Sea Level Rise Method. Without taking into account the acceleration of ice cap and glacier melting reported in recent decades, over the past 11,000 years the sea level has increased an average of 43 inches per century. At that historic rate, the current sea level would rise 37.4 inches by 2100. We have chosen a 6-foot SLR (the high side of the four projections) because that height is based on Dr. Jacob's expert judgment and because news media reports since the 2009 study indicate accelerating rapid melt of the ice in the Arctic Sea, the Antarctic ice shelves, and the Greenland ice sheet.

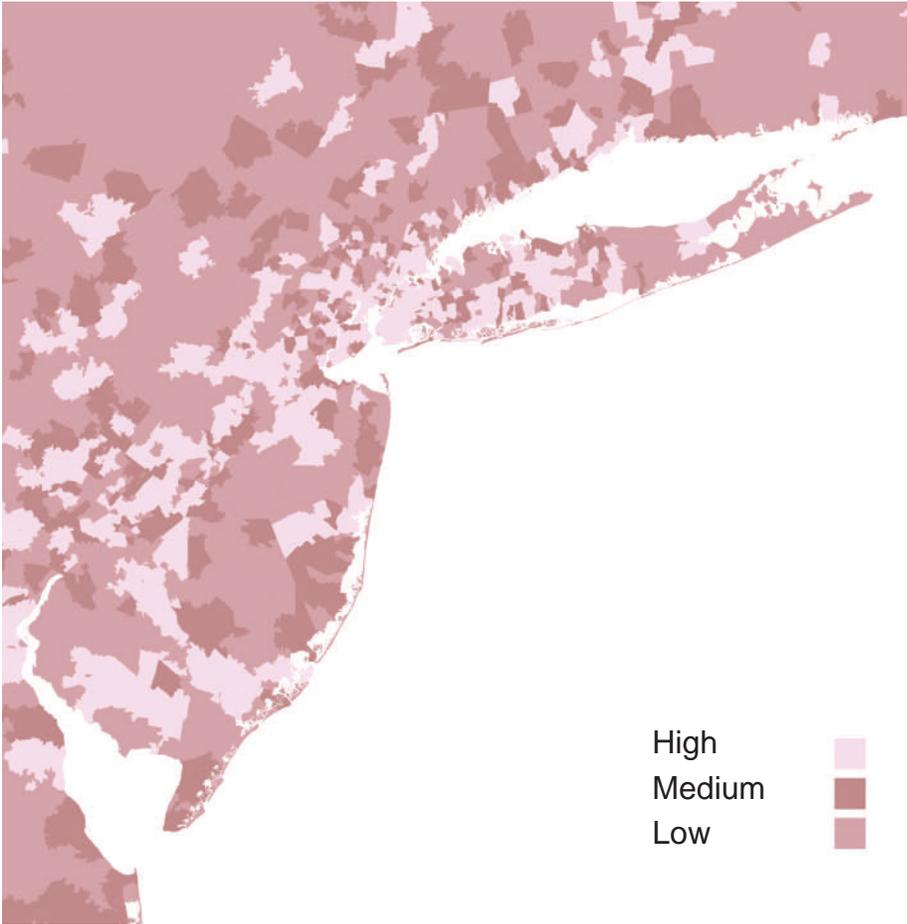
Low and Medium Income Communities



Hurricane Sandy did in fact discriminate: low-income communities were hit harder, more severely disrupted, and less likely to get back on their feet. We want to use this competition as a means to address recognized

emergencies—like floods—but also everyday, invisible emergencies, such as income inequality, segregation, and environmental racism, that are found in low-income communities.

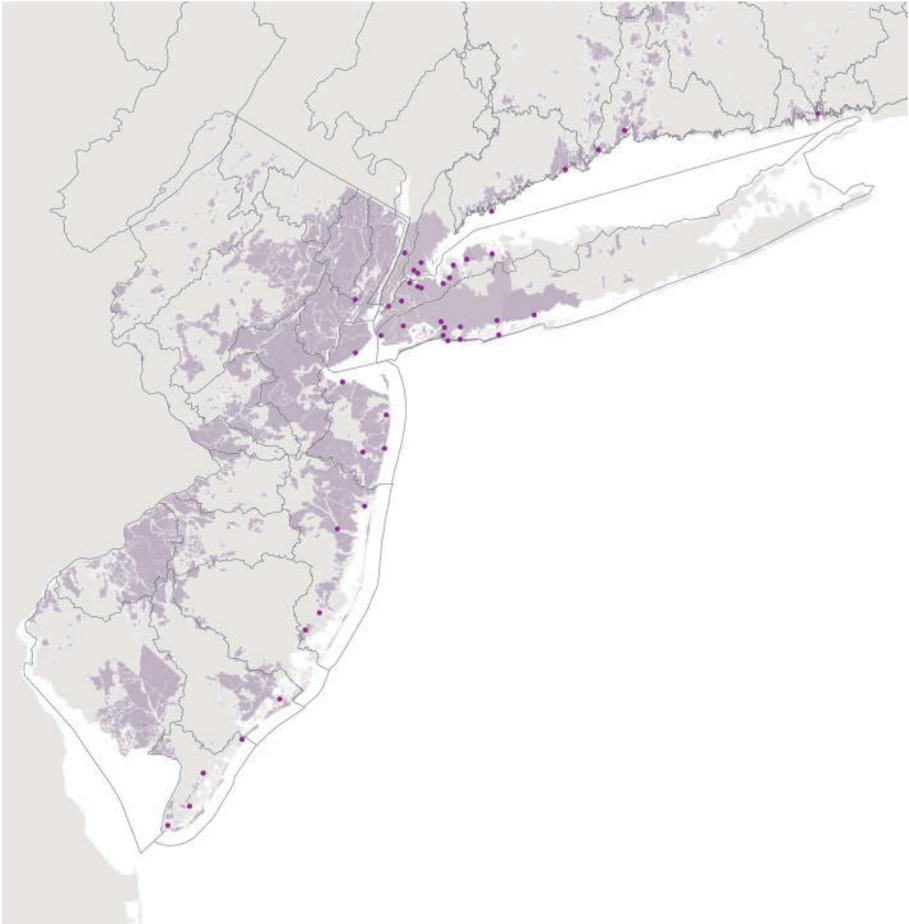
Low and Medium Density Communities



We decided to work in low- and medium-density coastal communities because of the unique challenges they present. Very high-density places are more likely to be protected against floods and very low-density places are less likely to be. But what about

medium-density communities that don't have the resources to effectively adapt to storm surges and sea level rise (or move somewhere else)? We want to use this competition as an opportunity to address questions like this one.

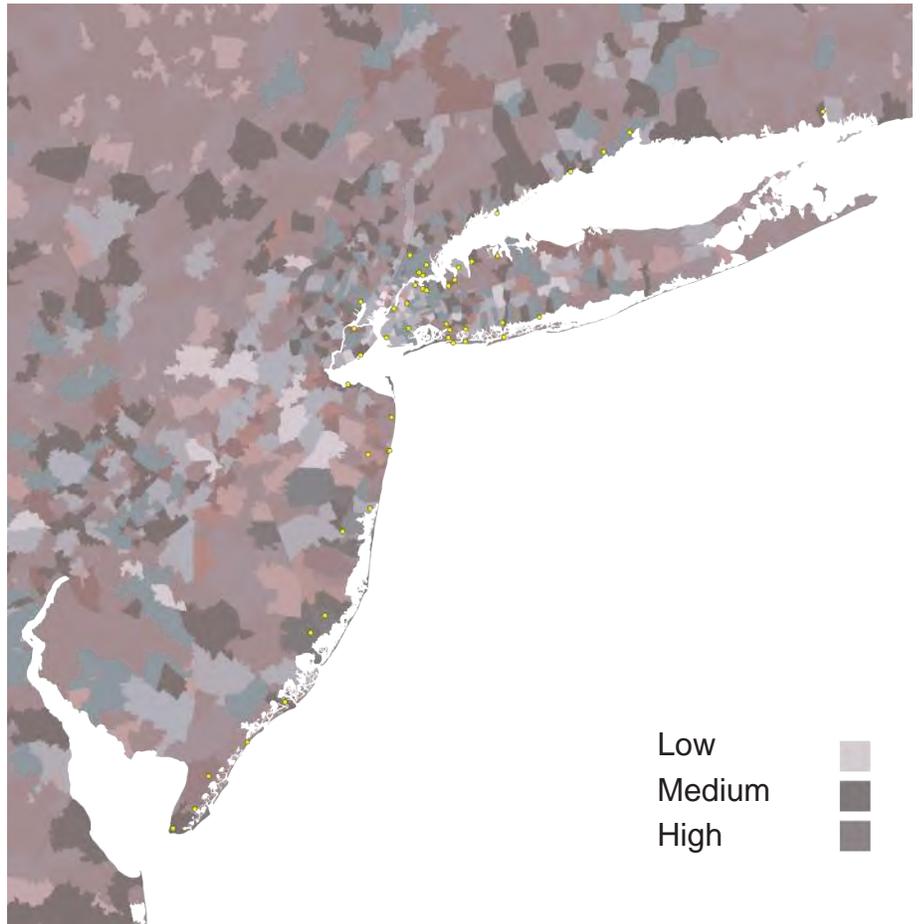
Communities with Critical Infrastructure



Because they rely on the force of gravity to move sewage, sewage treatment plants are typically located in low-lying, coastal communities and can't therefore be moved. Sewage treatment plants are critical to the regions they serve and therefore need to be protected. But as Climate Change Central concedes, "The vulnerabi-

lity of wastewater treatment plants to rising sea levels and severe storms is not well-studied and the projected costs of protecting these facilities (or making them more resilient to storm surge events) is not well-understood." In our projects, we want to explore solutions to this problem.

Communities that are Socially Vulnerable



The University of South Carolina's Social Vulnerability Index measures the social vulnerability of U.S. counties to environmental hazards. The index, which synthesizes 30 socioeconomic variables that are thought to contribute to or reduce a community's ability to prepare for, respond to, and recover from hazards, is a standard me-

tric that demonstrates where "there is uneven capacity for preparedness and response and where resources might be used most effectively to reduce the pre-existing vulnerability." According to the Index, all of our sites have a high social vulnerability to hazards.

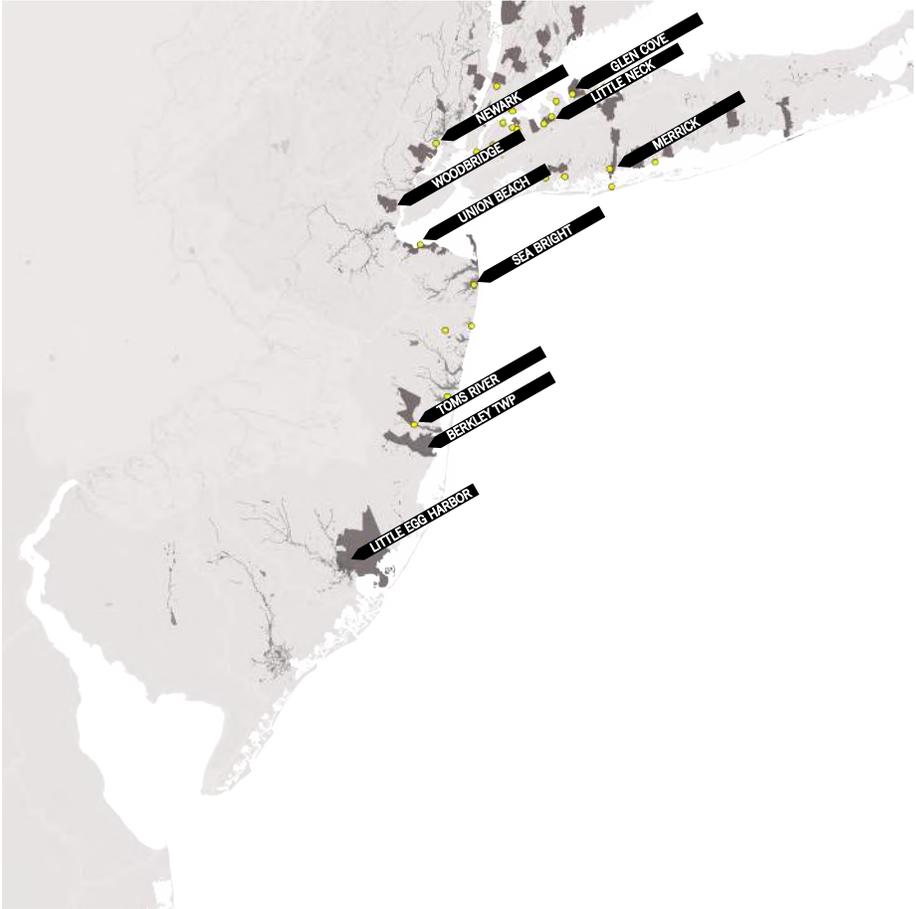
Diverse Natural Systems



The Sandy-damaged region contains a variety of coastal landscapes, from central New Jersey's tidal bays, to the cliffs and bluffs of Staten Island's south shore, to the urban waterfronts that flank Hoboken, New York, and other high-density communities in the region. For this competition, we wanted to ensure that our sites represented

a selection of commonly inhabited coastal landscapes that suffered at the hands of the storm. We decided to look at creeks, freshwater marshes, bays, and oceanfronts. No two freshwater marshes are the same, of course, but our hope is that a proposed solution for one freshwater marsh will be applicable to another.

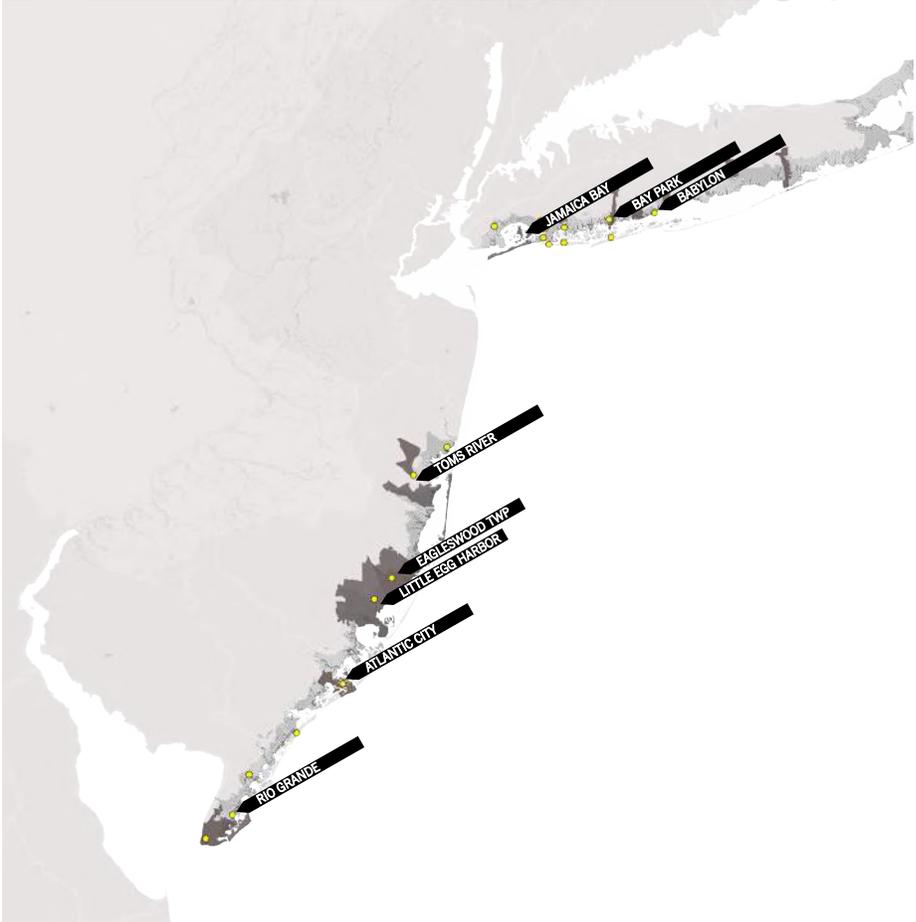
Creeks



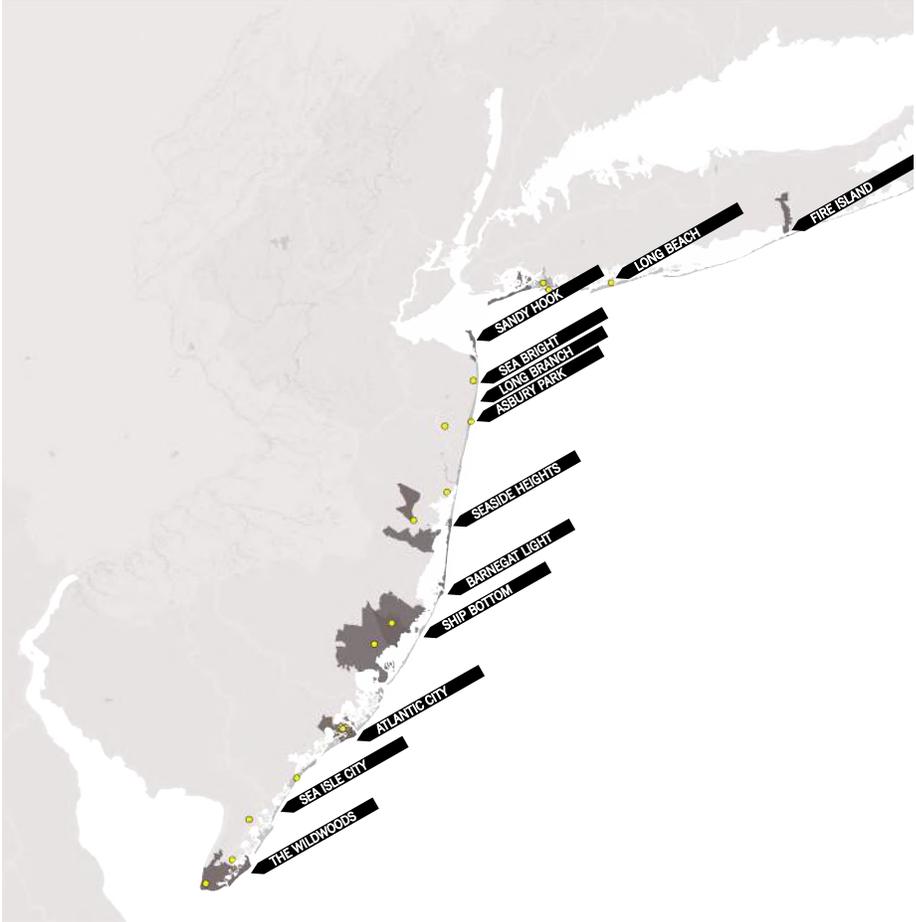
Freshwater Marshes



Bays



Oceanfronts



Design Opportunities

Living with the Marsh:
Options for Staten Island's Eastern Shore

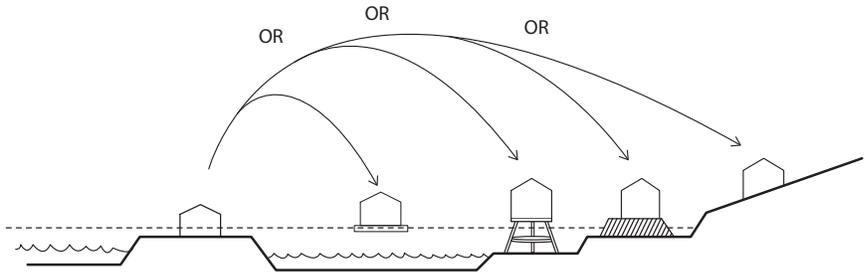
Living with the Creek:
Options for Monmouth County Watersheds

Living with the Bay:
Options for Southern Nassau County

Living with the Coast:
Options for New Jersey's Coastline



Give residents of low-lying, low-opportunity communities the opportunity to “move on up,” either by moving to high and dry, high-opportunity areas by identifying appropriate sites, or by elevating homes on fill.



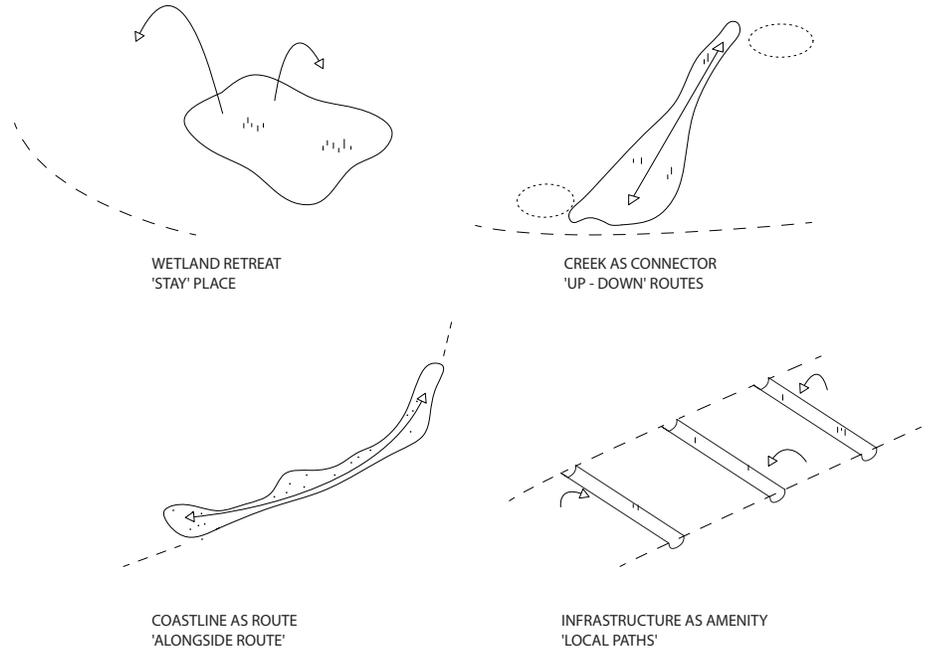
One of the best things we can do to make the region more resilient is to create more opportunities for people to live in high and dry, high-opportunity communities that are less prone to flooding. But there is a major obstacle to this seemingly simple solution: a lot of high and dry, high-opportunity land in the region is inaccessible to low-income and minority persons because of exclusionary zoning tactics.

Many states in the region have policies that require their municipalities to build their fair share of affordable housing (for example, New Jersey’s Mount Laurel Doctrine, Long Island’s Workforce Housing Act, and Connecticut’s Affordable Housing Law Use Appeals Process). Despite these progressive measures, however, many of the area’s high and dry, high-opportunity municipalities have not complied with mandates to build more affordable housing and therefore have unfulfilled obligations. For example, within a short commute of New Jersey’s vulnerable Long Beach and Barnegat Bay Islands, there are 16 relatively high and dry, high-opportunity towns with a projected constitutional obligation to build a total of 11,254 affordable housing units.

In our design opportunities, we look to offer individuals in low-lying, low-opportunity communities opportunities to move to high and dry, high-opportunity areas by identifying appropriate sites for the construction of mixed-income housing.

Where appropriate, a parallel strategy would be to offer options to remain on site by elevating homes on “fill hills” that would raise homes out of the floodplain. These fill hills could be scaled and phased by block, and could offer opportunities for densification. Fill could be generated from an onsite excavation that will offer an opportunity to unfill wetlands that had previously been filled. This would create more room for water, and could help restore the ecological function of the landscape.

Restore the natural functions of coastal landscapes in a way that simultaneously strengthens them as attractive, accessible public spaces.

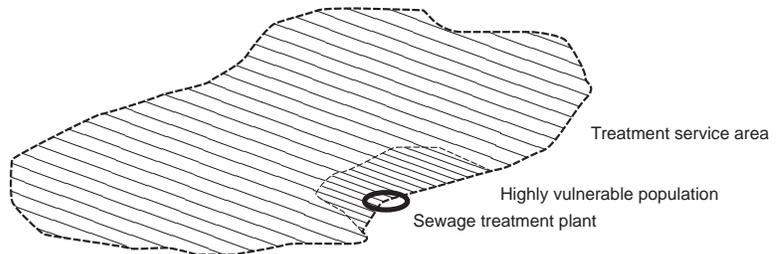


Unsustainable development practices have led to the erosion of the region's marshes, bays, creeks, and beaches. This has both undermined the ability of these landscapes to protect us from severe weather events and decreased their recreational potential.

Is there a more harmonious way to live with nature? Is there a way to make room for our marshes, bays, creeks, and beaches, and enable them to perform their ecological functions? And is there a way to do this that simultaneously increases our ability to enjoy them?

In our design opportunities, we have identified opportunities in which a win for nature is a win for public space and recreation.

Protect regionally critical infrastructures (such as sewage treatment plants) in ways that would have a direct benefit to people living in the immediate vicinity of these critical infrastructures.



Low- and medium-income communities host a disproportionate number of the region's treatment, storage, and disposal facilities and therefore bear a disproportionate burden of the negative externalities that these facilities produce (for example, toxins in the air and drinking water).

People who live near sewage treatment plants have the added problem of having to cope with bypasses and overflows, a fact that was brought into sharp focus by Hurricane Sandy, which caused about 11 billion gallons of untreated and partially treated sewage to flow into the rivers, bays, canals, and streets of coastal communities in nine states. (Because the plants rely on the force of gravity to move sewage, they are typically located in low-lying, coastal communities.)

Because of their regional importance, sewage treatment plants need to be protected from flooding. Typical solutions include improving the capacity of the storm collection system, raising the elevation of key components above projected flood heights, constructing watertight doors and windows, installing submersible pumps, and building walls, earthen levees, and floodgates. But from an environmental justice perspective, shouldn't people who have to bear a disproportionate brunt of the externalities of a region's critical infrastructure be rewarded in some way? In all of our design opportunities, we propose to leverage investments in the protection of sewage treatment plants in ways that have direct, positive benefits to those who live near them.

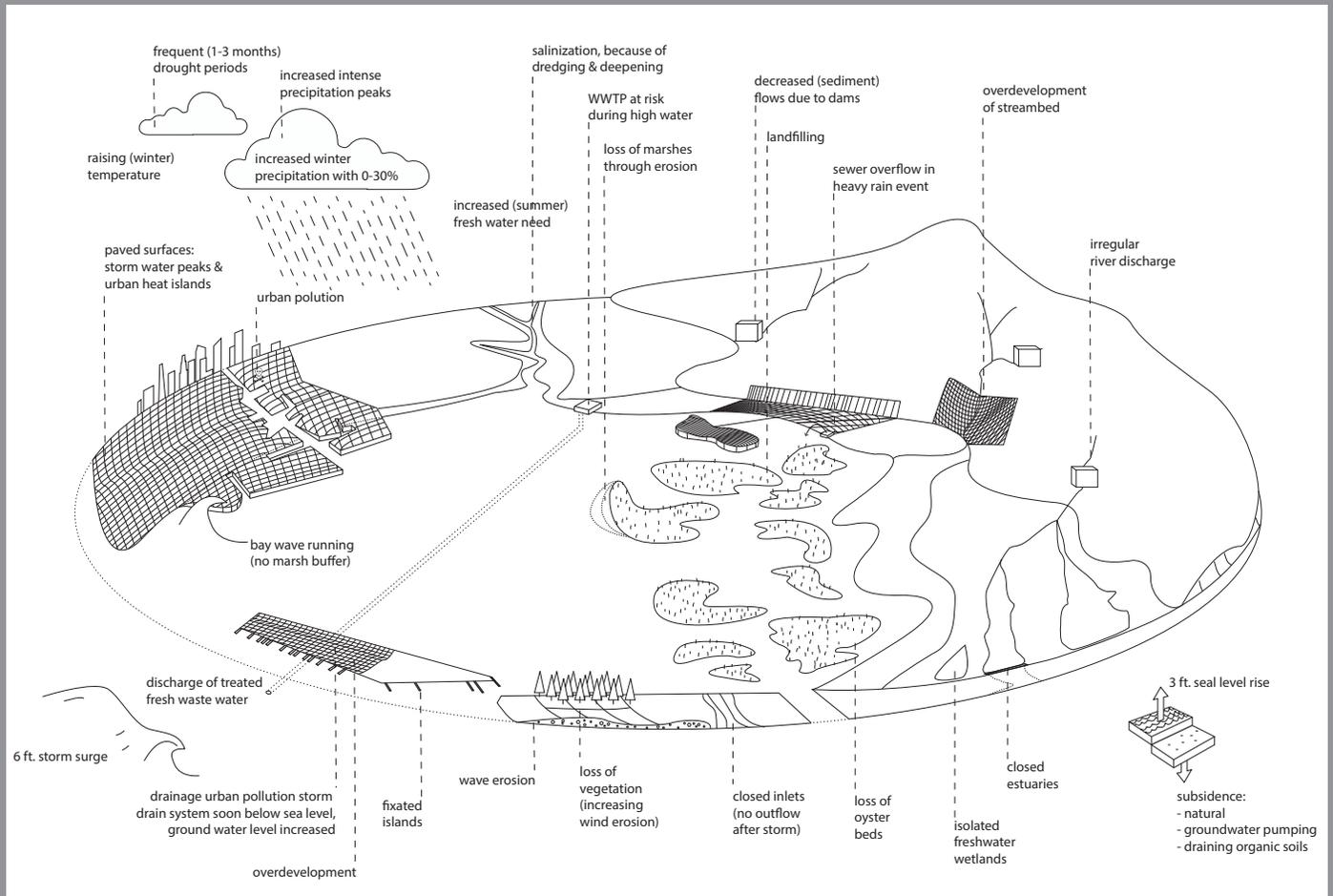
Human / Nature Interactions

Natural systems have been greatly influenced by human habitation.

The most important degradation of the natural system is caused by the human-made sediment imbalance. Urbanization is responsible for the closing of tidal gates in the barrier islands: this has reduced the sediment supply of the back barrier lagoon and the landside coastal area, and has stopped the natural barrier island process.

The natural system is also strongly altered by human-made storm drainage systems, paved areas, septic tanks and wastewater treatment plants. In general storm drainage is polluted and discharged in nearby creeks, bays and lagoons. Treated wastewater is discharged into the ocean, often with pipes 1,5 miles long.

Due to natural geological processes and human-made processes, the surface is slowly dropping. The human-made subsidence is caused by groundwater pumping and shallow drainage by pipes, canals and ditches. Drainage has caused dewatering of the organic marsh soils. Groundwater pumping has created overexploitation of aquifers and salinization.



The Freshwater Marsh

The marsh is characterized by soft soils and (mostly saline) water. Natural marshes are important for fishery and ecology, but also for reducing storm surges. Man-made drainage of the marsh creates serious subsidence and CO₂-emission into the air, transforming marsh into open water. In urban areas on marsh soils, groundwater drainage is mostly generated by leaking sewer and storm drainage pipes.

At the ocean and bay side, urbanized areas need more protection. Keep the natural marshes healthy! Keep the groundwater level as shallow as possible in marshes! Protect the marshes for wave erosion!

The Creeks

If current development patterns continue, the creeks will be attacked from the ocean, bay, and land. Sea level rise will cause it to drown and salinize. Climate Change will increase pollution due to increased rainfall, which will cause more urban drainage.

To help improve the creek's resilience, we need to take actions to restore the natural balance of the creeks: retain and store water stream upwards at any scale (harvesting winter water), stimulate vertical sedimentation and wetland growth, optimize the creeks natural gradient, and create more space and improve sustainable use.

The Bays

Now, and even more in future, the Bay is essential for safety, especially as water levels rise, and waves become larger and stronger. Thanks to the (urban) stabilization of the barrier islands, bays are becoming hungrier for sediment.

We need to optimize the sand balance in the bay. To reduce waves, we should restore or create wetlands, nourish sediment to fill deep water, and build new barrier islands to support nature, fishery and recreation. We should also evaluate the impact of dredging of the Intracoastal Waterway and the influence of existing deep borrow holes. Storm drainage water quality could be improved with a "blue-green" solution.

The Oceanfronts

75% of the New Jersey coastline is urbanized. Natural sediment processes are a thing of the past. Because of sea level rise, shores constantly need to be elevated or strengthened (at the ocean side and the bay side), and beaches constantly need widening. Do cheaper and greener solutions exist?

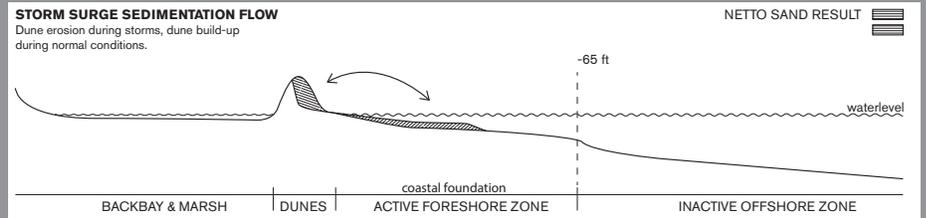
At the ocean side, as well at the bay side, shores need to be elevated or strengthened. Beaches need to be widened. Maintenance needs continuous attention. How can we develop cheaper and greener solutions?

The Dynamic Landscape

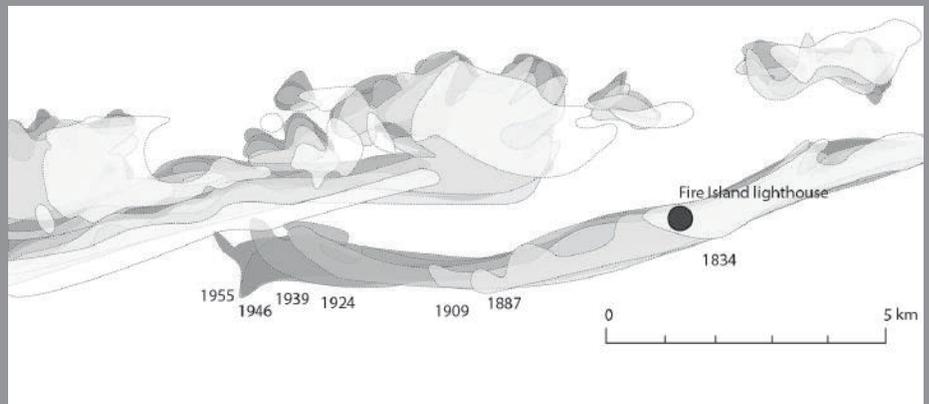
The landscape is continuously transforming. The current morphology of the landscape is the result of a long process of sedimentation and erosion. Barrier islands moved slowly to their present position. The shallow sea was filled with river deposits.

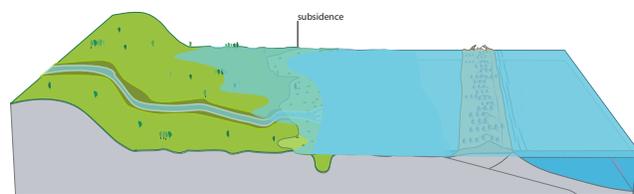
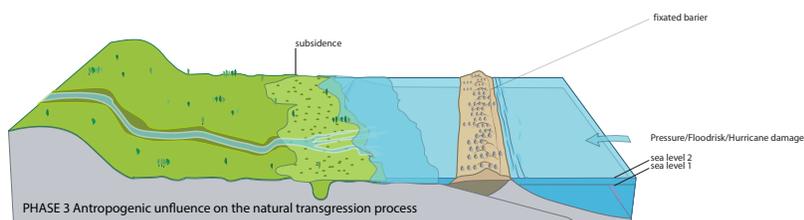
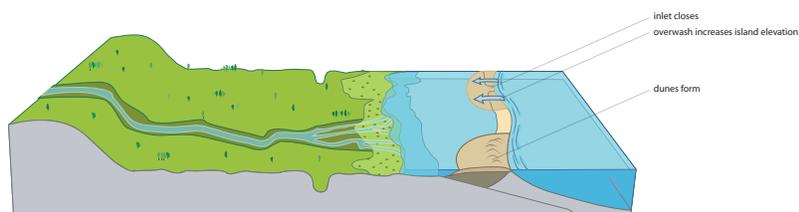
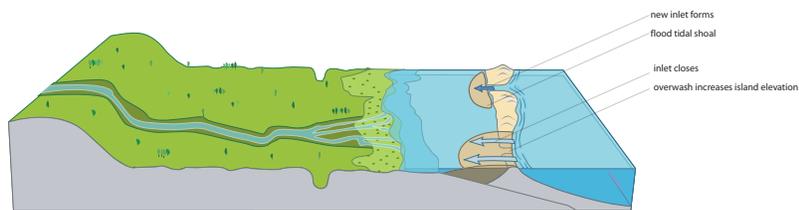
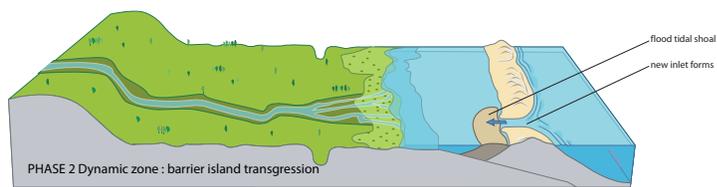
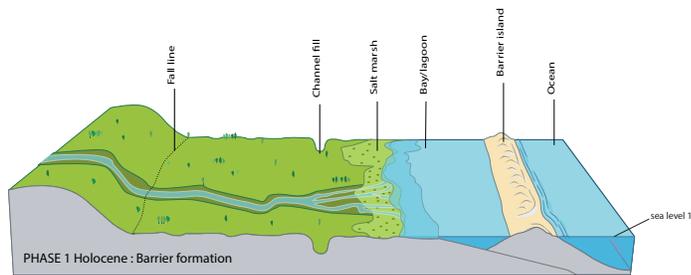
Knowledge of dynamic natural processes such as tidal movement, erosion, and sediment movements allows us to work with and anticipate on these transformations. If we take into account the various interconnections within the natural system, we can use these processes to our advantage, and can create a more safe, productive, accessible, and attractive landscape.

schematic map of zone with active sediment transport, showing main direction of movement sediment



Longshore migration between 1834-1955 of Fire Island, one of Long Island's barrier islands. The net longshore transport is towards the southwest corner of the box and the Island migrates in that direction (from Prothero, 1990).

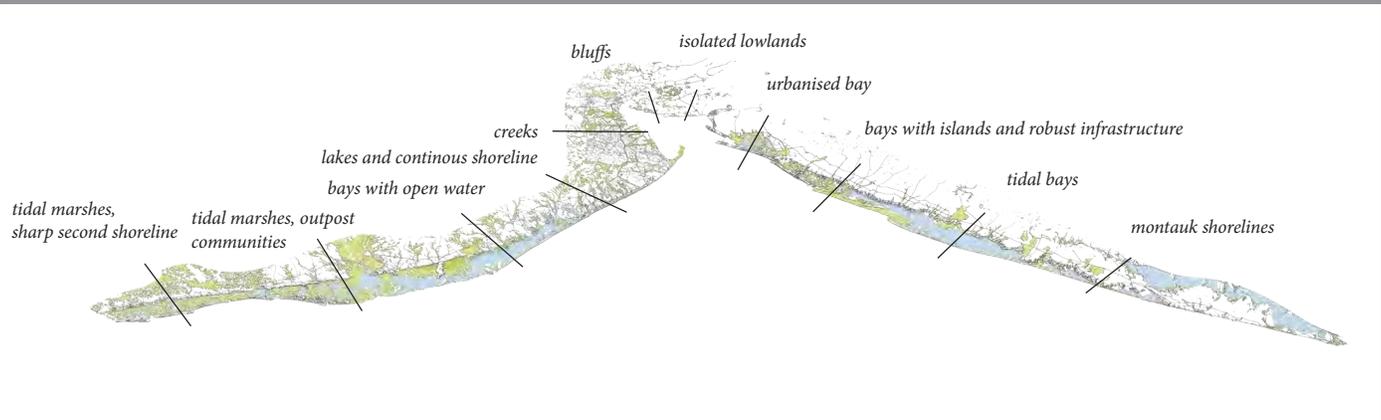




The Coast Shifts

In a transgressive island system the island migrates back towards the land. These systems are typically associated with a eustatic rise in sea level or continental subsidence. This process of migration has become very important in recent years as barrier islands have become populated. As these barrier islands migrate landward (a process which is happening all along the eastern seaboard of the US) people are losing property and homes to the ocean. In model B above it can be seen that the strata goes from fine grained lagoon sediments and becomes more coarse upwards. This is a result of the barrier island migrating over the top of the lagoon as it migrates landward.

Coastal Typologies: A Closer Look



Sections along the coast reveal how our four coastal typologies combine with settlement patterns to create ub-typologies.



This is a park for post-occupancy Oakwood Beach. We propose to create a model for what to do with land that communities leave behind. If planned and designed properly, such a park could change the conversation about “managed retreat,” and incentivize other vulnerable communities to collectively retreat too.

The Oakwood Beach Water Pollution Control Plant could be protected in a way that provides direct benefits to those who live near it.

Former residents of Oakwood Beach could be granted easements for light occupation of the park.

Freshwater m... highly product... ecosystems, s... variety of plan... communities a... They also miti... damage and f... nutrients from... runoff.

LIVING WITH THE MARSH

Options for Staten Island's Eastern Shore

Marshes are
effective
at
sustaining a
wide
variety of
plant and
wildlife.
They
act as
natural
gate flood
filters and
filter excess
nutrients
from
surface

Sites in high and dry,
high opportunity
communities should be
identified for those who
opt to retreat.

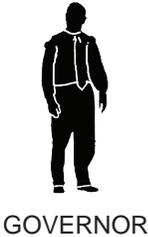
Cut and fill development
could contribute to
watershed restoration
and the health of the
Lower Bay.

Fill from the bay could be
used to create new high
and dry mounds for
residents who opt to
remain.

The park would closely
involve former residents
of Oakwood Beach in its
planning and design.



There are some parcels that Mother Nature owns. She may only visit once every few years, but she owns the parcel and when she comes to visit, she visits.



GOVERNOR

These freshwater marshes were once thriving with wildlife. The communities on this very low land are particularly vulnerable to flooding from run-off coming from the inland, as well as stormsurges from the ocean. Restoring the natural floodplains makes a lot of sense, expanding storage capacity of the Staten Island blue belt.



ENVIRONMENTAL ADVOCATE

Oakwood Beach was fortunate to get a deal with the state. They made the Governor promise that there would be no development if they left - that the land would become a park. Here in Midland Beach we had to deal with the Mayor, who wouldn't make that promise. For us, there was no deal.



MIDLAND BEACH RESIDENT

Sandy was just like the last straw that didn't even allow you to fool yourself into thinking it was OK to stay.



OAKWOOD BEACH RESIDENT



Living with the marsh:

Options for Staten Island's Eastern Shore

Less than four months after Superstorm Sandy devastated New York, Governor Cuomo announced an ambitious new home buyout program: homes destroyed or heavily damaged by the storm could be sold to the government at 100 percent of their pre-storm value. While local representatives welcomed the program, most operated on the assumption that when given a choice, most communities would opt to rebuild rather than retreat, and were therefore less than optimistic about its prospects. As Harvey Weisenberg, a State Assemblyman from Long Beach, NY put it, "we have the sand in our shoes. Once you're here, you never want to leave, and if you do leave, you want to come back." And for the most part, the skeptics were right: many months have passed since Cuomo introduced his program (and since Governor Chris Christie introduced a similar buyout program for New Jersey), but few communities have taken the bait.

Staten Island's Oakwood Beach is an exception. A tight-knit, blue-collar community of modest bungalows built on a highly vulnerable marshland, Oakwood Beach was, like many communities on Staten Island's eastern shore, devastated by the storm. Within days of the Governor's announcement, 170 of 184 Oakwood Beach homeowners had registered to be bought out. As one resident put it, "It's with a heavy heart that we do it, but it's a necessary decision to be made." Indeed, while most of New Jersey was boasting about being "stronger than the storm," residents of Oakwood Beach were painfully coming to the realization that, as Cuomo put it, "there are some parcels that Mother Nature owns." A newspaper headline taped to the front door of one resident's Foxbeach Avenue home says it all: "GET US OUTTA HERE!"

"Managed retreat," the preferred coastal management strategy of many scientists, academics, and even a few policy makers, has in all but a few instances proved to be a political non-starter. Towns whose municipal budgets rely on property taxes say they can't afford it, residents with ocean views, dense social networks, and ancestral ties and the memories that come with it say they don't want it, and the federal government for the most part isn't set up to administer it. Why is it working in Oakwood Beach? Oakwood Beach was extremely vulnerable, and had recently been devastated by a nor'easter, a marsh fire, and another hurricane. And indeed the Governor's deal was generous. But one reason that has been overlooked has to do with the fact that the residents had a say in determining what would happen to Oakwood Beach once they left it behind. Dismayed at the prospect of the land being redeveloped, homeowners put pressure on the Governor to promise that the land would be turned into open space. Dismayed at the prospect of the land being redeveloped, homeowners put pressure on the Governor to promise that the land would be turned into open space for use as parks, wetlands, drainage or other water-management purposes.

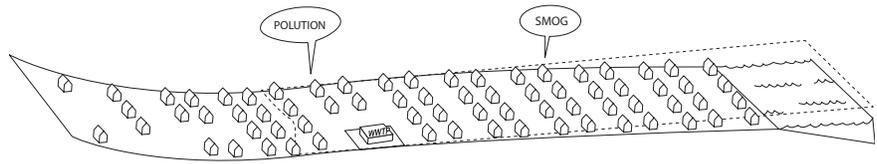
For this design opportunity, we propose to work with HUD, the State of New York, the Department of Environmental Protection, and the former residents of Oakwood Beach to design a park in post-occupancy Oakwood Beach that could be a model for what to do with land that communities leave behind. Our hope is that if planned and designed properly, such a park could change the conversation about "managed retreat," and incentivize other vulnerable communities to collectively move too.

Large extents of the freshwater marshlands on Staten Island's eastern shore have been filled in and urbanised, putting these low-lying communities at risk from sealevel rise and storm surges, as well as pluvial flooding from the creeks.



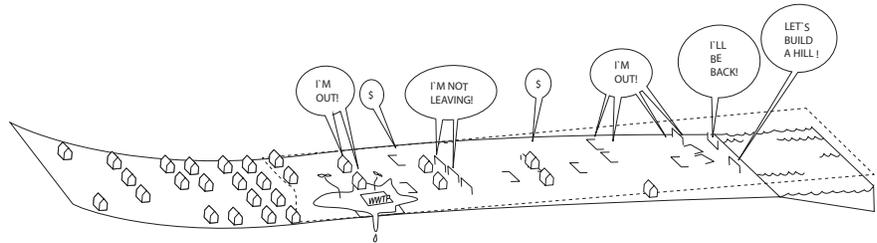
Everyday Emergency

- Staten Island has the worst smog of any of the five boroughs, and the New York State Department of Health reports that the death rate from lung cancer on Staten Island is 48 percent higher than for the rest of New York City.
- Chemical bulk storage. Brownfield sites. State Superfund sites. Sellers of commercial pesticide. Landfills. Virtually every neighborhood on Staten Island has its share of businesses and public facilities that handle environmentally hazardous material.



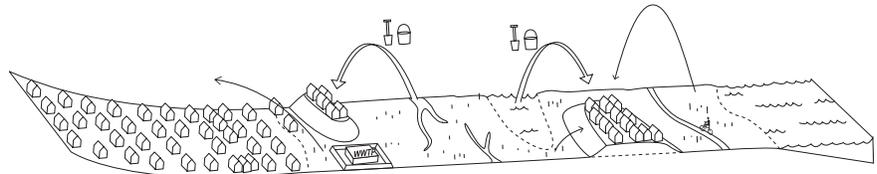
Occasional Emergency

- Superstorm Sandy hit Oakwood Beach with 20-foot waves, killing three residents.
- Midland Beach, with its low-lying bungalows, was the hardest hit of any Staten Island community.
- Out of the 43 New York City residents who were killed by Sandy, 23 perished in Staten Island.
- Before it was slammed by Superstorm Sandy, Oakwood Beach was walloped by a 1992 nor'easter, incinerated by a 2008 fire in the marsh, and drowned by Hurricane Irene in 2011.
- The ocean submerged the neighborhood of Oakwood Beach under 16 feet of water.
- Hurricane Sandy has contributed to a rise in lung disease and other health problems on Staten Island, possibly related to noxious fumes or mold, according to experts on a local health panel.



Project

- Work with former residents of Oakwood Beach to build a park at the location of Oakwood Beach; enable former residents easements for temporary occupation of the park.
- Elevate homes on fill generated from an on-site excavation.
- Build a protective levee around the Oakwood Beach Water Pollution Control Plant that doubles as a recreational amenity.

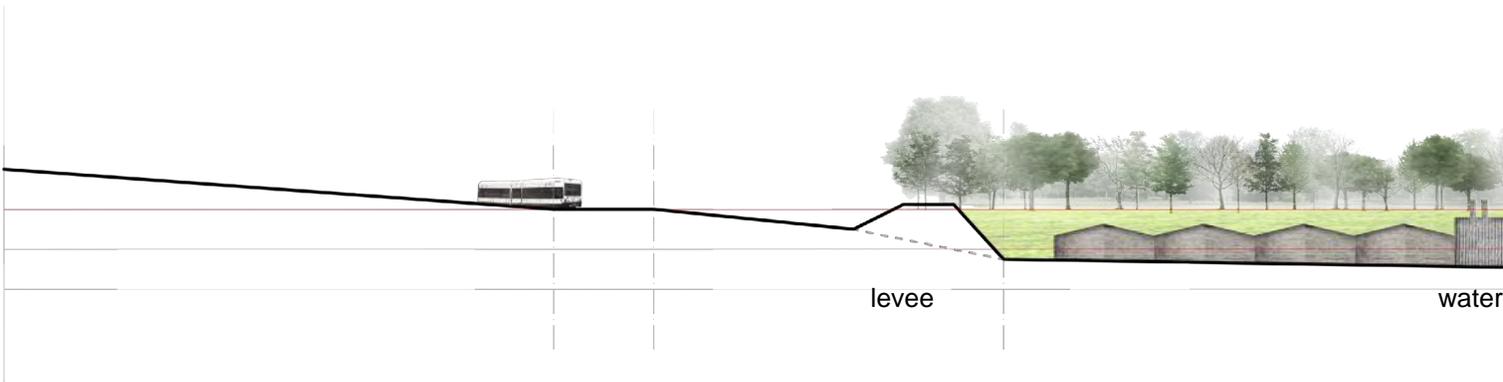


-  + 6 ft. sea level rise up to 2100
-  + 6 ft. storm surge
-  - soil subsidence
-  10,000 buildings in 100-year FP in SI
-  close to 30,00 inhabitants below floodline
-  STP serves 200,000 people

PROTECT +

Protection of the Pollution Control Plant

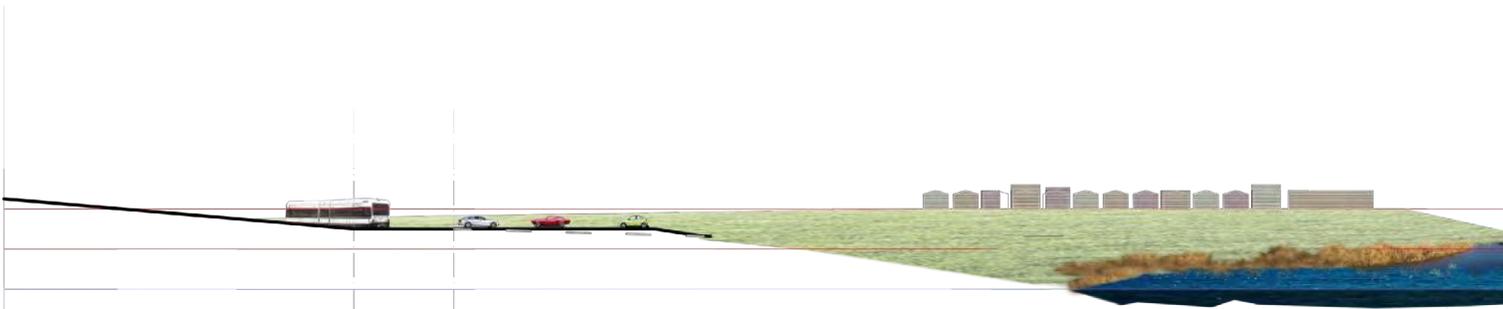
We propose to build a protective levee around the Oakwood Beach Water Pollution Control Plant that doubles as a recreational amenity.

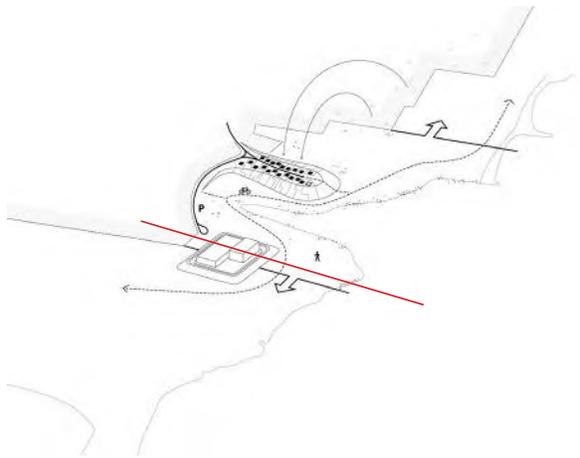


LIVING WITH THE LANDSCAPE

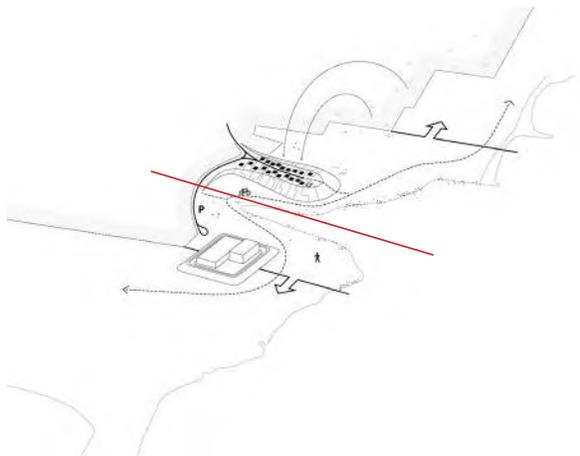
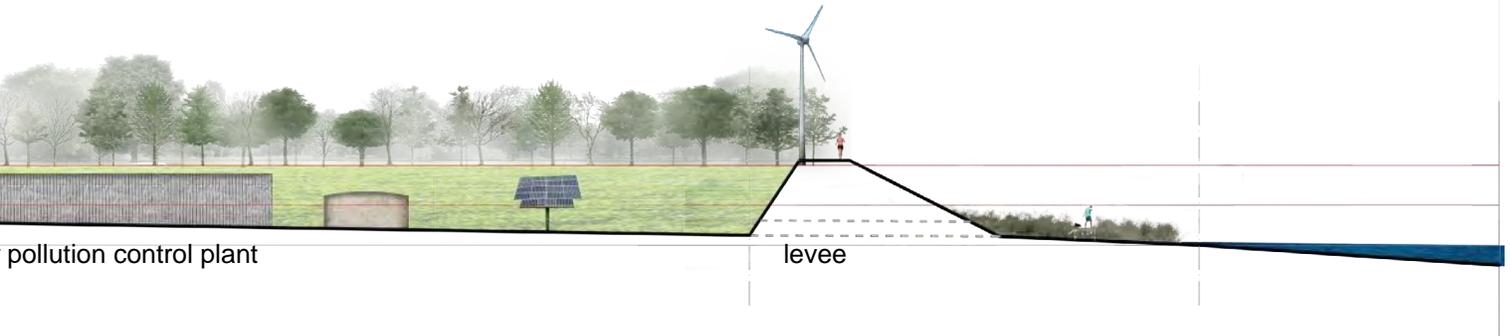
Oakwood Beach Park

Oakwood Beach Park would be a highly accessible, attractive regional amenity that would contribute to the restoration of the freshwater marsh and the health of the Lower Bay. It would closely involve former residents of Oakwood Beach in its planning and design, and would grant former residents of Oakwood Beach an easement allowing them to lightly occupy designated areas.





new park



restored marsh



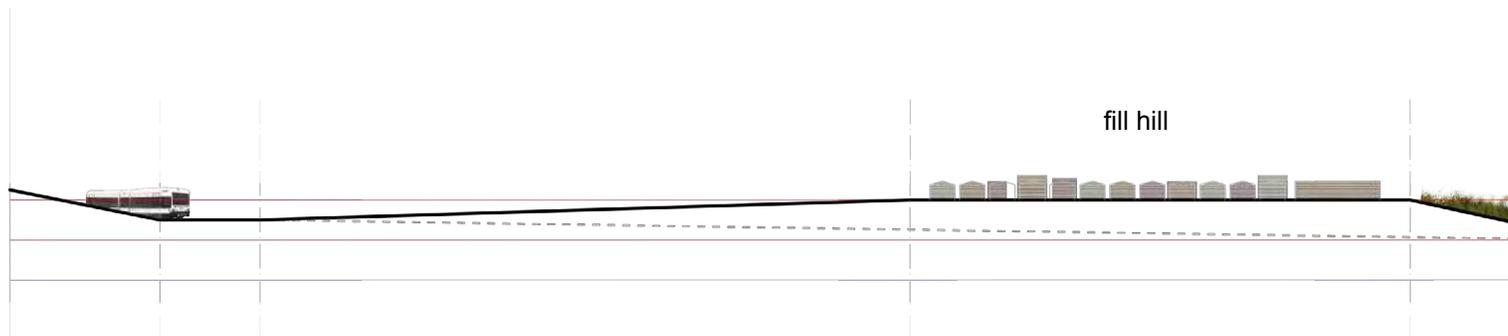
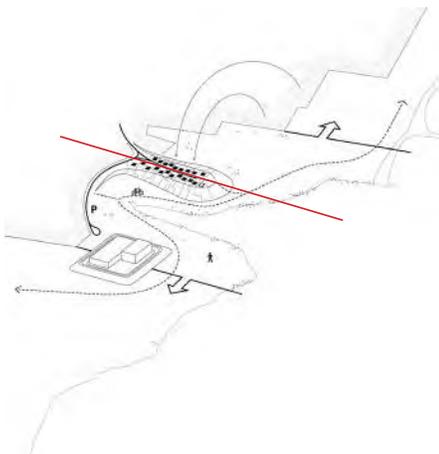
Flood Beach Park

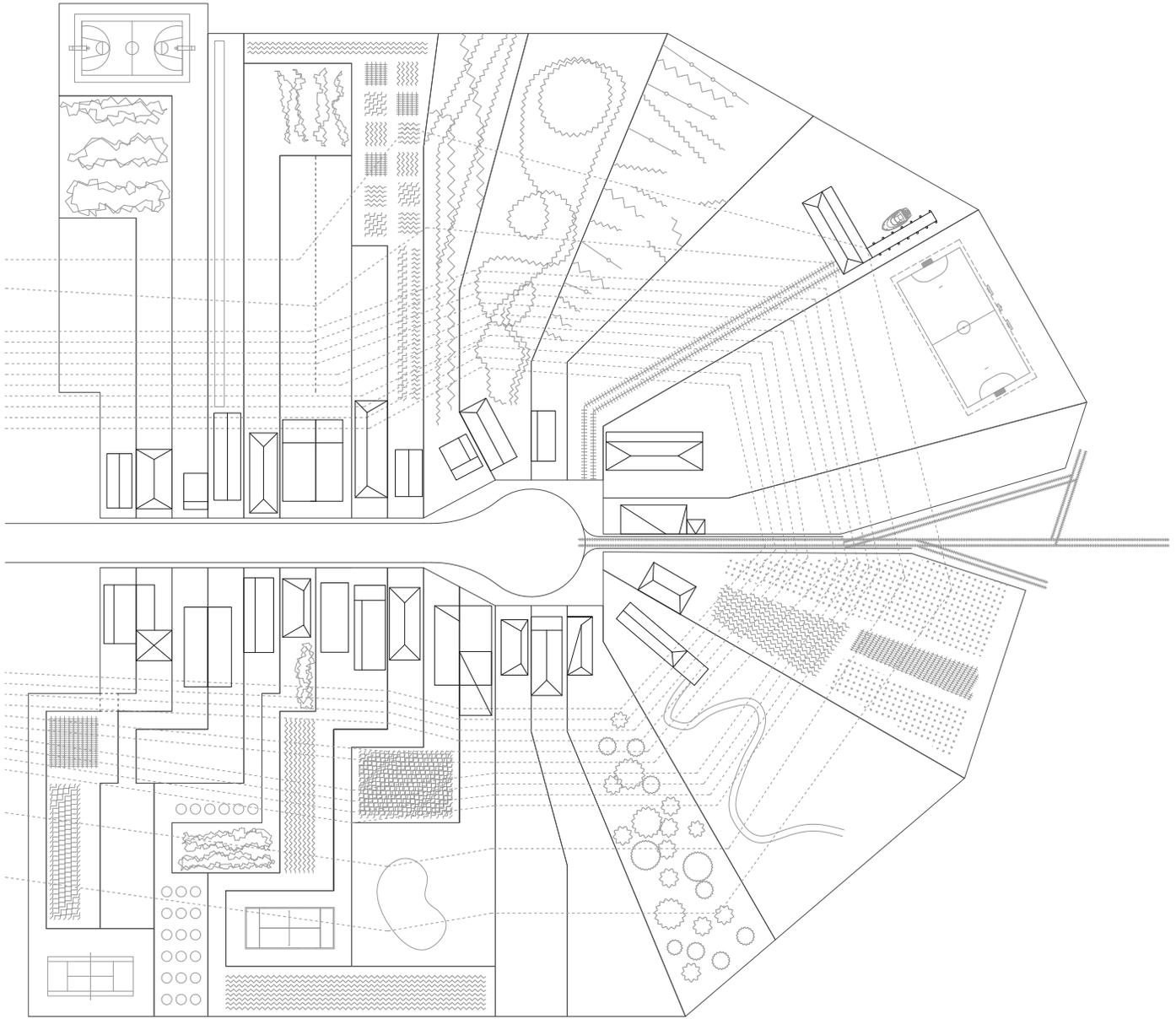
Mill Hill Upland Community

We propose a “cut and fill” project that would elevate homes on fill from an on-site excavation that could simultaneously contribute to the restoration of the freshwater marsh and the health of the Lower Bay.

To provide a more resilient coast line, we propose a excavate and mound technique wherein soils / materials are excavated from land just along the shoreline (mostly back bay and more protected shore-lines). The materials are then utilized to build up the lands on an adjacent area. These lands would be constructed to an elevation above local flood-hazard elevations. The design tool has many advantages, best looked at with respect to the final / finished elevations, including:

- New low lands / wet lands are basically where the materials were removed. Depending upon excavation depths, such areas could be utilized for purposes such as wild-life areas, water features, passive parks, ball fields (which would be designed to survive occasional flooding), etc. These areas would result in a resilient shoreline be adding to available flood water storage and marshes to protect from dynamic wave forces, as well as providing filtering of stormwater pollutants from land-side run off;
- New slope / lands between low lands and uplands. These areas could provide a wide range of beneficial uses to their communities including potential locations for community gardens and as paths to allow residents unimpeded access to the shoreline; and,
- New upland areas would be constructed above the local flood-hazard elevation, and, as such, would be protected from flooding associated with future major metrological events. These new uplands could be utilized for any number of beneficial uses including homes, businesses, active parks to name a few. A major benefit of this tool is the flood insurance costs are expected to be much lower for those homes and businesses constructed on the new uplands, and potential for areas landward of the uplands, assuming that they are also protected from storm surge water. As such, anticipated lower insurance costs / flooding risks could actually provide a partial mechanism to fund this alternative.





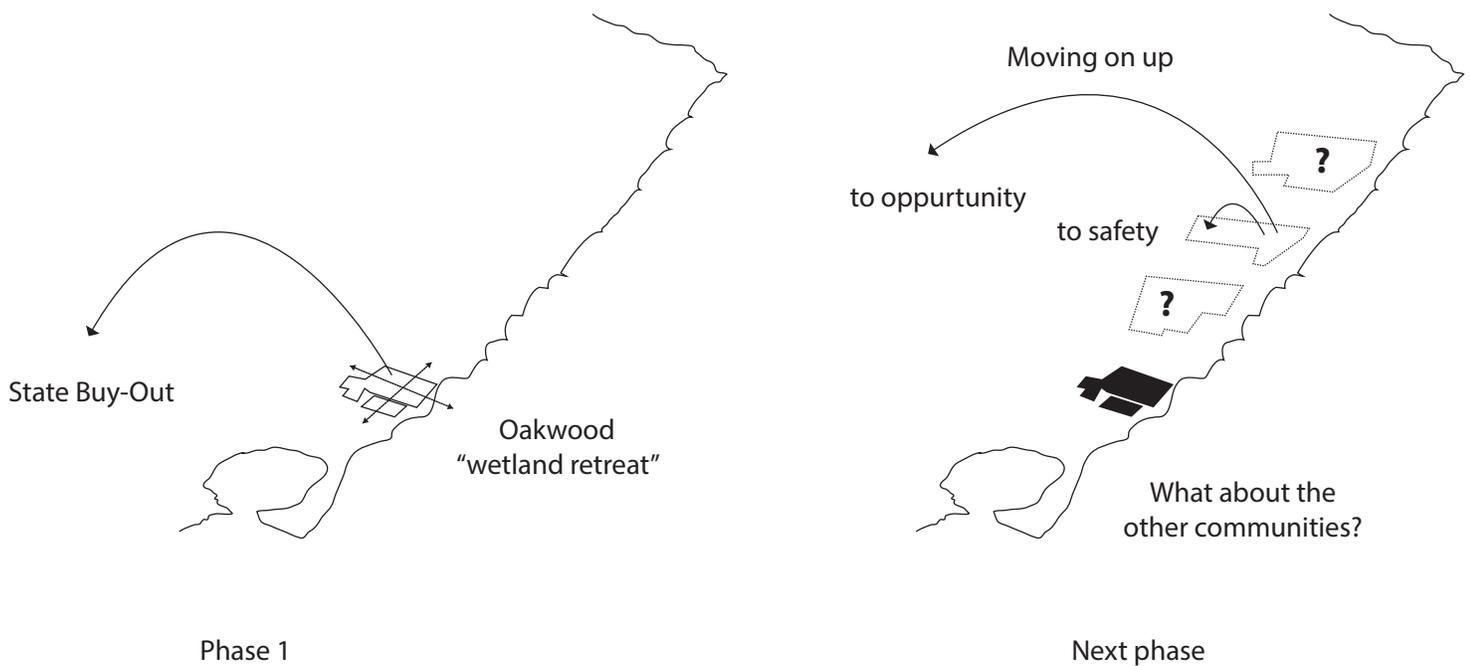
To justify the investment, housing on “fill hill” needs to achieve a certain density. However, larger, suburban-scale lot sizes are achieved by expanding the lot on the hill and at the base of the hill.

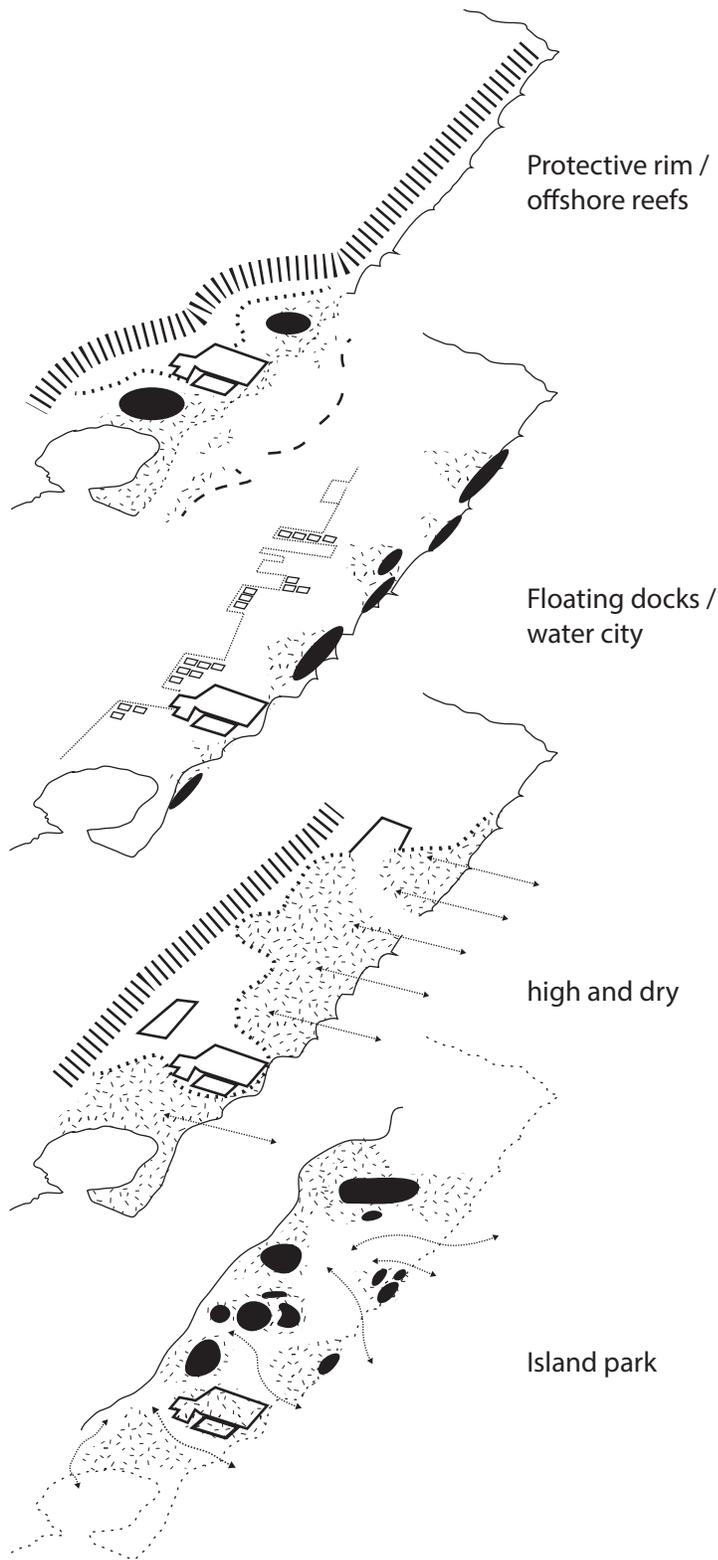
restored marsh



Scenarios for the Lowlands

The Park could catalyze change across Staten Island's Eastern Shore, especially in other Sandy-damaged communities like Midland Beach that the Mayor has not yet made an offer to. We propose a menu of options for these communities.

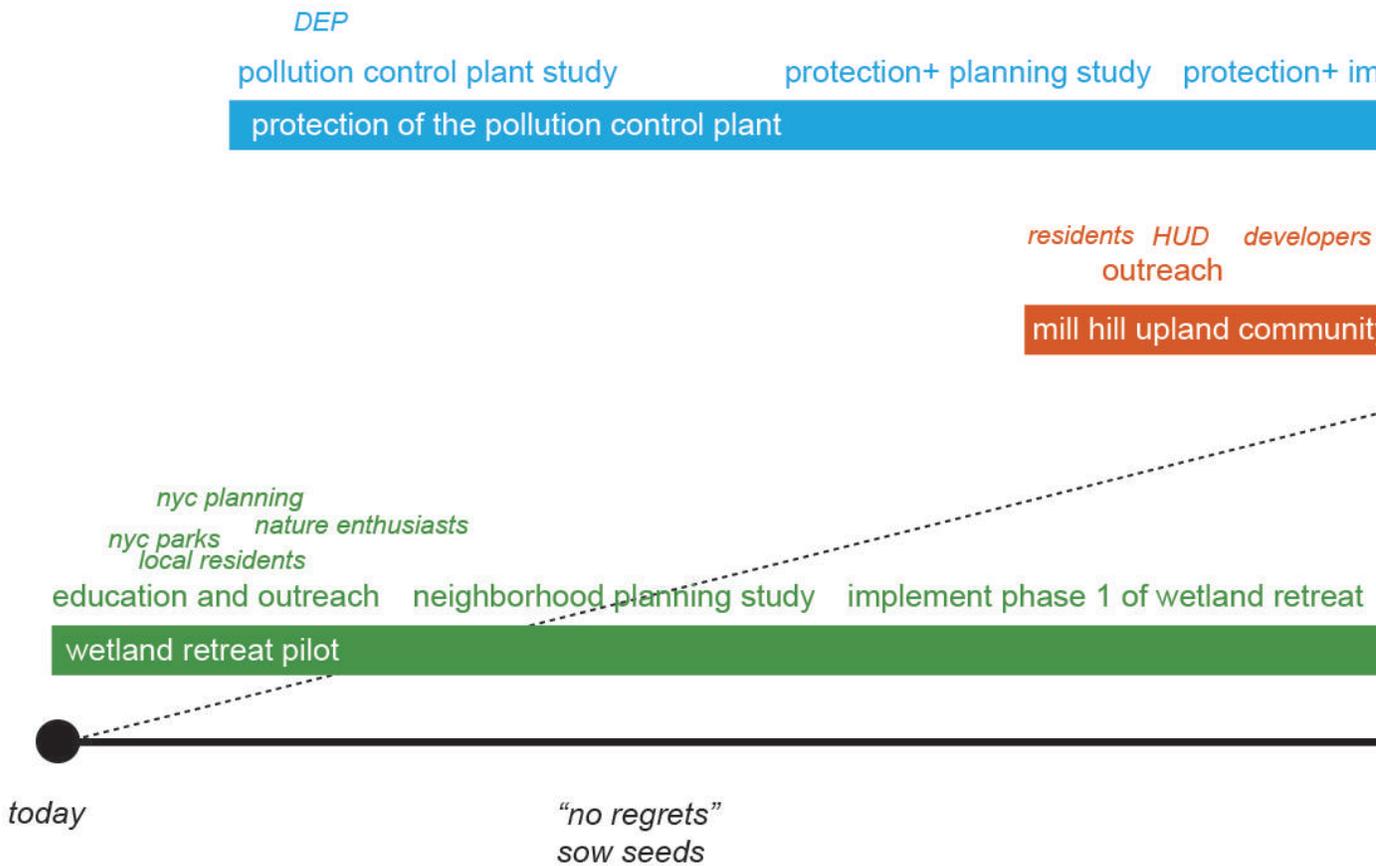




Long Term Perspectives

Oakwood Beach residents were bought out by the state; discussions between neighboring communities and the city are ongoing. What opportunities exist for them?

Timeline





ESTABLISH
NATIONAL
WITHDRAWAL
INCENTIVE
PROGRAM

insurers

HUD the president of the united states

FEMA

plementation

development of new pollution control plant

conversion of the pollution control plant

sea level rise

upland community iii

upland community development ii

y development

wetland retreat project 2

wetland retreat project 2

wetland retreat project 2

long term



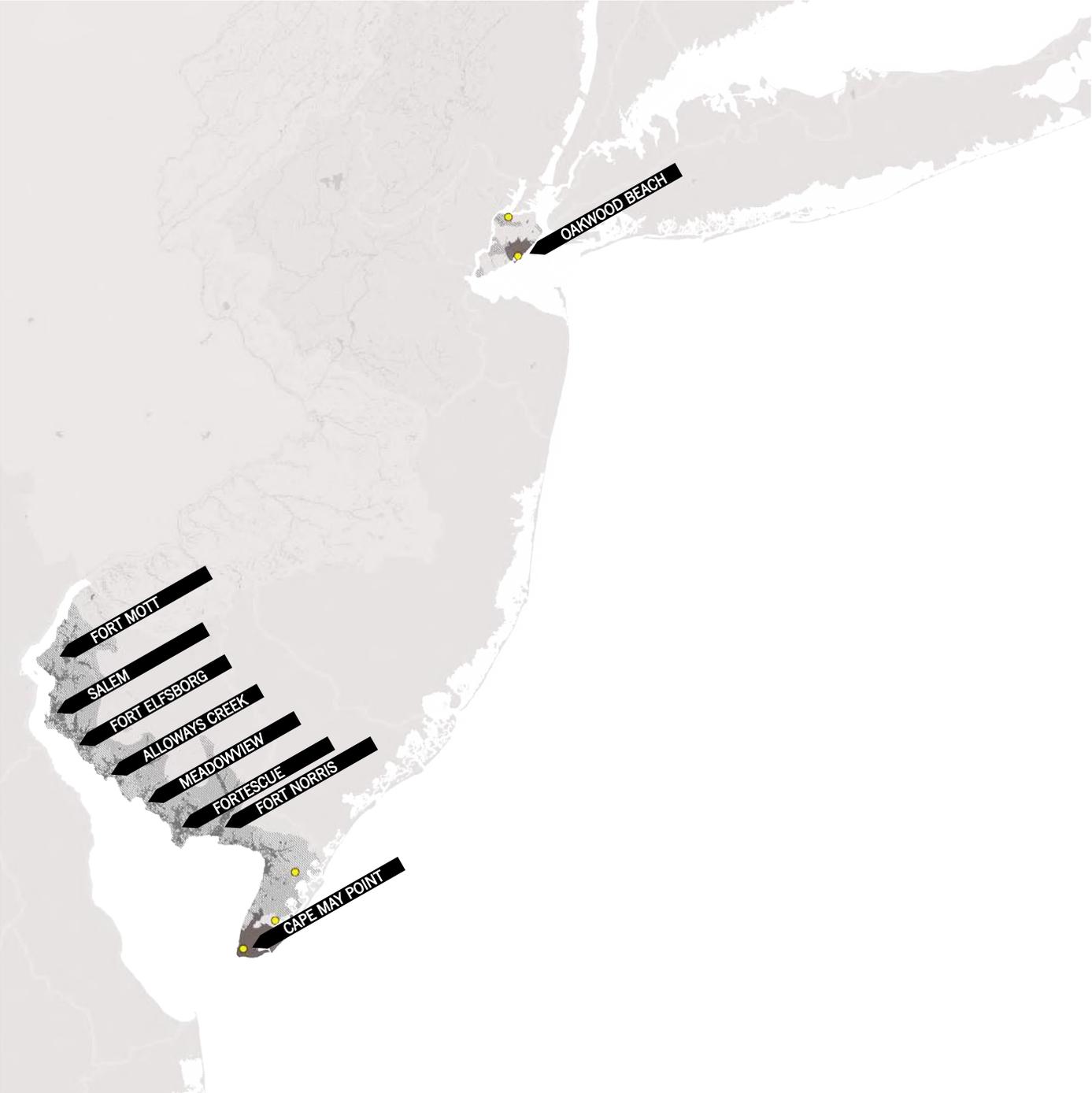
Regular funding

- FEMA Hazard Mitigation Grant Program (HMGP)
- New York Community Development Block Grant – Disaster Recovery
- United Way Hurricane Sandy Recovery Fund

Innovative funding & financing

- Investments in buffer zones and watershed restoration make the land and properties behind the Oakwood Park more valuable. This will lead to a long term cash flow of higher property tax revenues, also known as the “tax increment”. Through Tax Increment Financing (TIF) these future cash flows can be made available for current investments. TIF is a well-known method to use future gains in taxes to subsidize current improvements.
- Protecting the land and properties behind the Oakwood Park will reduce the flood risk for these properties. As a result, insurance premiums –reflecting the risk profile – are expected to go down. This can help paying for the same investments, either by letting property owners contribute on the basis of the insurance premium savings or by letting the property owners pay the same premium, in return for which the insurance companies will contribute to the investments.
- The properties in Oakwood are uninsurable or carry very high insurance premiums. Relocation leads to lower insurance premiums for the property owners. The insurance premium savings can be used to pay for the relocation.
- The damage to properties that are not compensated for – also known as “casualty loss” – are eligible for income tax deduction. This will lead to availability of cash with the property owners.

Freshwater Marshes



Making room for the creek offers an opportunity to create a more attractive recreational amenity.

As a way to increase housing options in high and dry, high income, high opportunity areas for lowlanders displaced from the storm, we propose to take advantage of outstanding affordable housing obligations in Hazlet, Middleton, and Homedale by building affordable housing units in superfluous parking

A revitalized stream could provide critical habitat, food, and shelter for waterfowl, fish, and other aquatic species, and also mitigate damage from floods and filter pollutants.



LIVING WITH THE CREEK

Options for Monmouth County Watersheds

Despite the encroachment of development, the five creeks that feed Monmouth County's Keyport Harbor are crucial to the watershed, channeling stormwater from upland communities through the low-lying communities and finally into the Raritan Bay.

NJ Route 35 and the parking lots along it could be turned into "gutters" that detain rainwater and simultaneously create a greener, more attractive environment along the corridor.

Making physical connections along the creek can foster an awareness of ecological and social interdependencies.

To make room for the creek, residents occupying land in the creek bed could trade their parcel for one outside the creek bed.



To solve [the flooding] problem, you have to look up the watershed.



ENVIRONMENTAL ADVOCATE

The state has a nationally recognized policy, so if we're going to continue to be a national leader in Complete Streets, this [route 35 reconstruction] is the project that I think a lot of people are going to be looking at.



TRANSPORTATION ADVOCATE

In the mad rush to rebuild "stronger than before," the powers-that-be have made no serious attempt to address the fundamental problem that brought us to this point: human-caused environmental degradation and climate change that make extreme weather more frequent and more devastating.

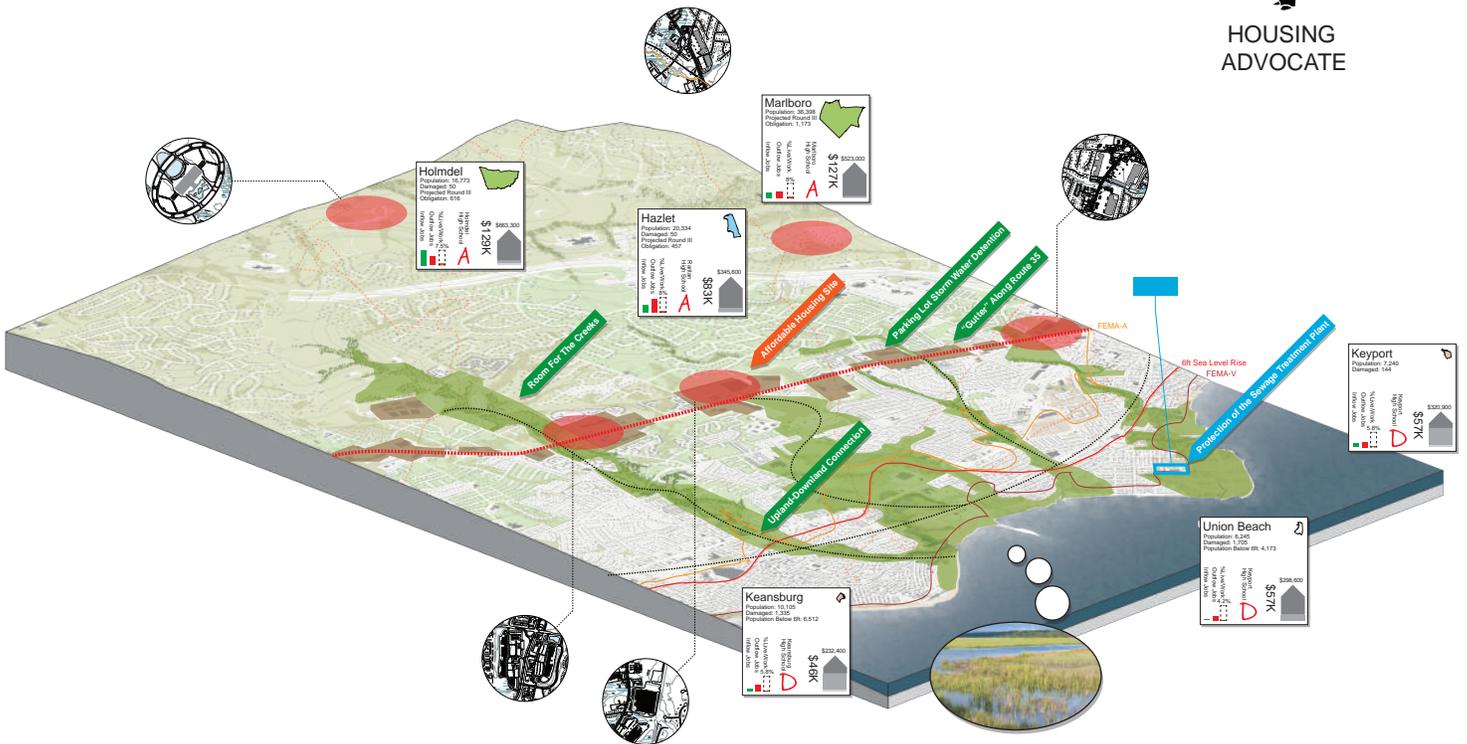


SOCIAL ACTIVIST

If the town can afford to build a big mall, it needs to be able to create housing for the people who work at the mall (...). We need to be creating inclusive communities where people can live, work and educate their children.



HOUSING ADVOCATE



Living with the creek

Options for Monmouth County Watersheds

Options for Monmouth County Watersheds

Five creeks--the Chingarora, the Flat, the East, the Thornes, and the Waackaack--feed the Raritan Bay. Despite the encroachment of single-family houses, shopping centers, and the occasional industrial parcel (not to mention a sewage treatment plant), the creeks are crucial to Monmouth County's watershed, channeling stormwater from the upland communities of Hazlet, Middleton, and Holmdel through the low-lying communities of Keansburg, Union Beach, and Keyport, and finally into the Raritan Bay.

The creeks know no political boundaries, but the people who live in the communities surrounding them certainly do. Despite sharing a region (New York), a state (New Jersey), a county (Monmouth), and a watershed, the upland communities of Hazlet, Middleton, and Holmdel and the low-lying communities of Keansburg, Union Beach, and Keyport are separate municipalities, which, in a "home rule" state like New Jersey, means that each town has the right to basically plan and provide services solely in its own self-interest, without having to consider the consequences its actions have on its neighbors.

This has produced environmental and social injustice. When it comes to the environment, for example, upland towns have little incentive to control their stormwater, since the negative effects of stormwater runoff (for example, flooding) are experienced primarily by their lowland neighbors, who are powerless to do much about it. When it comes to social issues like housing, wealthier towns have little incentive to build affordable housing: because municipal services are financed largely by local property taxes (and because services like affordable housing are a drain on property revenue), affordable housing is thought of as a burden.

Indeed, all of the creek communities mentioned above are predominantly white, predominantly single-family residential suburbs, but when it comes to demographics, the similarities pretty much end there. By point of comparison, consider the low-lying community of Keansburg and the upland community of Hazlet. Keansburg's median family income is about half Hazlet's (\$52,128 v. \$102,743), Keansburg's share of persons living below the poverty line is over six times that of Hazlet's (16.1% v. 2.5%), and Keansburg's median home value is merely 67% of Hazlet's (\$232,400 v. \$345,600). When it comes to educational attainment, the difference is profound: less than 30% of persons 25 and older have a high school degree in Keansburg, whereas in Hazlet, 45% do. And when the New Jersey Department of Education issued its annual School Report Card, measuring school environment, student performance, staff, district finances and other indicators, it awarded Keansburg a "D" and Hazlet an "A." According to the municipal opportunity index, which measures job opportunity, school opportunity, municipal services quality, and municipal socioeconomic status, Keansburg is a "minimum-opportunity" place, whereas Hazlet is a "high-opportunity" place. That is to say: all other things equal, if you're lucky enough to be born in Hazlet instead of Keansburg, you'll have a better opportunity of obtaining a good job, a good education, and financial stability.

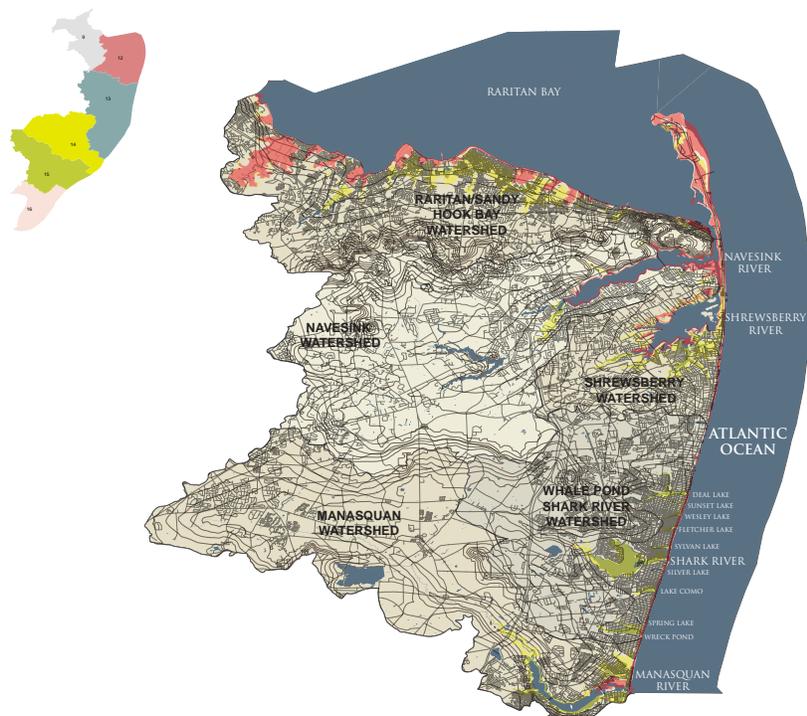
The differences between these two towns came into focus during and immediately after Hurricane Sandy. Not surprisingly, the low-lying, low-income, low-opportunity areas fared the worst. In part because of flooding from its upland neighbors, 1,335 homes were reportedly damaged in low-lying Keansburg (70% of Keansburg was underwater during Sandy), compared to 46 in

upland Hazlet.

On the other hand, Sandy brought out the best in people: stories of cooperation and sympathy across municipal lines. For example Hazlet raised over \$100,000 for their lowland neighbor.

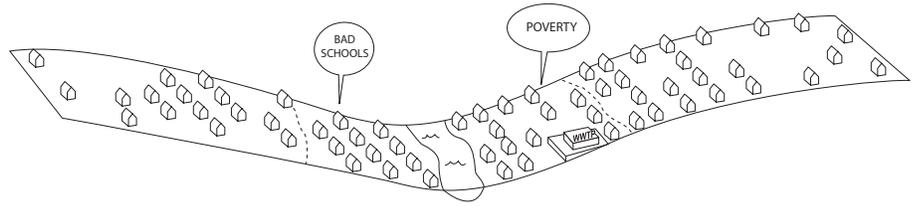
Is there a way to encourage cooperation apart from emergencies?

For this design opportunity, we propose to create a connection between the low-lying, low-opportunity towns of Keansburg, Union Beach, and Keyport, and the high and dry, high and maximum-opportunity towns of Hazlet, Middletown, and Holmdel by playing up the natural connections (i.e. the creeks) that already exist here, and leveraging them to create social connections.



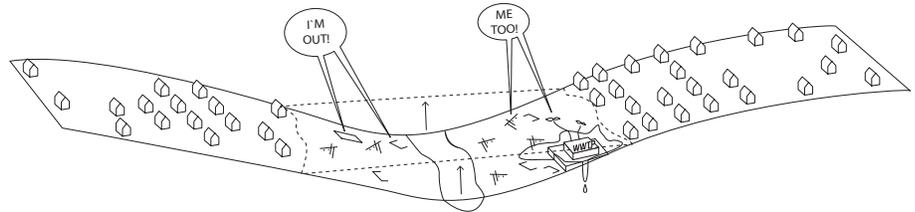
Everyday Emergency

- Half of Union Beach's 6,200 residents qualified for low-income federal assistance post-Sandy.
- Before Sandy, 4.9% of Union Beach residents lived below the poverty line.
- Schools in Union Beach and Keansburg received the worst possible grade from the NJ Department of Education.
- Keansburg's median family income is about half neighboring Hazlet's (\$52,128 v. \$102,743).
- Keansburg's share of persons living below the poverty line is over six times that of Hazlet's (16.1% v. 2.5%).
- Union Beach officials say that FEMA has paid for 170 demolitions but is not covering an additional 92 homes unless they are in imminent danger of full or partial collapse. 50 of these properties require asbestos removal.



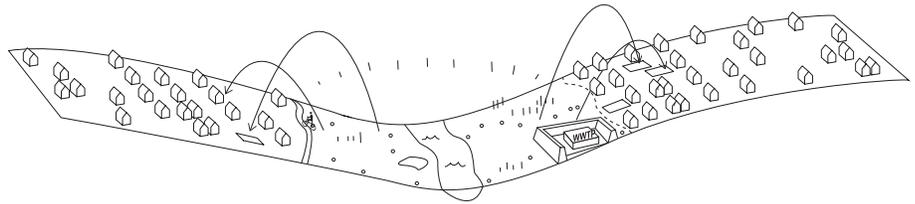
Occasional Emergency

- When Sandy made landfall, about 85% of Union Beach's homes flooded with two or more feet of water.
- Roughly 1,335 Keansburg homes were damaged by Superstorm Sandy, including 145 houses and 44 rentals sustaining "severe" damage.
- 216 Keansburg businesses indicated that they were impacted by Sandy.



Project

- Create an incentive-based program in which people occupying land in a creek bed can trade their parcel for one outside the creek bed
- Transform the creek bed into a recreational amenity by cleaning, greening, and installing park infrastructure.
- Transform Route 35 into a "gutter" that will detain rainwater and simultaneously create a greener, more attractive environment along the corridor that could serve as a vital new public space for the region.
- Build a protective berm around the Union Beach Sewer Plant that doubles as a recreational amenity.
- Take advantage of outstanding affordable housing obligations in Hazlet, Middletown, and Homedale by building affordable housing units in superfluous parking lots near public transportation stops.



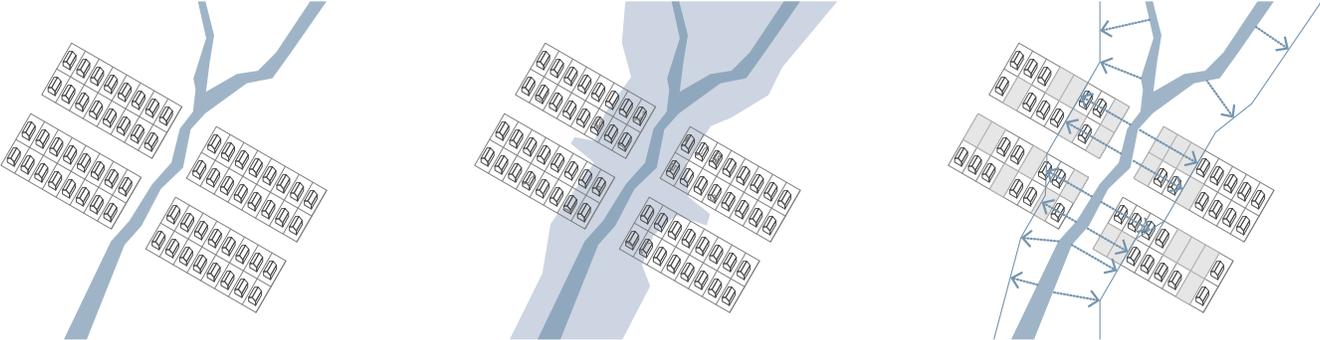
-  + 6 ft. sea level rise up to 2100
-  + 6 ft. storm surge
-  - soil subsidence
-  1,500 below floodline in Union Beach
-  6,000 below floodline in Union Beach
-  STP serves 500,000 +

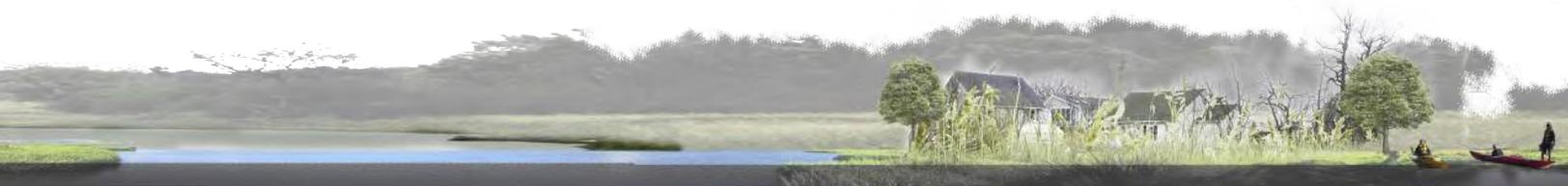
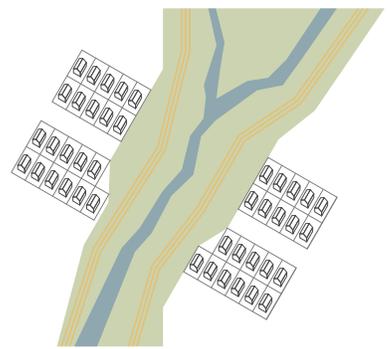
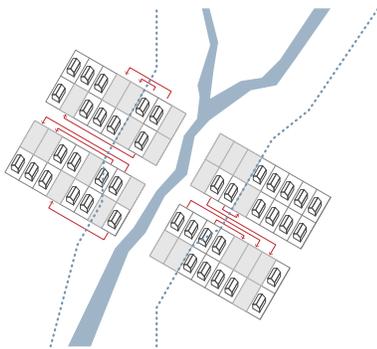
Room For The Creek

Upland-Downland Connection

We propose to transform the creek bed into a recreational amenity by widening the creek beds, cleaning and greening them, and installing park infrastructure.

We propose to create an incentive-based program in which people occupying land in a creek bed can trade their parcel for one outside the creek bed.





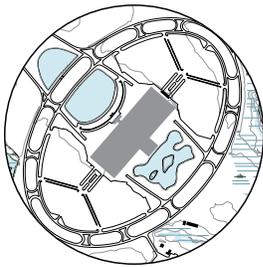
“Gutter” Along Route 35

Parking Lot Storm Water Detention

We propose to transform Route 35 into a green “gutter” that will detain rain-water and simultaneously create a greener, more attractive environment along the corridor that could serve as a vital new public space for the region.

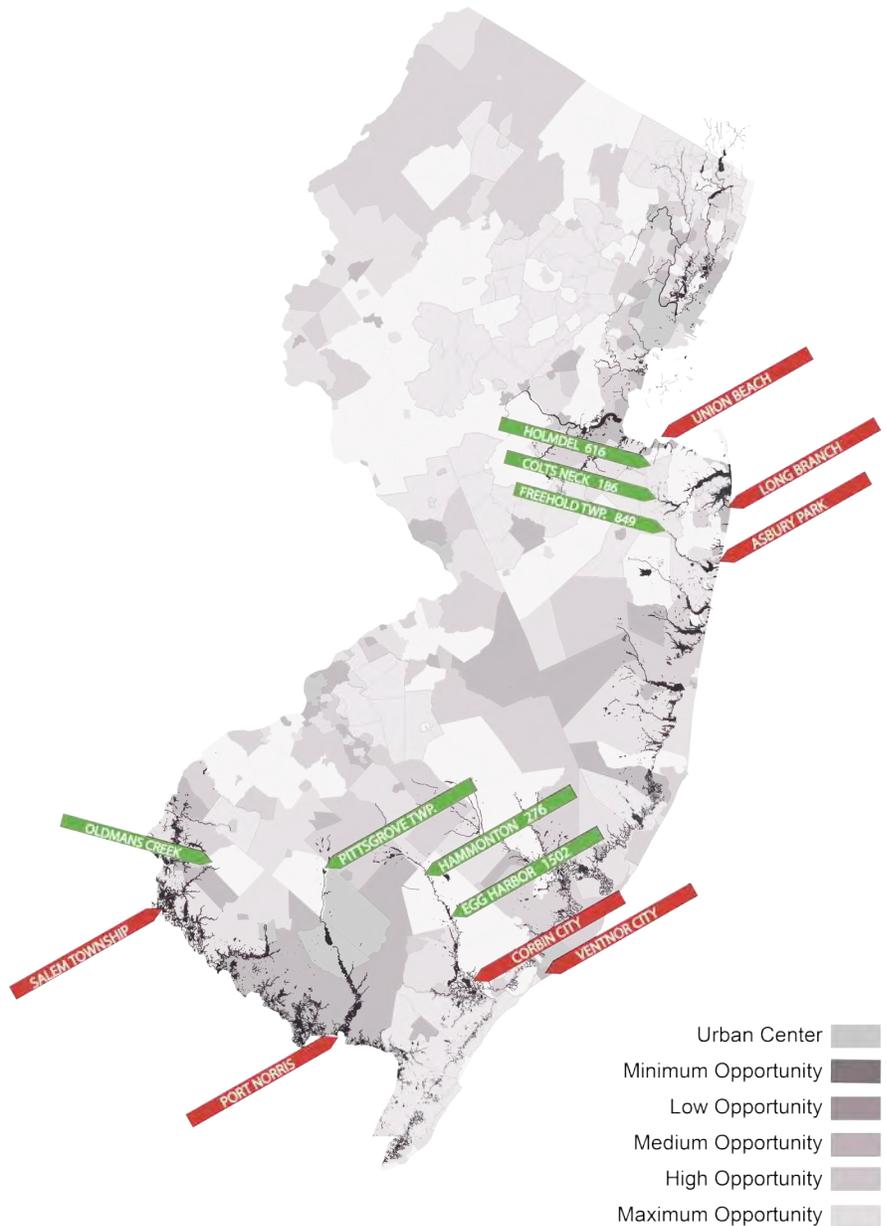






Affordable Housing Site

As a way to increase housing options in high and dry, high income, high-opportunity areas for lowlanders displaced from the storm, we're propose to take advantage of outstanding affordable housing obligations in Hazlet, Middletown, and Holmdel by building affordable housing units in superfluous parking lots near public transportation stops.



Many low-lying, low opportunity areas are connected by creeks to high and dry, high opportunity areas with outstanding housing obligations. The fundamental idea behind this proposal can be applied up and down the coast.

Using the projections of the federal National Oceanic and Atmospheric Administration, we have charted the percentage of year-round housing units that would suffer major/severe damage at six feet and ten feet above current sea level (the latter adds storm events).

We have also tabulated the degree to which nearby high-and-dry mainland communities have unfulfilled obligations to build affordable housing units under the Mount Laurel doctrine. These could help support relocation of low-income households under a policy of “managed retreat” – managed retreat at least affecting year-round residences. Clearly, other uses could continue in the face of rising sea levels and periodic hurricanes and storms, such as recreational enjoyment of the beach areas, seasonal residences (without publicly-aided flood insurance), temporary seasonal housing (RVs, tents, etc.) and commercial businesses that can be moved in advance of major weather events.

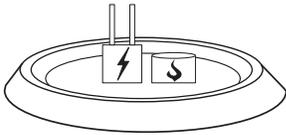
Our analysis has covered all municipalities in Cape May, Atlantic, Ocean, and Monmouth Counties. They have been characterized by geographic location: barrier island and oceanfront towns, inlet/bay back-up towns, and high-and-dry towns. All have also been categorized under Building One New Jersey’s Municipal Opportunity Index as maximum-, high-, medium-, low-, and minimum-opportunity towns (based on relative job opportunity, school opportunity, quality of municipal services, and local socioeconomic profile).

For the rest of the analysis, please see the appendix.

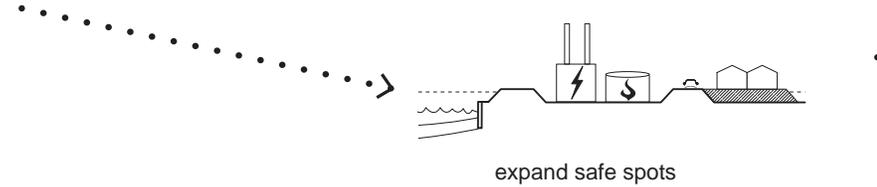
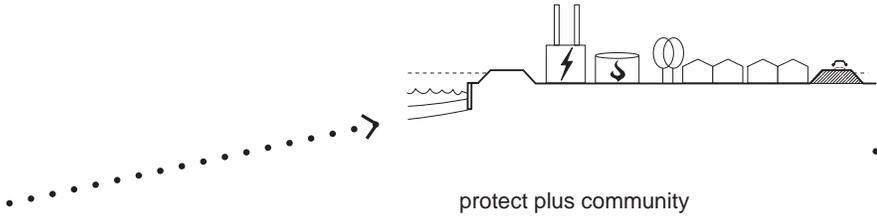
MANASQUAN-BELMAR TARGET REGION (MONMOUTH COUNTY)										
municipalities (south to north) (numbers keyed to Wikipedia map)	total households (year-round) 1-M	total seasonal housing units 1-N	% households with major/ severe damage from Sandy 1-AS	municipal opportunity index (MOI) classification	50% chance of Sandy-type damage (decade)	50% chance of Sandy-type damage (feet above current sea level)	6 foot level by 2100 (damage %)	50% chance of 10 ft level (current sea level plus surge (damage %)		
barrier island/oceanfront										
1-Brielle borough	1,805	229	7,0%	high-opportunity	2020	3'	4%	21%		
2-Manasquan borough	2,374	1,126	36,5%	maximum-opportunity	2090	7'	23%	58%		
3-Sea Girt borough	823	468	4,0%	maximum-opportunity	2100	10'	1%	2%		
5-Spring Lake borough	1,253	795	6,0%	maximum-opportunity	2020	3'	14%	30%		
7-Belmar borough	2,692	1,236	26,1%	minimum-opportunity	2100	9'	0%	37%		
	% households with major/ severe damage from Sandy 1- AS	6 foot level by 2100 (damage %)	50% chance of 10 ft level (sea level plus surge (damage %)	municipal opportunity index (MOI) classification	total year- round households (housing stock) 1-M	past affordable housing production	past affordable housing production as % of current housing stock	potential new affordable housing under goal A	goal A as % of current housing stock	
inlet/bay backup towns										
4-Spring Lake Heights borough	1,0%	1%	5,0%	low-opportunity	2,316	0	0,0%	94	4,1%	
6-Lake Como borough	11,0%	0%	10,0%	low-opportunity	788	0	0,0%	31	3,9%	
high-and-dry towns										
44-Wall township	0,0%	nf	nf	maximum-opportunity	10,051	228	2,3%	1,109	11,0%	
43-Howell township	0,0%	nf	nf	high-opportunity	17,260	307	1,8%	616	3,6%	
34-Farmingdale borough	0,0%	nf	nf	low-opportunity	547	9	1,6%	12	2,2%	
35-Freehold borough	0,0%	nf	nf	minimum-opportunity	4,006	139	3,5%	76	1,9%	
42-Freehold township	0,0%	nf	nf	maximum-opportunity	12,577	431	3,4%	849	6,8%	
36-Englishtown borough	0,0%	nf	nf	medium-opportunity	621	7	1,1%	76	12,2%	
41-Manalapan township	0,0%	nf	nf	maximum-opportunity	12,909	327	2,5%	685	5,3%	
37-Roosevelt borough	0,0%	nf	nf	low-opportunity	1,612	20	1,2%	12	0,7%	
40-Millstone township	0,0%	nf	nf	high-opportunity	3,615	24	0,7%	155	4,3%	
38-Allentown borough	0,0%	nf	nf	high-opportunity	704	0	0,0%	35	5,0%	
39-Upper Freehold township	0,0%	nf	nf	medium-opportunity	2,363	2	0,1%	155	6,6%	

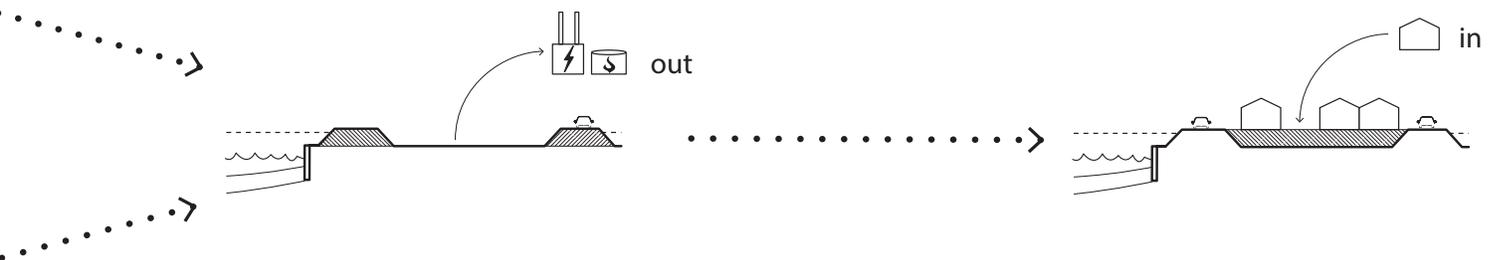
Protection of the Pollution Control Plant

We propose to build a levee around the Union Beach Sewer Plant that protects nearby homes and also serves as a recreational amenity.

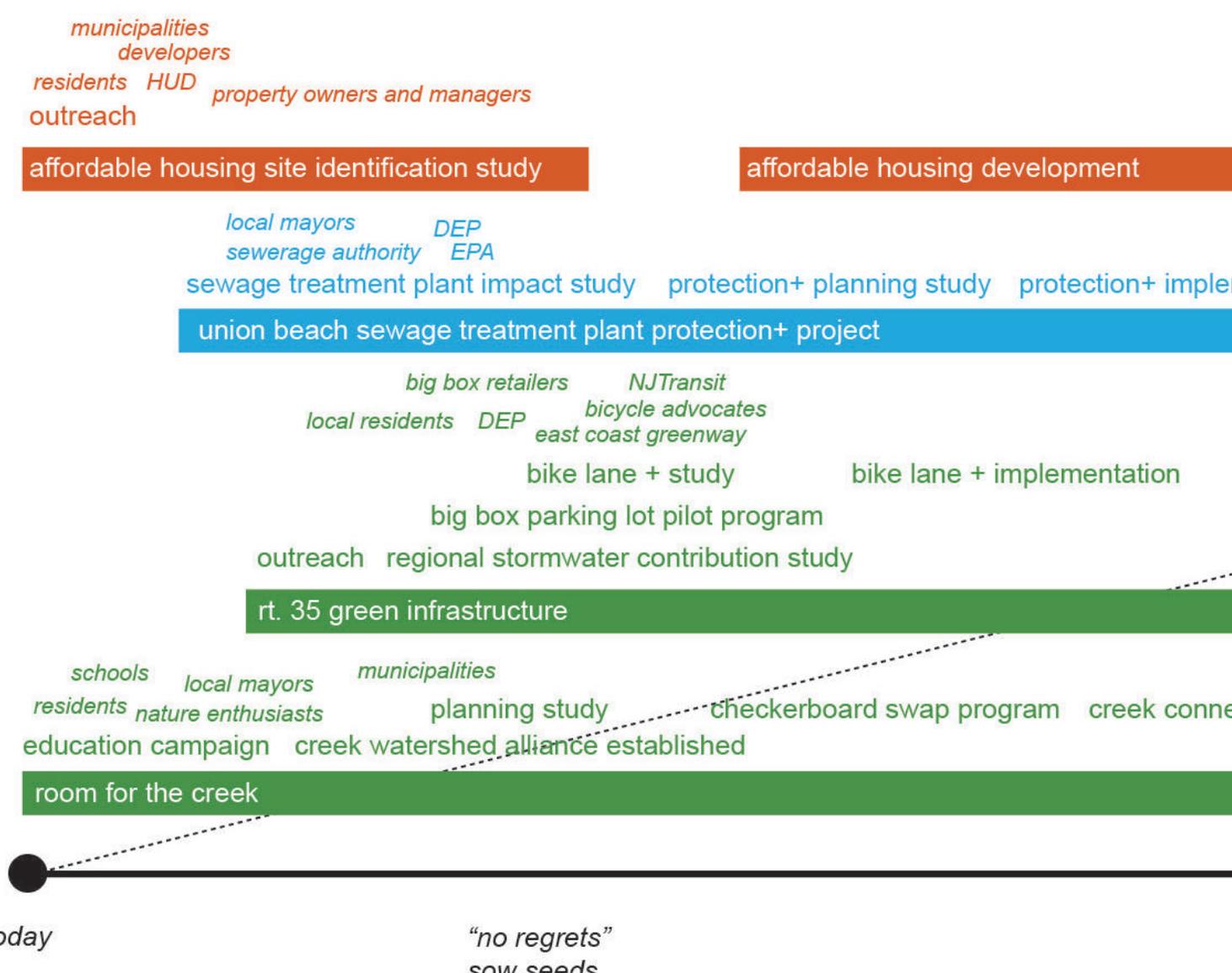


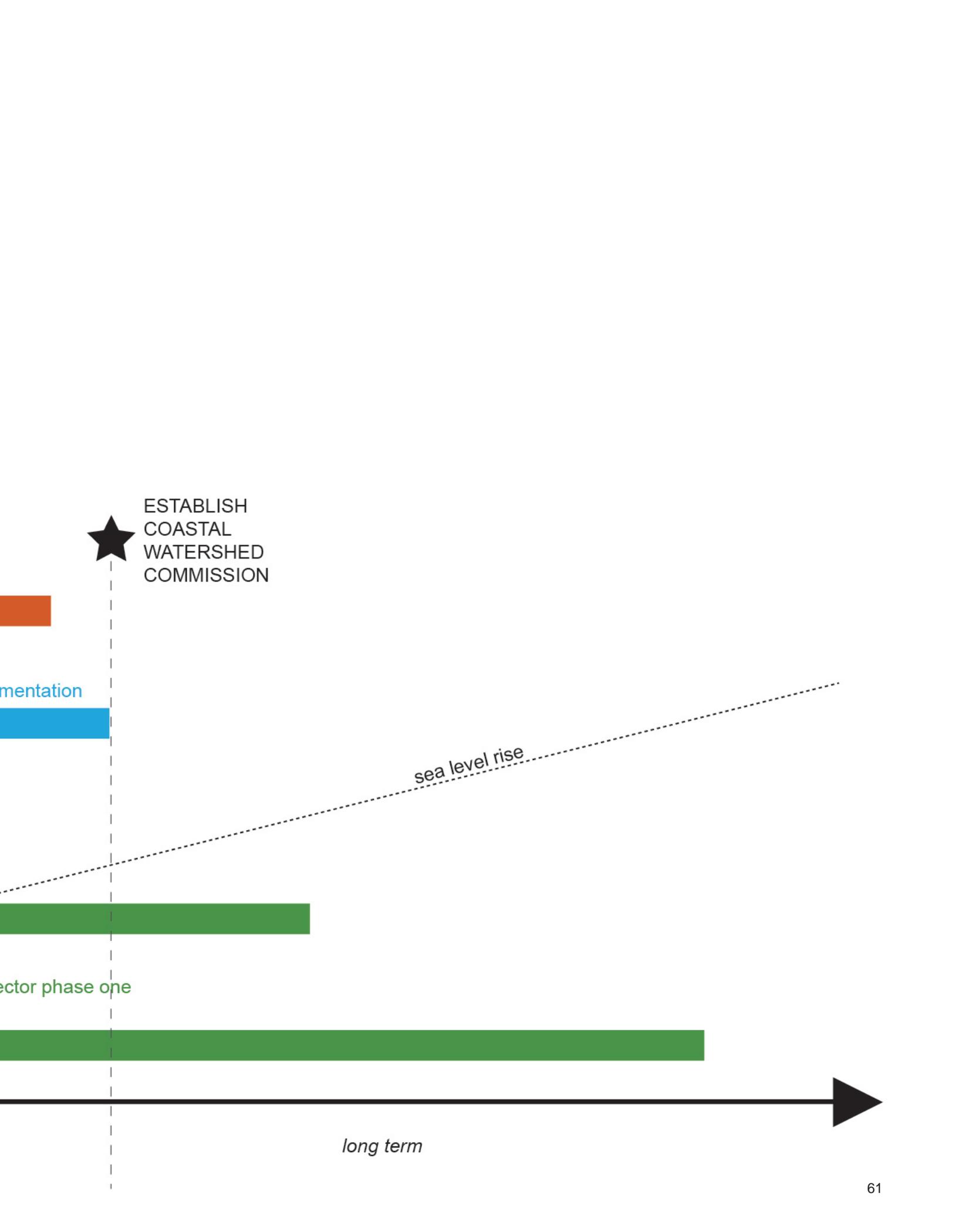
Protection of the Sewage Treatment Plant





Timeline





ESTABLISH
COASTAL
WATERSHED
COMMISSION

mentation

sea level rise

ector phase one

long term



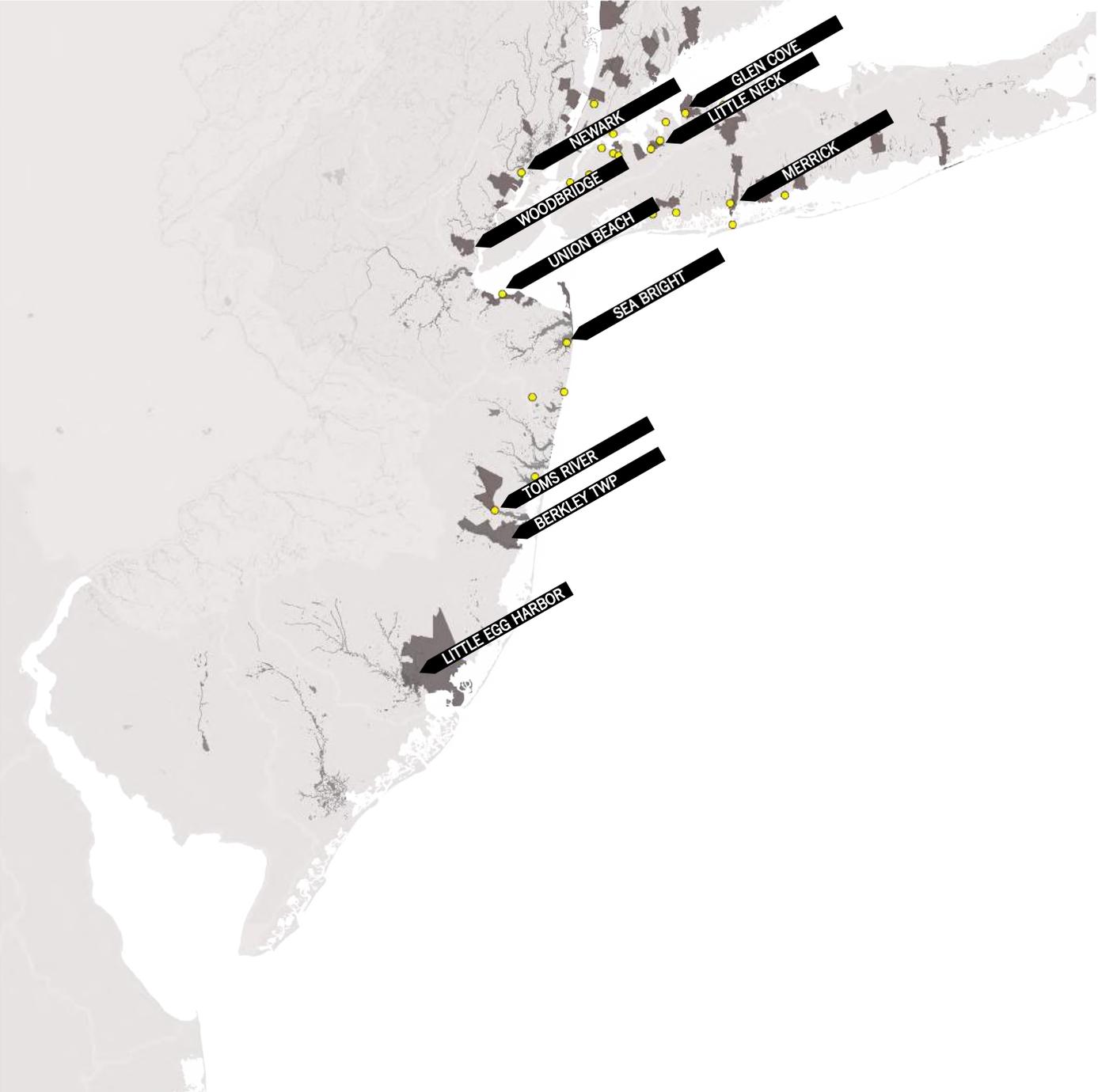
Regular funding

- New Jersey Community Development Block Grant – Disaster Recovery
- EPA Clean Water State Revolving Fund (CWSRF): more emphasis on “green infrastructure”
- Enterprise Green Communities

Innovative funding & financing

- The creek based retention system can be contracted out and financed on the basis of an availability payment P3. This long term contract not only spreads out the budgetary burden, but also incentivizes an optimal performance of the system over time.
- The government could levy an additional property tax or temporary fee, because it realizes some major improvements, that the property owners benefit from. The improvement district can be defined such that it includes both poor and rich communities.

Creeks

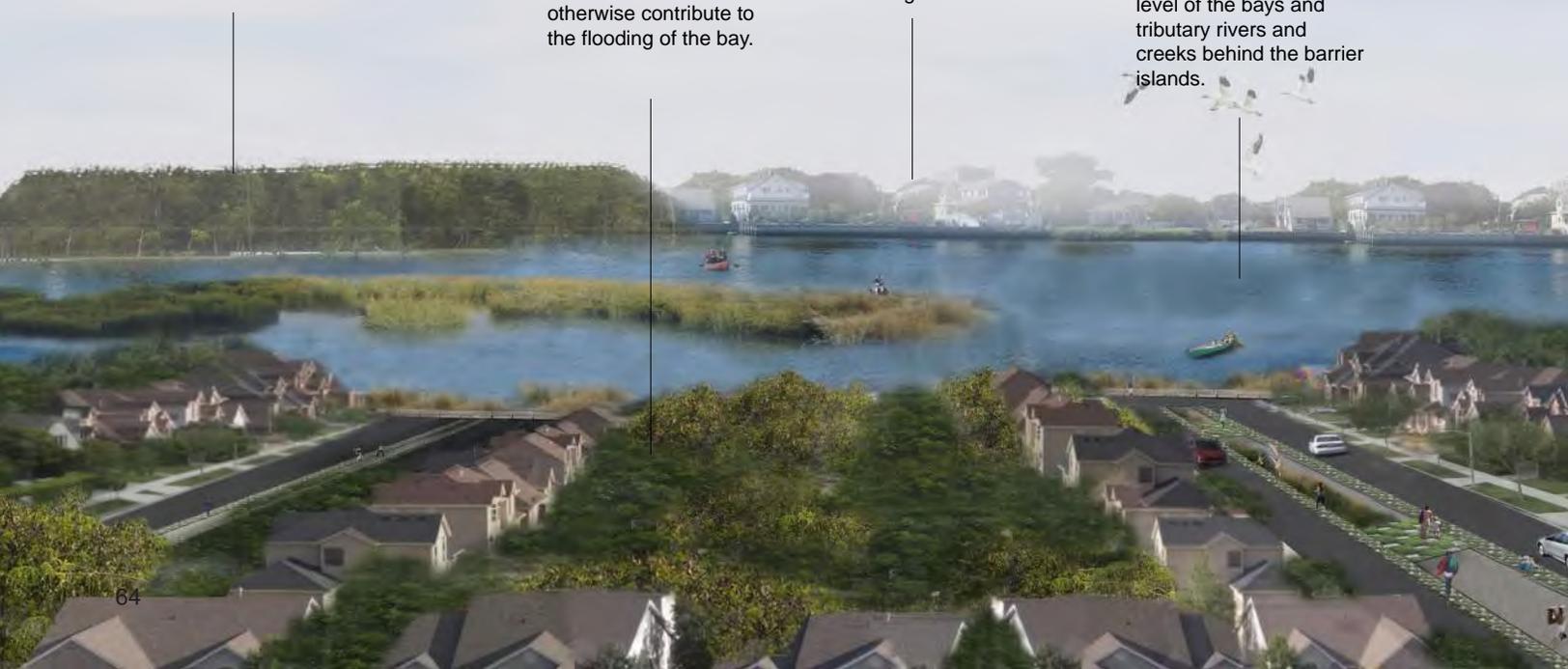


A protective levee around the Bay Park Sewage Treatment Plant could be built that doubles as a recreational amenity.

Decreasing paved surfaces and increasing vegetation can help break winds that cause erosion, as well as detain runoff water that would otherwise contribute to the flooding of the bay.

Housing development should be encouraged in high and dry, transit-rich areas with more housing options. Demographic trends suggest a need to diversify the housing stock in Nassau County, where single-family, detached homes account for 77 percent of the housing.

News reports of Sandy's destruction focused on the mountainous surf breaking on the Atlantic shoreline, but the greater damage resulted from the storm surge and the torrential rains that less dramatically raised the level of the bays and tributary rivers and creeks behind the barrier islands.



LIVING WITH THE BAY

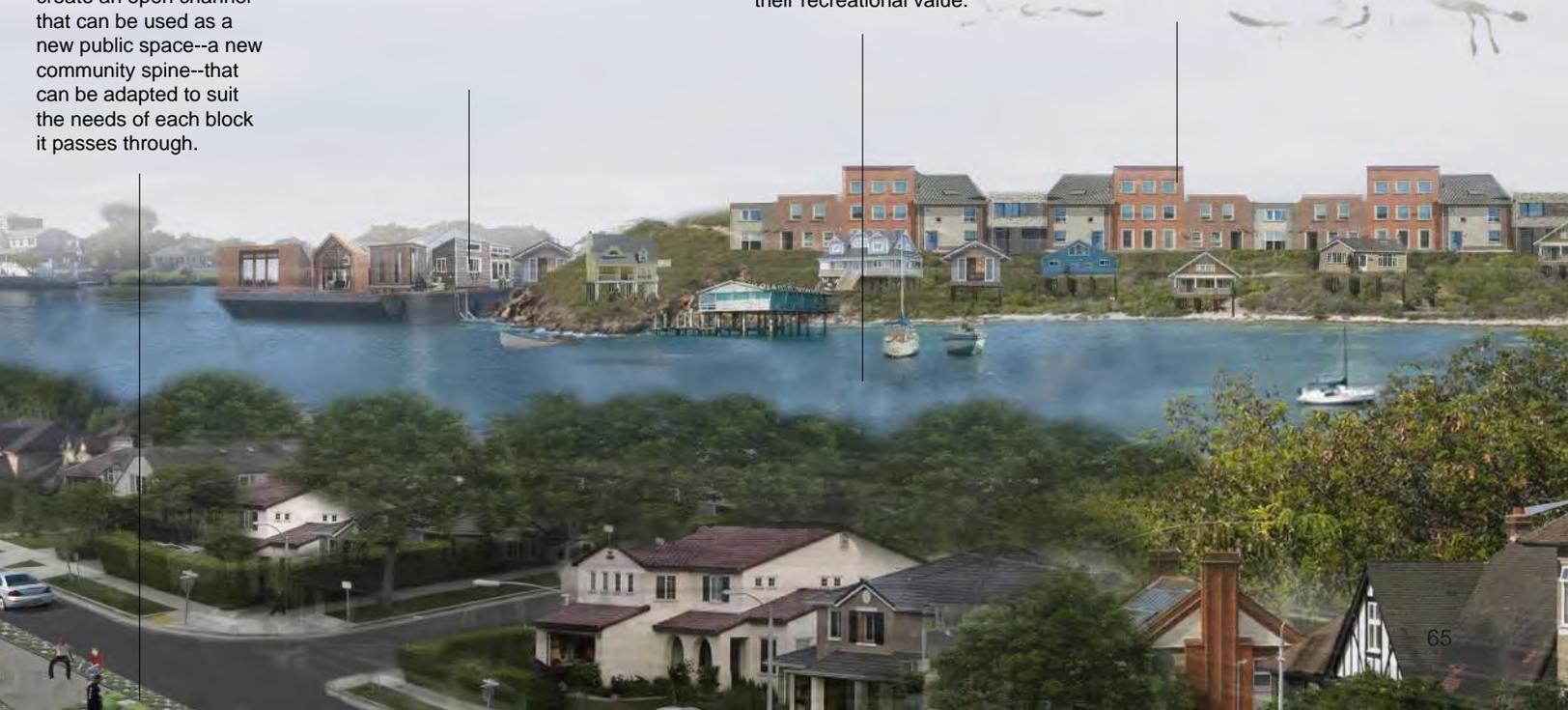
Options for Southern Nassau County

A system of “straws” built along north / south streets in Long Beach could help drain the bay during storms and tidal surges. Instead of covering them in a culvert, we propose to create an open channel that can be used as a new public space—a new community spine--that can be adapted to suit the needs of each block it passes through.

Another option for Southern Nassau County: houses on a barge.

The erosion of the region's tidal marshes that has been the result of irresponsible, unsustainable development practices has also undermined their ability to protect us from floods, and decreased their recreational value.

Options for inhabiting the island include elevating homes and clustering development on fill from an onsite excavation. Such an excavation could contribute to the health of the bay.



When we get a heavy rain, we are inundated. Just this July, we had 67" of rain. In 15 minutes the streets were flooded. The water takes hours to subside. The bay is just not drained properly.



ISLAND PARK RESIDENT

I used to get my mail at 1:00. Now I get it at 9:30 - there are so few people left around here. Sandy made the mailman's job a lot easier.



ISLAND PARK RESIDENT

Nassau County has seen big demographic changes. Our elderly population is growing; our Latino population is growing; we have seen a big rise in single persons in poverty. There aren't enough housing options here.



NASSAU COUNTY REPRESENTATIVE

Even today, the wetlands in the Bays are essential, buffering wave-energy. In the future, water levels will rise and waves will be stronger. The bay will become more hungry for sediment, than it already is now. We should restore the wetlands and sediment balance"



ENVIRONMENTAL ADVOCATE

The Bay Park sewage treatment plant dumps its effluent into the bay. See all of this seaweed? We can't even clam here anymore. There's no more winter fluke. All the kids around here know that if it rains, don't go swimming for a few days.



BAY PARK RESIDENT

When Bay Park failed and they couldn't get the sewage out of the system, that's when this became a real catastrophe event here.

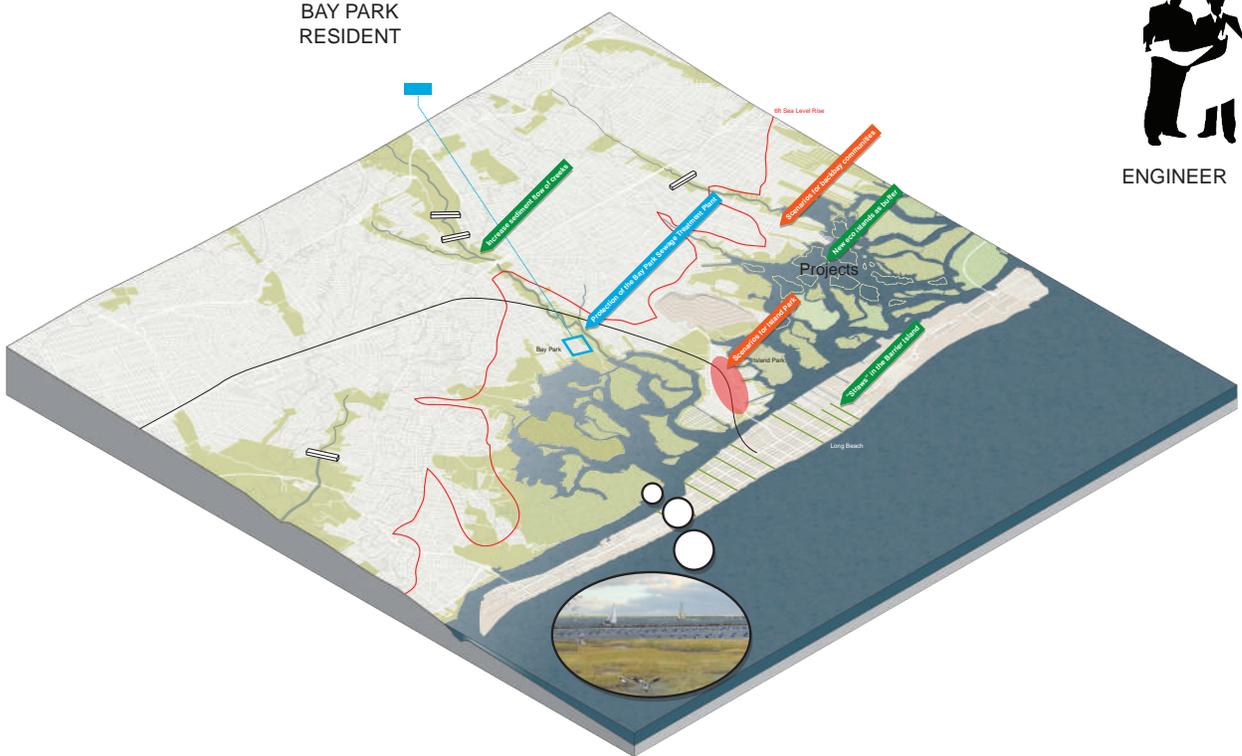


BAY PARK RESIDENTS

You're looking at significant expenditures of money to make the [Bay Park Sewage Treatment] plant more secure. There is no BandAid for this.



ENGINEER



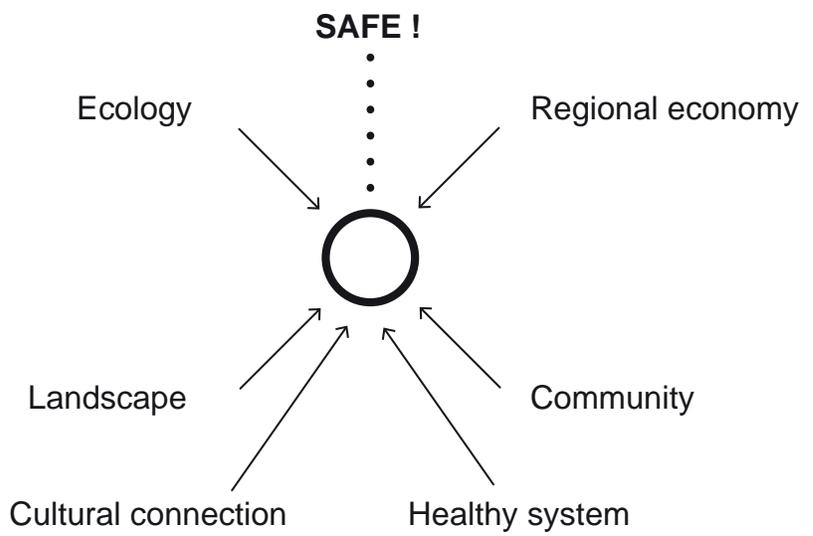
Living with the bay

Options for Southern Nassau County

Many news media pictures of Sandy's destruction focused on the dramatic impact of mountainous surf breaking on the Atlantic shoreline, breaching dunes (where they existed) and smashing oceanfront houses. The greater damage, however, resulted from the storm surge (up to 14 feet in some areas) and the torrential rains that less dramatically raised the levels of the bays and tributary rivers and creeks behind the barrier islands. In effect, the most pervasive threat came from flooding from the back, not from surf from the front.

This was certainly true in southern Nassau County, where communities like East Rockaway, Island Park, and Long Beach were inundated with flooding from the Hewlett Bay. In Bay Park, the flooding incapacitated Nassau County's Bay Park Sewage Treatment Plant, which spilled billions of gallons of untreated and partially treated sewage into local waterways, streets, and even homes. The damage to the bay was severe: runoff and outflows added to already high levels of nitrogen and fueled already explosive algal blooms.

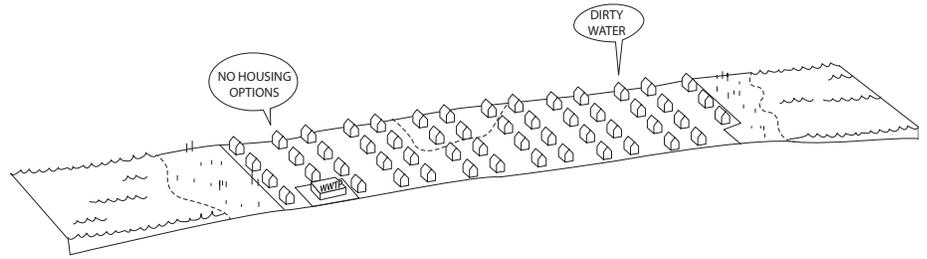
This project presents a menu of options for improving the health of Southern Nassau County's Bays in a way that expands housing and transportation options for existing residents and results in accessible, attractive public spaces.



Integrated watermanagement for the bays ensures investments serve multiple purposes
68

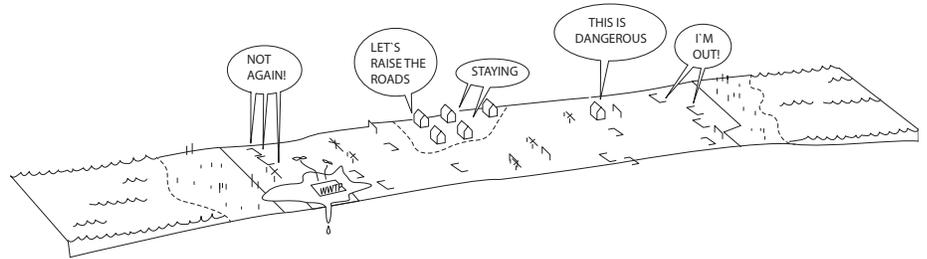
Everyday Emergency

- Thanks to outflows from the Bay Park sewage treatment plant, swimming in the bay is forbidden when it rains.
- in Nassau County, single-family, detached homes account for 77 percent of the housing stock.
- Because the bay is not properly drained, parts of Island Park are flooded within 15 minutes of heavy rain.
- When Sandy hit we did an inventory and found that there were a total of 122 rental apartments on the market.
- Trying to rent a home on Long Island is much more difficult than it is in other places, even other suburban regions. There are few apartments or houses to rent to start with. Of these, very few are vacant and on the market.
- Clamming and fishing is discouraged in the bay, thanks to outflows from the Bay Park sewage treatment plant.



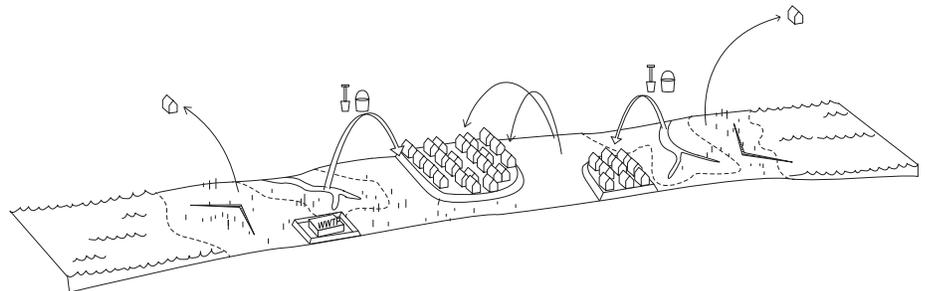
Occasional Emergency

- In Bay Park, flooding incapacitated Nassau County's Bay Park Sewage Treatment Plant, which spilled billions of gallons of untreated and partially treated sewage into local waterways, streets, and even homes.
- The night Sandy hit East Rockaway, over 100 calls were made for EMS services. The majority involved water rescues.
- The debris removal process in Oceanside was estimated at \$85 million, approximately the size of the town's annual budget.
- 34,000 people lived in Long Beach before Sandy, but six months later over 25% of residents still couldn't return full-time.
- Less than half of the 95,500 damaged buildings in Suffolk and Nassau counties were covered by flood insurance.



Projects

- Build "straws" along north / south streets in Long Beach to help drain the bay during storms and tidal surges. Treat them as a new public space--a new community spine--that can be adapted to suit the needs of each block it passes through.
- Build a protective levee around the Bay Park Sewage Treatment Plant could be built that doubles as a recreational amenity
- Elevate homes on fill generated from an on-site excavation: cluster development around public transportation.
- Identify housing development in high and dry, transit-rich downtowns with good schools an array of housing options.



-  + 6 ft. sea level rise up to 2100
-  + 6 ft. storm surge
-  - soil subsidence
-  95,534 buildings destroyed
-  43,106 experienced flooding
-  500,000 inhabitants served by STP

WTP

“Straws” In The Barrier Island

We propose a system of “straws” built along north / south streets in Long Beach could help drain the bay during storms and tidal surges. Instead of covering them in a culvert, we propose to create an open channel that can be used as a new public space--a new community spine--that can be adapted to suit the needs of each block it passes through.

Straws are high-capacity conduits running across the barrier island (with one-way valves on the ocean termination points). They are a passive means of “relieving the pressure” between the back bay and ocean which will minimize back bay flooding, as well as flood water retentions times. Such a system could also be improved with high-capacity pumps to actively transfer the waters from the back bays to the ocean. This would be the first line of defense in protecting back bay areas from still water flooding.



A system of “straws” built along north / south streets in Long Beach could help drain the bay during storms and tidal surges. Instead of covering them in a culvert, we propose to create an open channel that can be used as a new public space--a new community spine--that can be adapted to suit the needs of each block it passes through.

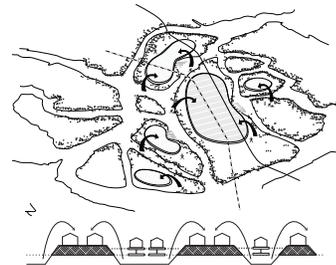
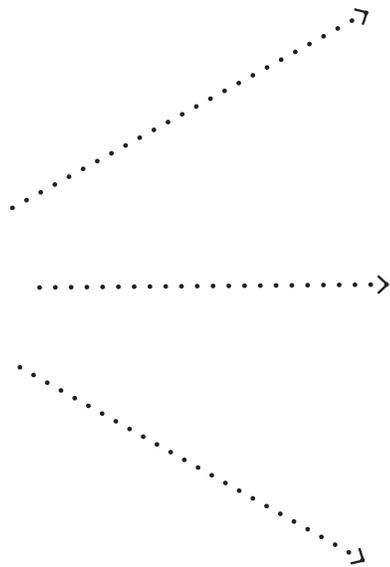


Scenarios For Island Park

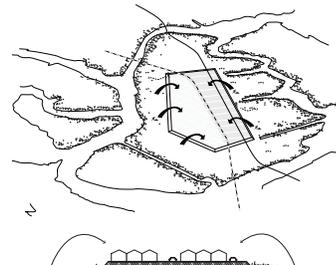
A “cut and fill” project could elevate homes on Island Park on fill generated from an on-site excavation that would simultaneously contribute to the restoration of the tidal marsh and the health of the bay.

Scenarios for Island Park

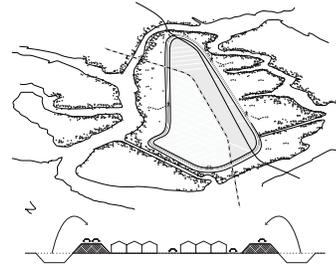
cut & fill scenarios
for Island Park



island town



hill town



dike town



Options for Island Park include a “cut and fill” project that elevates homes onto a hill and clusters development around the LIRR station.

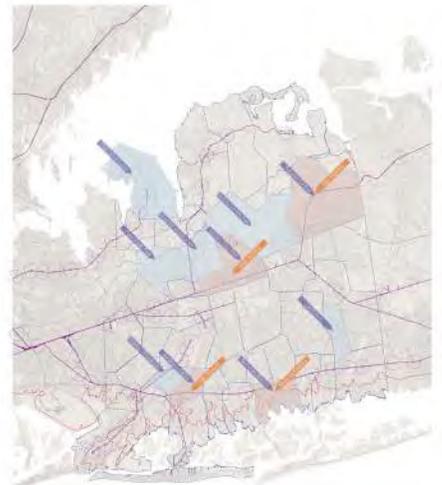
To provide a more resilient coast line, we propose an excavate and mound technique wherein soils / materials are excavated from land just along the shoreline (mostly back bay and more protected shorelines). The materials are then utilized to build up the lands on an adjacent area. These lands would be constructed to an elevation above local flood-hazard elevations. The design tool has many advantages, best looked at with respect to the final / finished elevations, including:

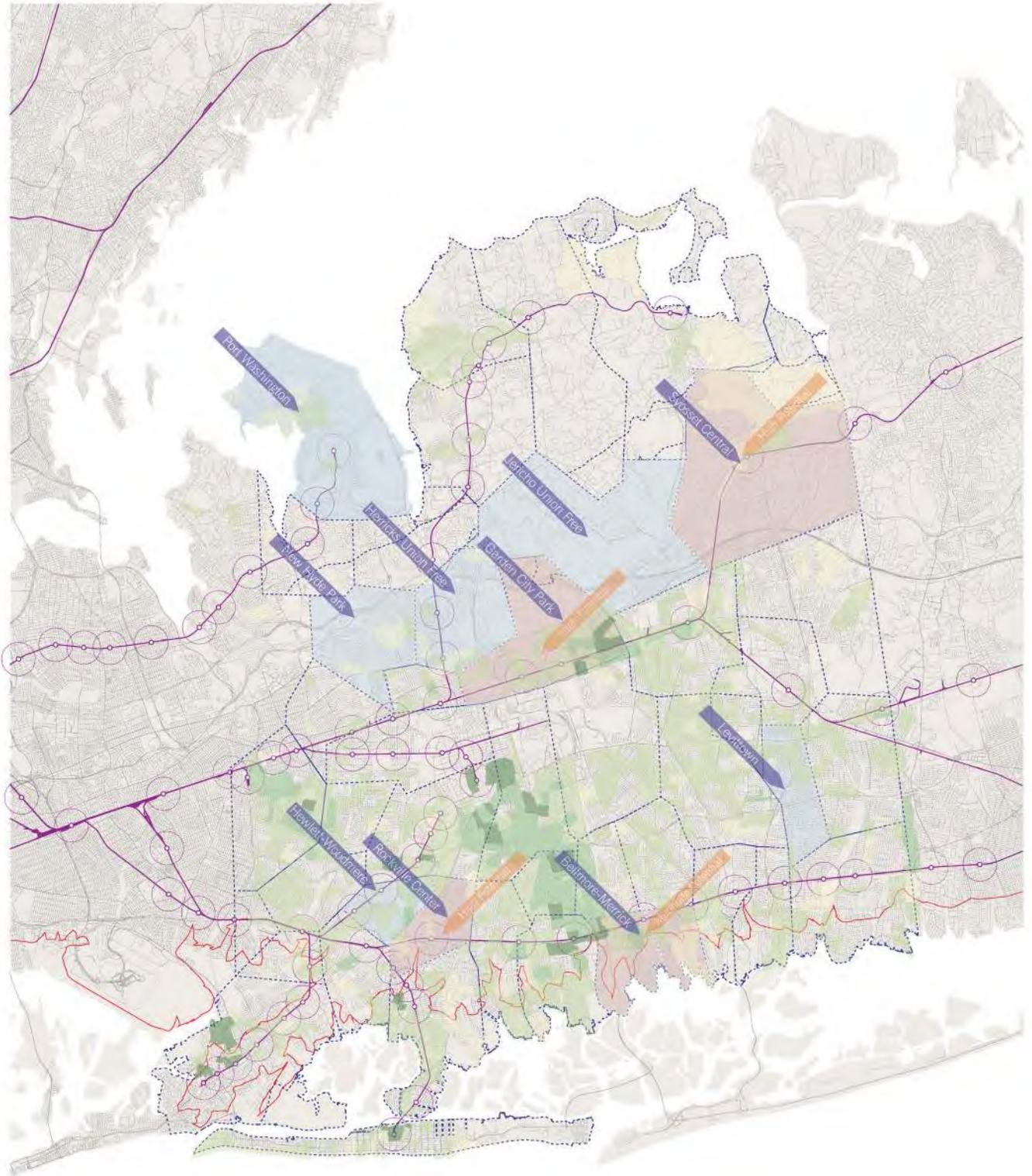
- New low lands / wet lands are basically where the materials were removed. Depending upon excavation depths, such areas could be utilized for purposes such as wild-life areas, water features, passive parks, ball fields (which would be designed to survive occasional flooding), etc. These areas would result in a resilient shoreline by adding to available flood water storage and marshes to protect from dynamic wave forces, as well as providing filtering of stormwater pollutants from land-side run off;
- New slope / lands between low lands and uplands. These areas could provide a wide range of beneficial uses to their communities including potential locations for community gardens and paths to allow residents unimpeded access to the shoreline; and,
- New upland areas would be constructed above the local flood-hazard elevation, and, as such, would be protected from flooding associated with future major meteorological events. These new uplands could be utilized for any number of beneficial uses including homes, businesses, active parks to name a few. A major benefit of this tool is the flood insurance costs are expected to be much lower for those homes and businesses constructed on the new uplands, and potential for areas landward of the uplands, assuming that they are also protected from storm surge water. As such, anticipated lower insurance costs / flooding risks could actually provide a partial mechanism to fund this alternative.



MOVING ON UP

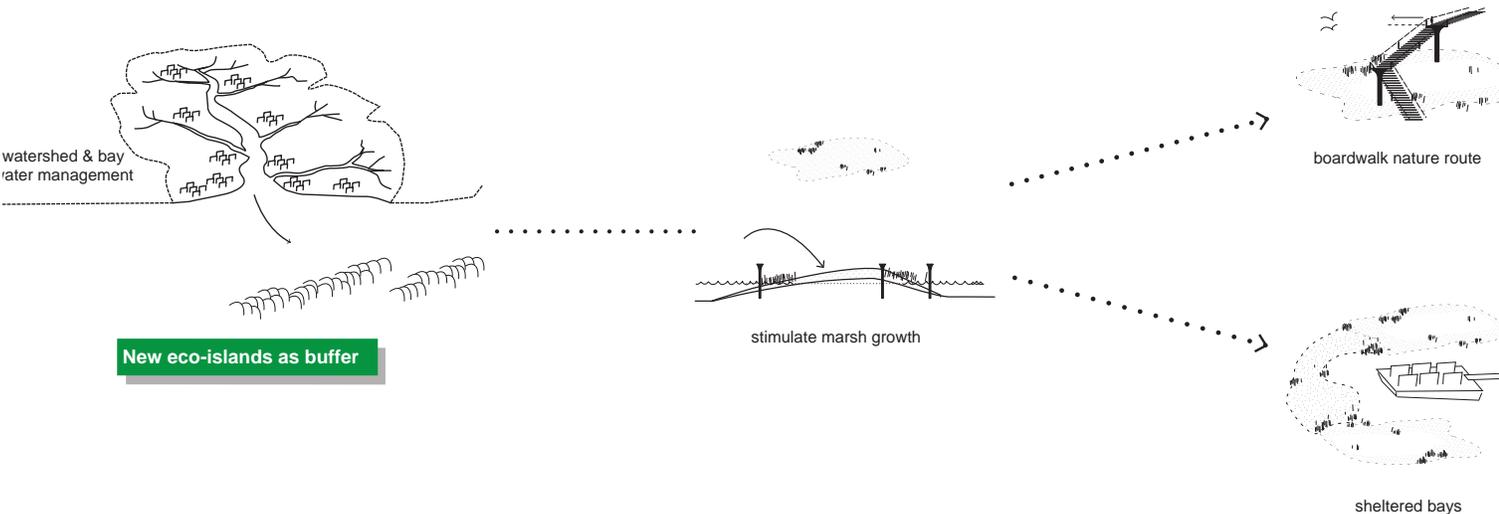
As the Long Island Index has pointed out, with over 100 downtowns and nearly as many rail stations--many of them in the best school districts--Long Island has a wide range of places that could support a new pattern of development that expands Long Islanders' housing options. Denser development should be encouraged in these sites to the fullest extent possible. From left to right, 15-minute walking radii from LIRR stations; Long Island's Best Schools as measured by US News; downtowns with high development potential as identified by Long Island Index, and availability of affordable homes. LIRR stations are represented by the circles.

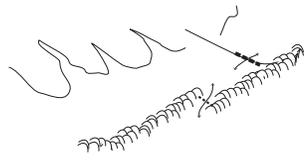




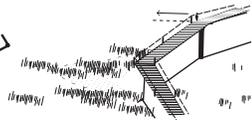
New Eco Island As Buffer

We propose to stimulate marsh growth as a means of increasing the sediment flow of Southern Nassau's creeks.

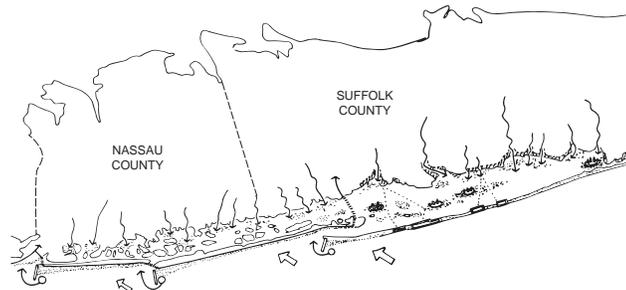




replace infrastructure (bridges) with hurricane doors and construct protective barrier system



2nd line of defence in the bay



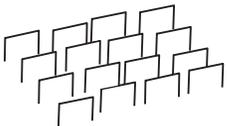
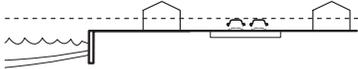
two different scenarios:
 - protect with dunes, groins, and open dams (minimal adapting)
 or
 - buffer marshes and adapt housing on flood line

Scenarios for Island Park

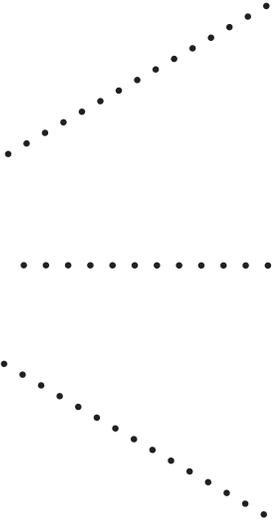
cut & fill scenarios for Island Park



Scenarios For Backbay Communities



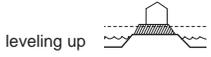
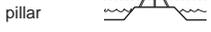
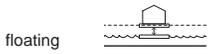
collective



Scenarios for backbay communities



individual



floating

pillar

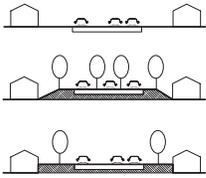
leveling up

move up

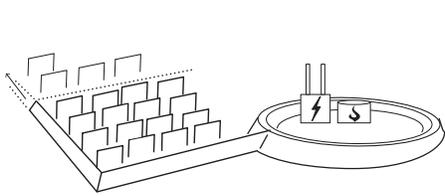


Scenarios for Island Park

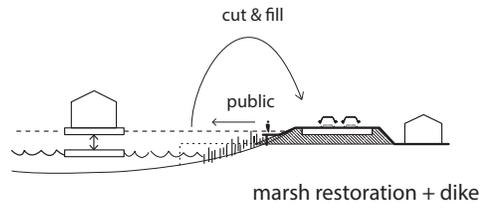
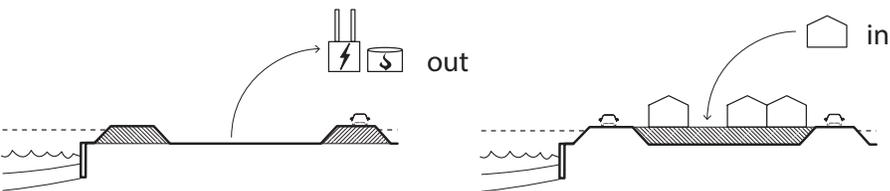
cut & fill scenarios
for Island Park



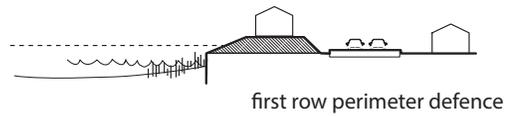
road becomes dike



build on safe spots,
collaborate to raise the first row

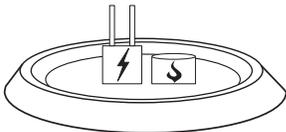


marsh restoration + dike

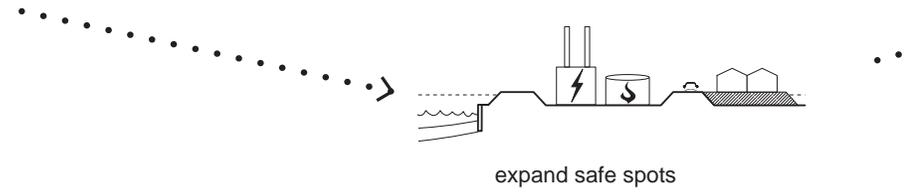
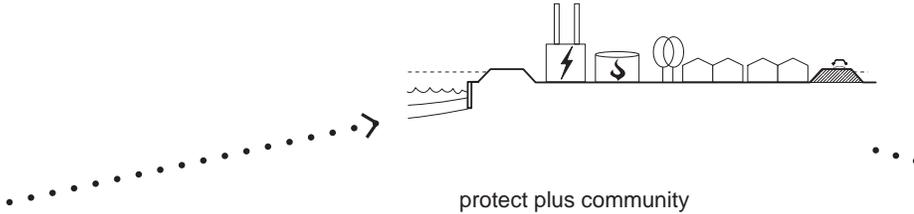


Protection of the Pollution Control Plant

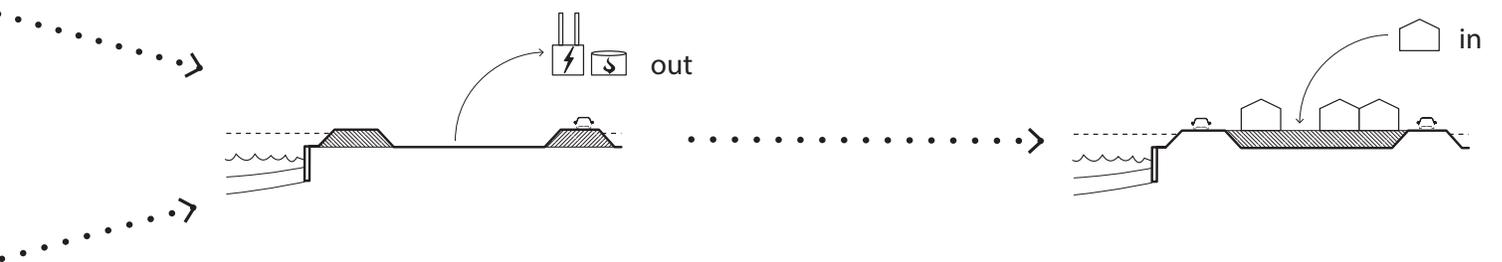
We propose to build a protective levee around the Bay Park Sewage Treatment Plant could be built that long-term local levee rings could be connected to.



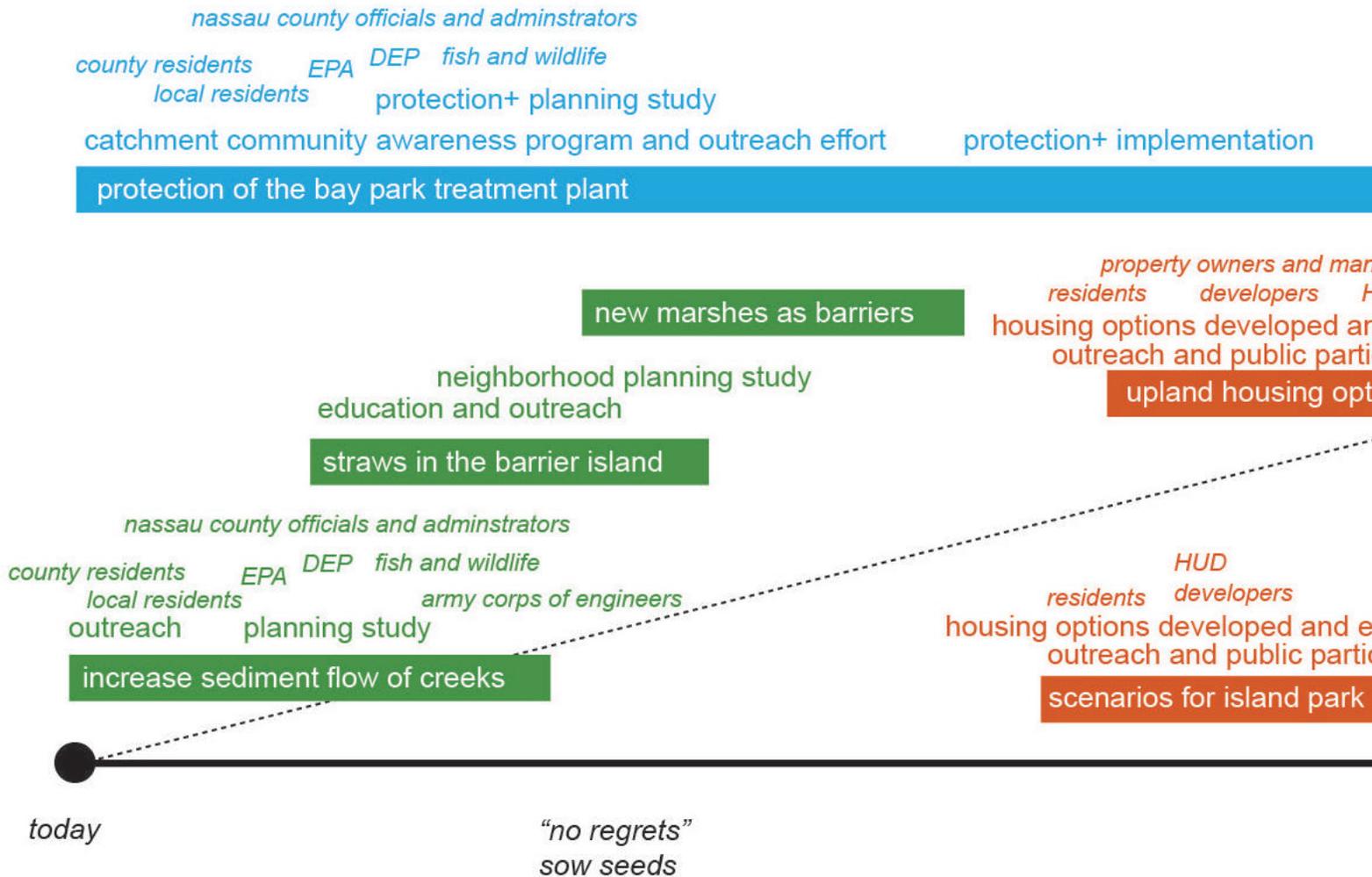
Protection of the Sewage Treatment Plant



A levee protects the Bay Park Sewage Treatment Plant.



Timeline



★ ESTABLISH NATIONAL BAY IMPROVEMENT INCENTIVE PROGRAM
FEMA HUD EPA insurers
the president of the united states

development of new treatment plant

conversion of the treatment plant

managers HUD and evaluated participation options

sea level rise

dike town???

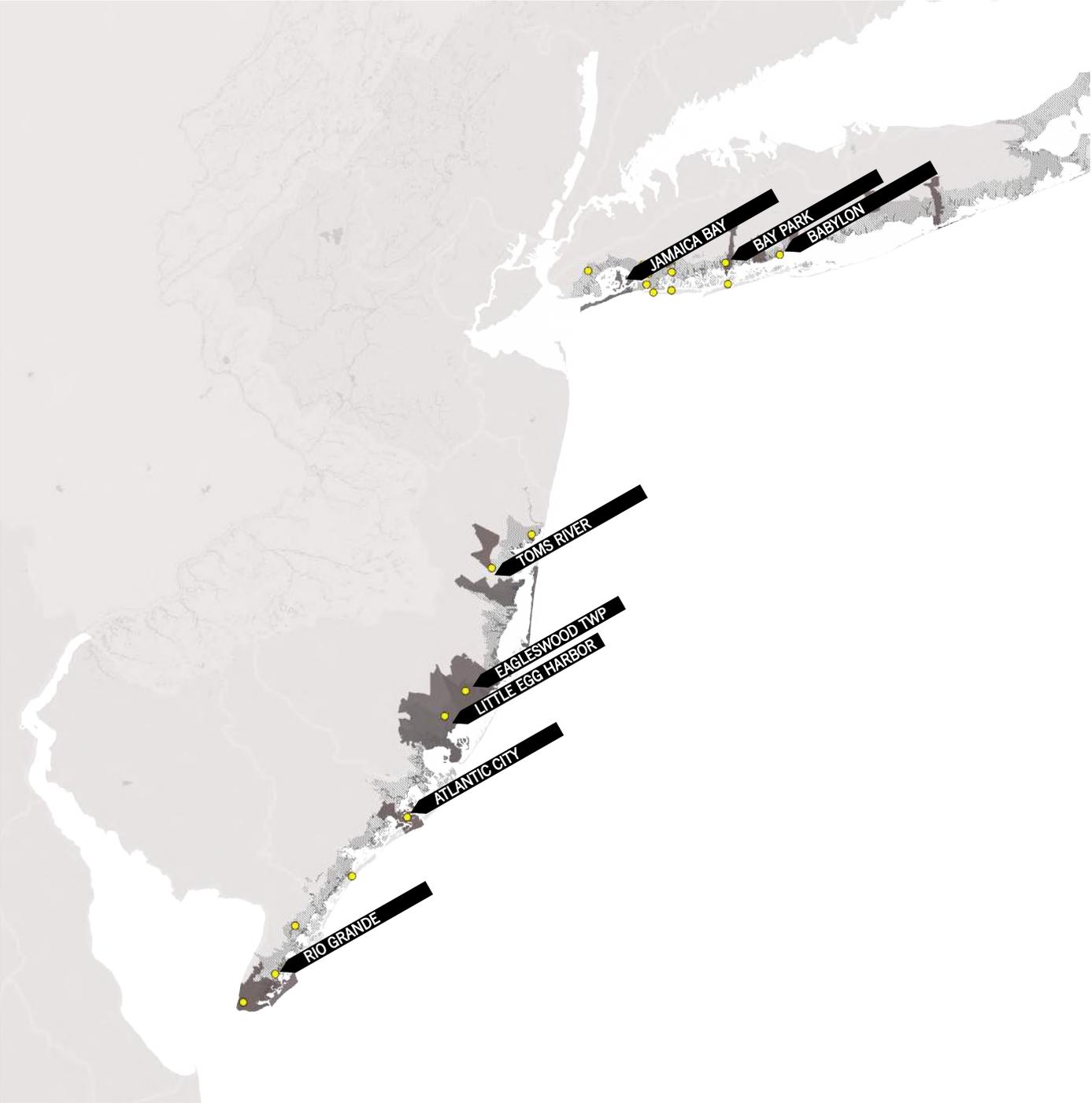
hill town???

evaluated participation island town???

long term



Bays



The Coastline is a continuous, maximally accessible coastal trail that would extend from Cape May to Sandy Hook.

The Coastline adapts to local conditions, and doubles as a protective barrier in the form of protective boardwalks, seawalls, and sand carpets.

High-density cities, medium density suburban communities, and undeveloped environments can leverage The Coastline to create a more attractive, more accessible, and more resilient beachfront.

The New Jersey coast is one of the country's most iconic places, full of natural beauty and human-made attractions that draw millions of visitors every year. But as Hurricane Sandy illustrated all too well, the natural and human-made amenities that make the coast great are highly vulnerable to extreme weather events.



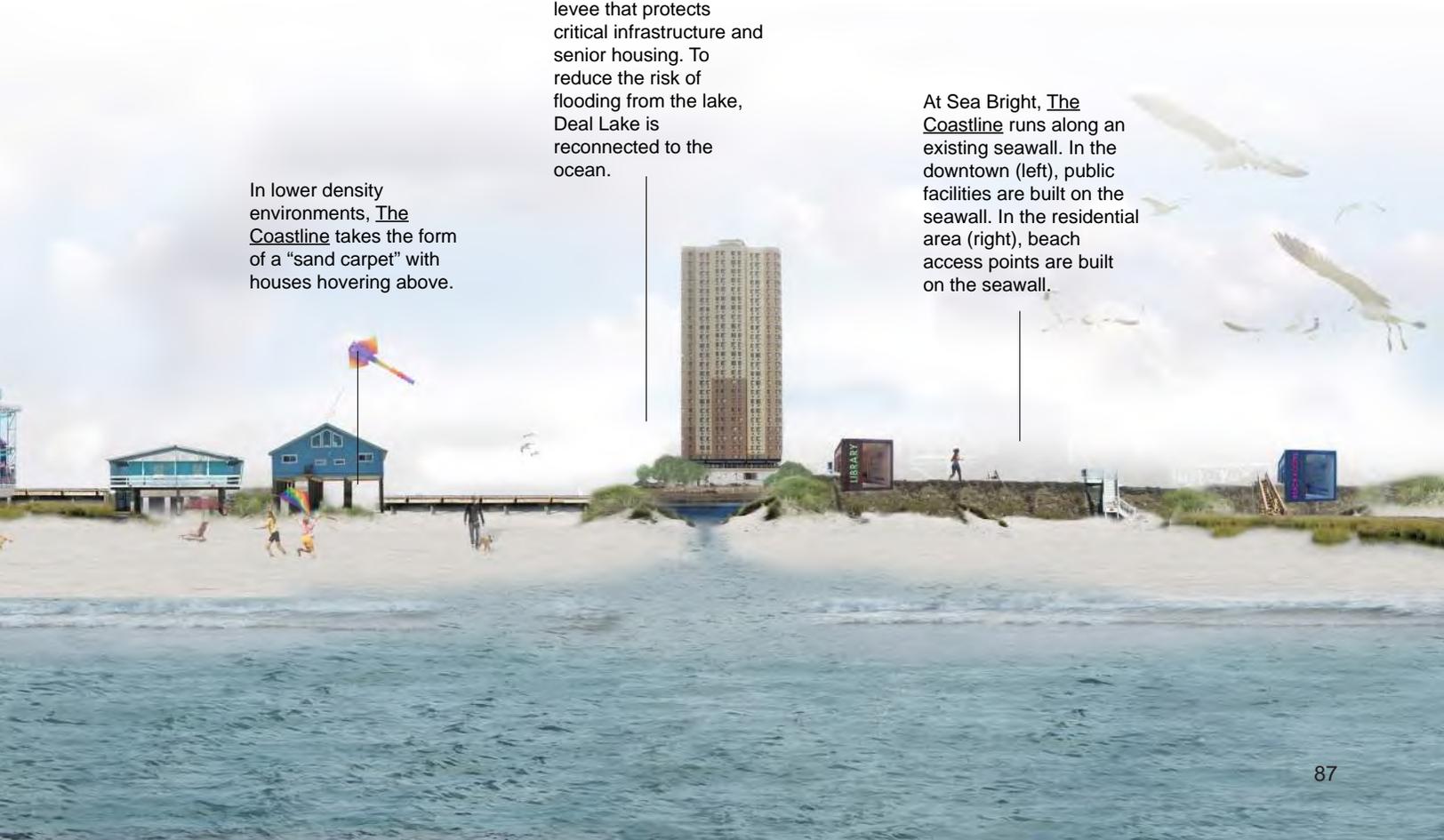
LIVING WITH THE COAST

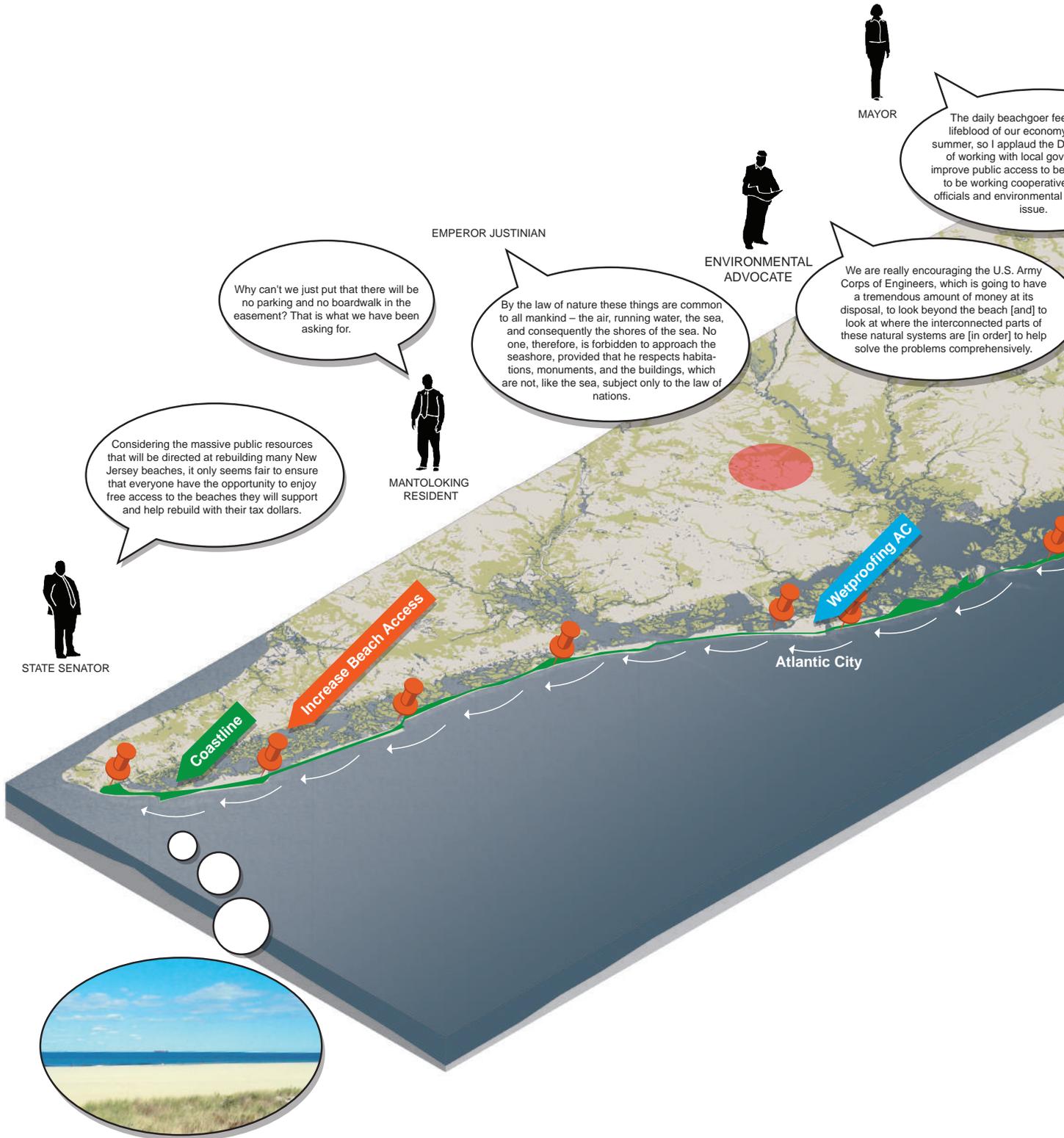
Options for New Jersey's Coastline

In lower density environments, The Coastline takes the form of a “sand carpet” with houses hovering above.

At Asbury Park, The Coastline runs along a levee that protects critical infrastructure and senior housing. To reduce the risk of flooding from the lake, Deal Lake is reconnected to the ocean.

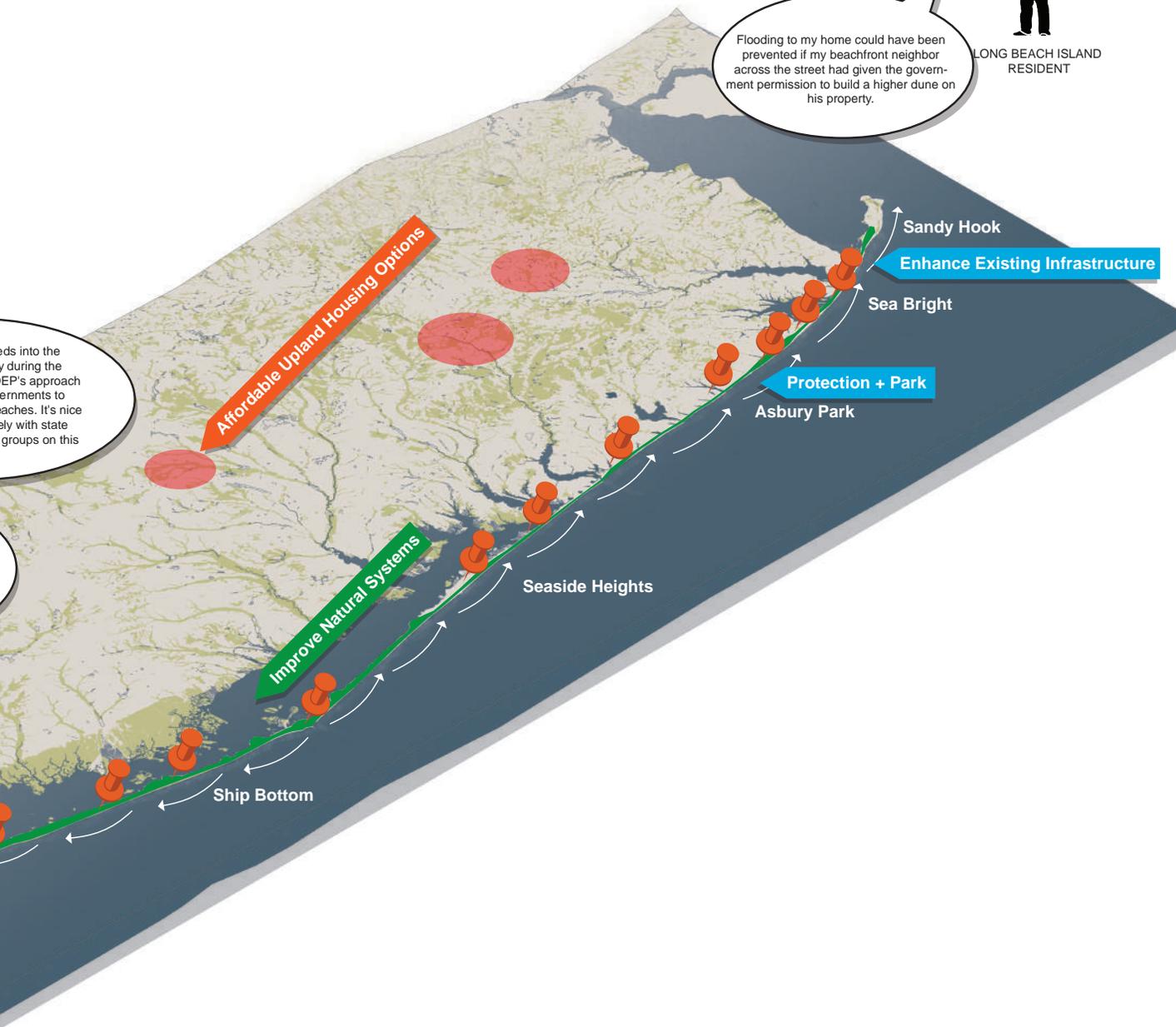
At Sea Bright, The Coastline runs along an existing seawall. In the downtown (left), public facilities are built on the seawall. In the residential area (right), beach access points are built on the seawall.





eds into the
y during the
EP's approach
ernments to
aches. It's nice
ely with state
groups on this

Flooding to my home could have been prevented if my beachfront neighbor across the street had given the government permission to build a higher dune on his property.



Living with the coast

Options for New Jersey's Coastline

The New Jersey coast is one of the country's most iconic places, full of natural beauty and human-made attractions that draw millions of visitors every year (In 2010, 67.8 million tourists spent \$35.5 billion on the New Jersey coast.) But as Hurricane Sandy illustrated all too well, the natural and human-made amenities that make the coast great are highly vulnerable to extreme weather events.

But New Jersey's beaches are vulnerable to another form of erosion, namely, the erosion of the public's right to access and enjoy them. Access to New Jersey's beaches is protected by the Public Trust Doctrine, which states that "the sea, and consequently the shores of the sea" are common, and that "no one, therefore, is forbidden to approach the seashore." Thanks to the Doctrine, most efforts to privatize or in any way restrict access to New Jersey's beaches have been struck down by the state's courts. The earliest challenge to the Public Trust Doctrine dates to 1821, when a landowner (unsuccessfully) argued that his beachfront property gave him the right to exclusively harvest adjacent tidal oyster beds. But the challenges really heated up in the 1970s and 1980s. Fortunately for beach-goers, from a 1972 ruling that made it illegal for municipalities to charge non-residents higher fees to access municipal-owned beaches, to a 1978 ruling that made it illegal for a municipality to set aside part of its beaches for residents only, to a 1984 ruling that affirmed the public's right to access land below and above the mean high water mark, where the "use of dry sand is essential or reasonably necessary for enjoyment of the ocean," New Jersey's courts continually struck down exclusionary tactics that would have undermined the public's right to enjoy unimpeded access to the beach.

However, despite the Public Trust Doctrine and the courts' unambiguous rulings affirming it, on a day-to-day level, "unimpeded beach access" remains something of a phantom. Towns refrain from building paths, parking lots, and bathrooms, adopt restrictive parking regulations and residential parking permit programs, and only reluctantly penalize private interests from encroaching on the beach. Homeowners, for their part, post phony "private beach" signs, bark at people to get off "their" property, and even disguise access points as front yards. Furthermore, the different beach badges that all but a handful of New Jersey towns require fragment the beach and undermine one's ability to walk up and down it.

To some, Hurricane Sandy offered an opportunity to better enforce the Public Trust Doctrine and improve the quality of public space along the coast: soon after the storm, State Senators Steve Sweeney and Mike Doherty proposed legislation that would force municipalities that accept state or federal aid to rebuild storm-damaged beaches to provide beach access and beach restroom facilities to the public free of charge. (This initiative is evocative of former Governor Jon Corzine's unsuccessful effort to require municipalities accepting state funding for beach beautification to provide public beach access 24/7, increase the number of parking spaces, and provide restrooms and access points every quarter mile.)

For this design opportunity, we propose to create "The Coastline," a continuous, maximally accessible coastal trail that would extend from Cape May to Sandy Hook. Adapting to local conditions, the trail would double as a protective barrier in the form of protective boardwalks, seawalls, and sand carpets. Here we demonstrate how a range of high-density cities, medium-density suburban communities, and undeveloped environments can leverage coastal trail to create a more attractive, more accessible, and more resilient beachfront.

Everyday Emergency

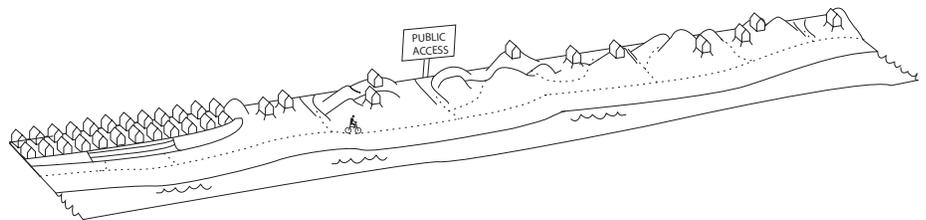
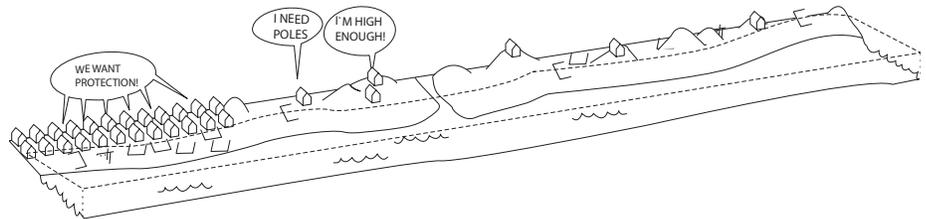
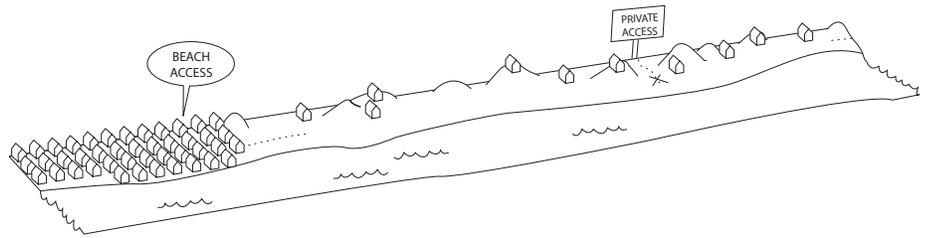
None, but local demands for increasing public beach access

Occasional Emergency

- The effects of Hurricane Sandy in New Jersey in 2012 were severe, with economic losses to businesses of up to \$30 billion
- Over two million households in the state lost power in the storm, 346,000 homes were damaged or destroyed,[2] and 37 people were killed.

Project

- Declare the New Jersey Shore a National Park.
- Implement a continuous, maximally accessible coastal trail extending from Cape May to Sandy Hook that adapts to local conditions, and doubles as a protective barrier in the form of protective boardwalks, seawalls, and sand carpets.
- Give residents of low-lying, low-opportunity communities the opportunity to “move on up” to high and dry, high-opportunity areas with outstanding housing obligations by identifying appropriate sites.



-  + 6 ft. sea level rise up to 2100
-  + 6 ft. storm surge
-  - soil subsidence

The Coastline

When we combine the sediment strategies with a vision on public space (coastline as a route) a long term perspective follows out of this





In some instances, it's best to let the water in.



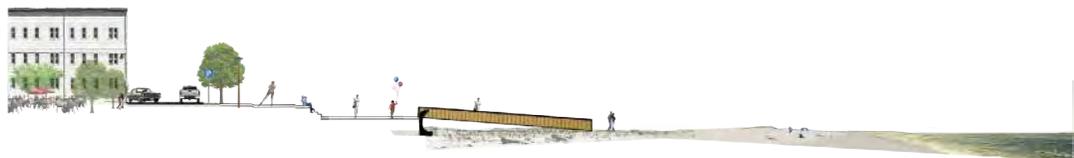
At Sea Bright, The Coastline runs along the existing seawall. In the downtown, public facilities are built on the seawall. In the residential area, beach access points are built on the seawall. Homes and businesses could be raised to the elevation of the seawall.



In Asbury Park, the Coastline runs along a levee that protects critical infrastructure and senior housing. Deal Lake is connected to the ocean.



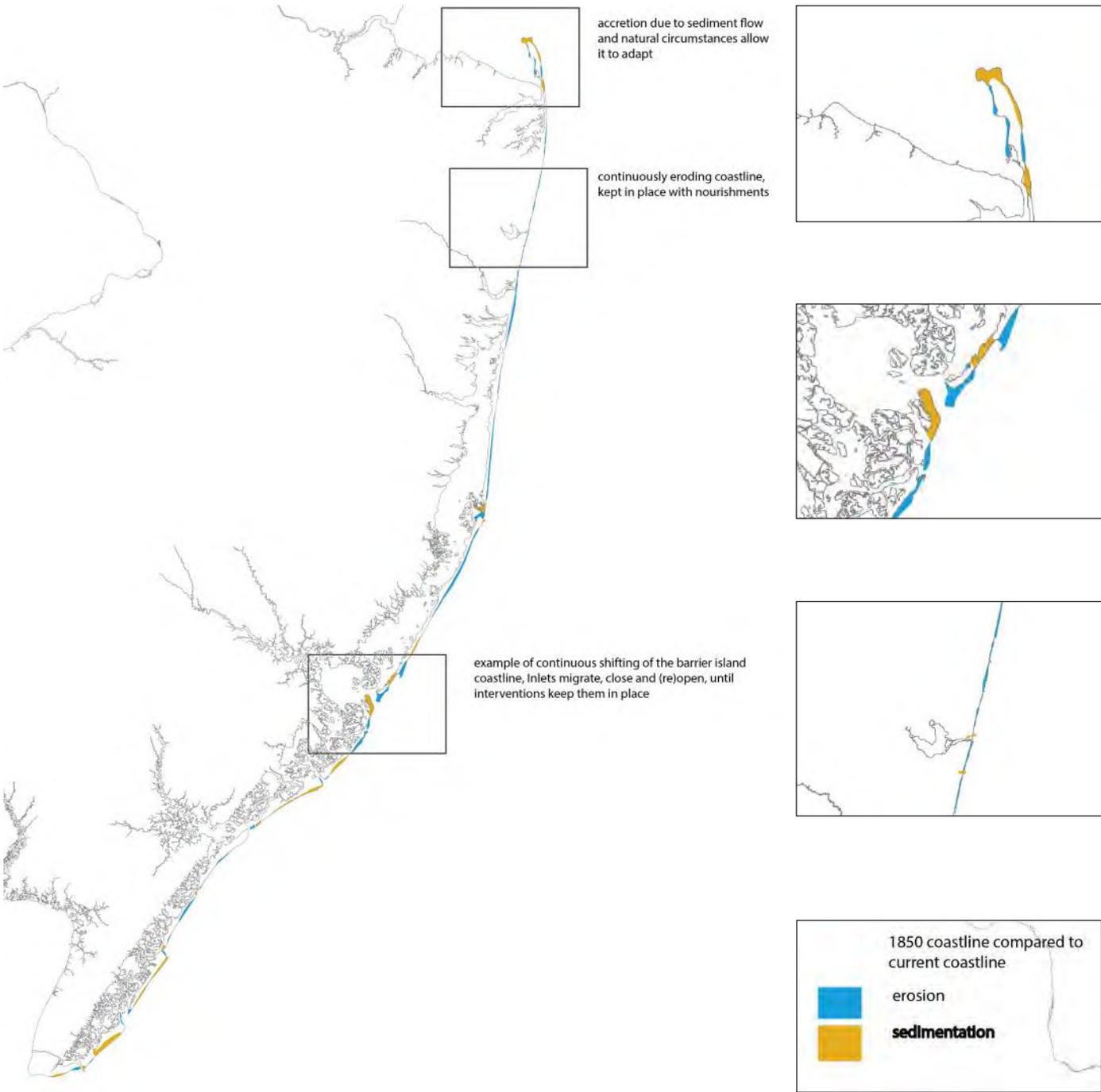
In lower density environments, The Coastline takes the form of a sand carpet.



A wave breaker doubles as beach access

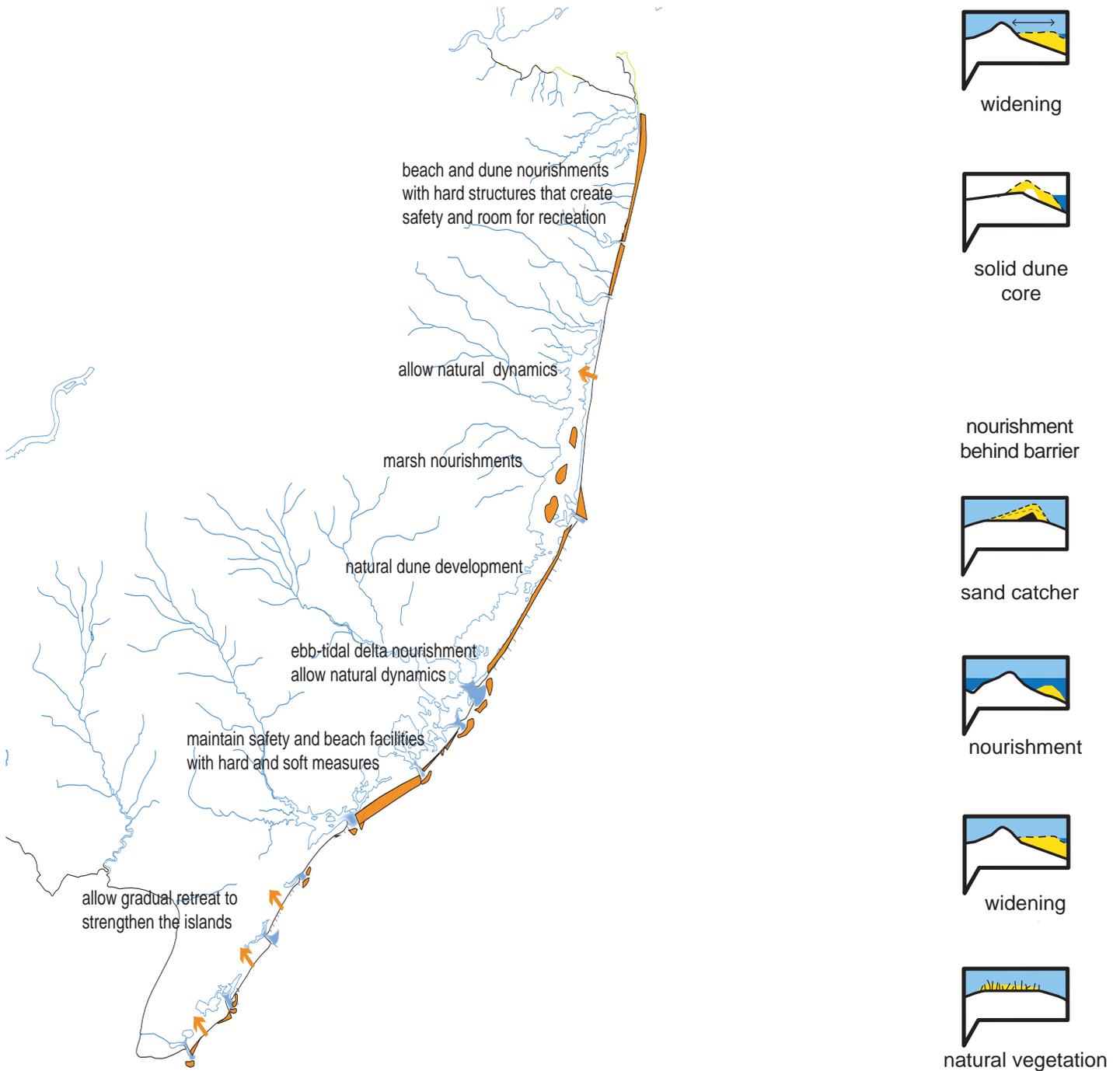
Erosion and Migration

New Jersey has a retreating coastline. However due to its dynamic nature, the local variations are large.



Sediment system strategies

The dynamic coastline of New Jersey needs a strategy that is based on local characteristics, not only for the landscape typologies but also related to the changing coastline. Many different coastal safety strategies are possible. The map below shows promising strategies related to the different coastal typologies.

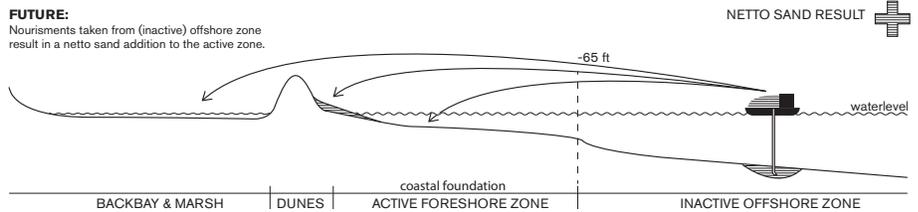
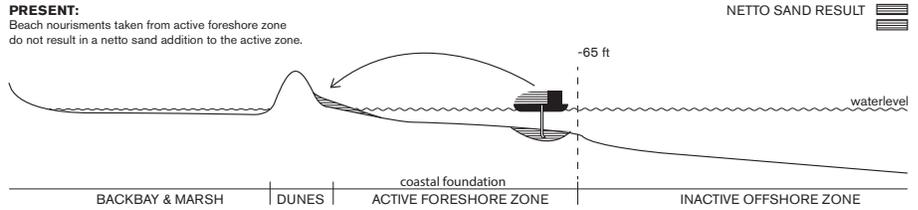


System recommendations

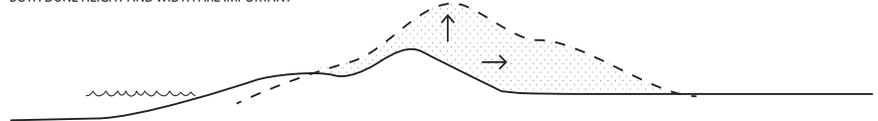
Nourishment sand should not be taken from the active foreshore zone, but from the inactive offshore zone so that nourishment of the beach and the building of dunes adds sand to the active system.

To create a safe area that also keeps the sand in the system several strategies are viable.

Below a few possible strategies are pictured.



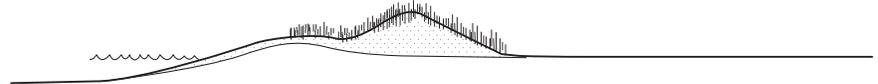
BOTH DUNE HEIGHT AND WIDTH ARE IMPORTANT



ALLOW DUNES TO MIGRATE



VEGETATE WITH NATIVE SPECIES



KEEP PEOPLE OFF THE DUNES



KEEP SAND IN THE SYSTEM



Example: Coastal typologies & Global Strategies

At the coastline of the Monmouth watershed we distinguish roughly two morphological types. The first type shows along the Lower Bay and the second type shows in the coastal area facing the Ocean.

Along the Lower Bay

The Raritan Bay and the Sandy Hook Bay include communities like Cifwood, Keyport, Union Beach and Keansburg. Positioned in the refuge of Sandy Hook we see attractive and interesting refuge areas.

The area is dominated by the sequence of large and low creeks. Between the the creeks we see dunes and beaches. The main part of the coastal land is positioned under the 6 feet elevation line and is very vulnerable to flooding. In the section we see that just a few miles inland we find high and dry land. The occupation pattern can be described as urban sprawl. Over time, the communities encroached into the creeks.

Ocean Shore

The ocean shore includes communities like Allenhurt, Ashburypsark, Ocean Groove, Bradly, Avon, Belmar, Springlake, Sea Girt, and Manasquan. Creeks in this area flow into the linear beachfront. Occupation is characterized by linear development, parallel to the sea. As soon as the creeks flow into the urbanized strip the banks are paved.

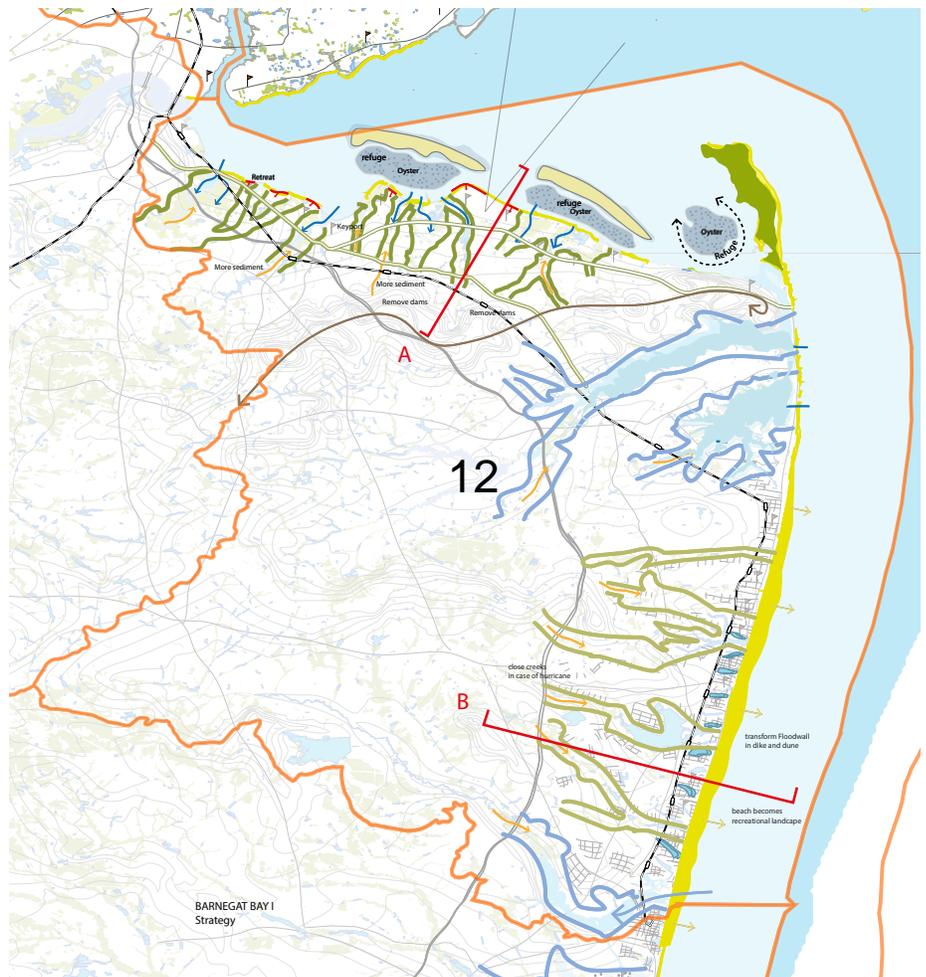
Strategies Along the Lower Bay [A]

Coast:

- add refuge areas, oyster reefs

Creeks:

- retain and store water stream upwards
- stimulate sedimentation
- stimulate wetland growth
- optimize natural gradient
- maximize room for the creek





Strategies for Barnegat Bay [C]

Coast side:

- widen beaches
- elevate and strengthen shores

Bay side:

- stimulate wethland growth
- soften slopes
- optimize sand balance
- add sand plains
- restore or create wetlands
- nourish sediment
- build new barrier island

Land side:

- retain and store water stream upwards
- stimulate sedimentation
- protect existing non urban-ised marshes
- adapt communities

Stafford Township:

Coast side:

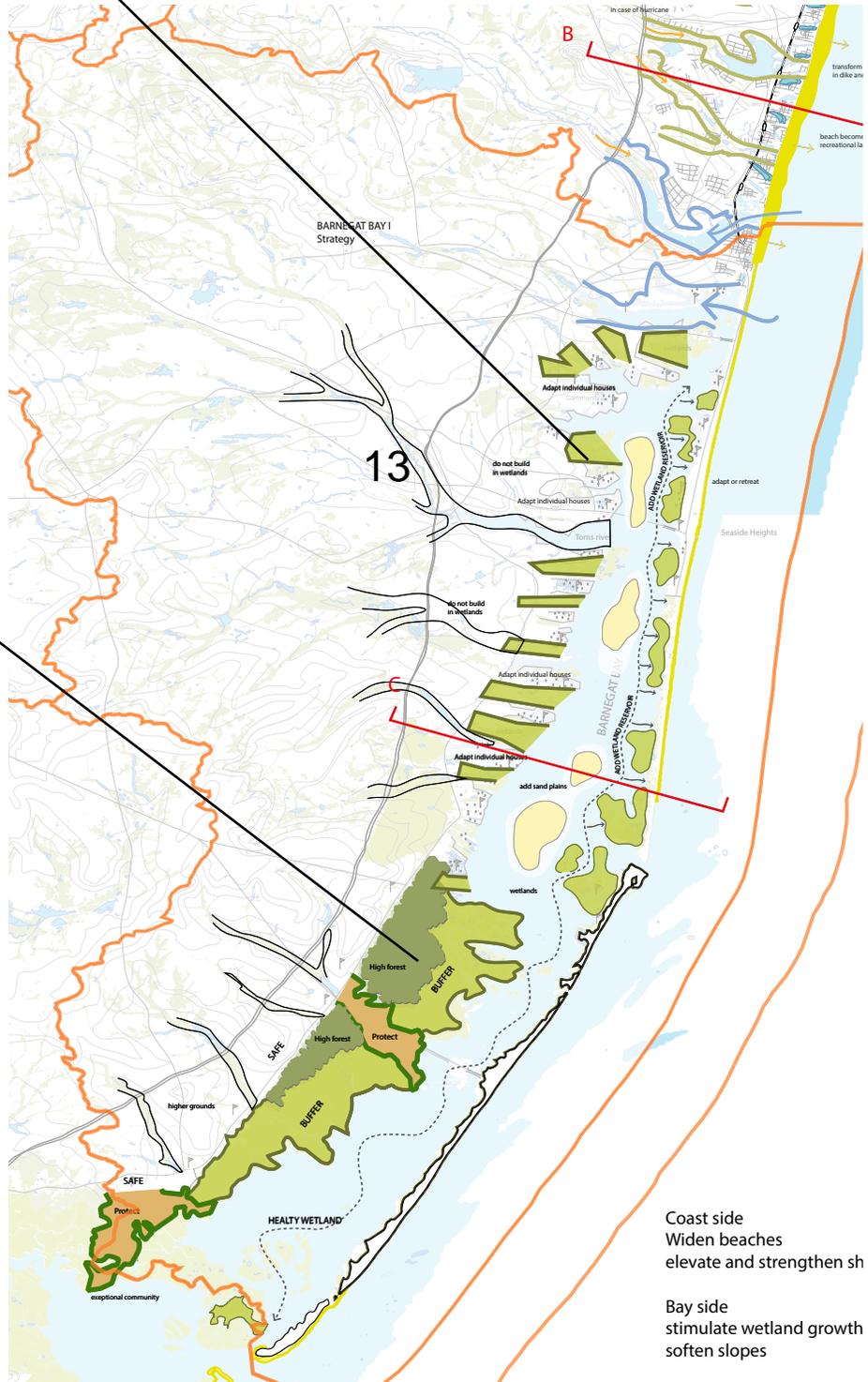
- widen beaches
- elevate and strengthen shores

Bay side

- stimulate wetland growth
- soften slopes

Land side

- retain and store water stream upwards
- stimulate sedimentation
- protect existing non urban-ised marshes
- adapt and protect outpost communities



Coast side
Widen beaches
elevate and strengthen sh

Bay side
stimulate wetland growth
soften slopes

PROTECT +

MOVING ON UP

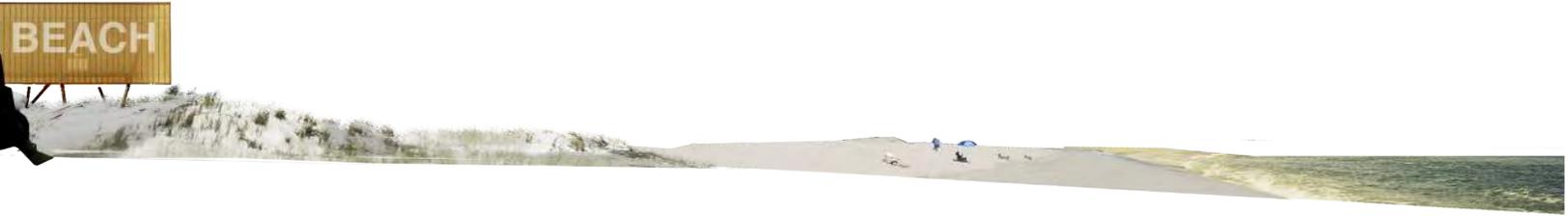
Increase Beach Access

Enhance Existing Infrastructure





At Sea Bright, The Coastline runs along the existing seawall. In the downtown, public facilities are built on the seawall. In the residential area, beach access points are built on the seawall. Homes and businesses could be raised to the elevation of the seawall.



LIVING WITH THE LANDSCAPE

PROTECT +





Affordable Upland Housing Options

LONG BEACH ISLAND TARGET REGION (OCEAN COUNTY) (rev. 9-16-13)									
municipalities (south to north) (numbers keyed to Wikipedia map)	total households (year-round) 1-M	total seasonal housing units 1-N	% households with major/ severe damage from Sandy 1-AS	municipal opportunity index (MOI) classification	50% chance of Sandy-type damage (decade)	50% chance of Sandy-type damage (feet above current sea level)	6 foot sea level by 2100 (damage %)	50% chance of 10 ft level (current sea level plus surge) (damage %)	
LONG BEACH ISLAND									
Long Beach Island (all municipalities)	7,066	29,101	31.1%	low-opportunity	2020	4' = 37%	47%	99%	
32- Long Beach township	2,513	11,866	57.9%	low-opportunity	na	na	nf	nf	
North Beach Haven CDP	1,115	5,099	na	na	2020	4' = 39%	64%	99%	
2-Beach Haven borough	641	3,173	0.0%	high-opportunity	2020	4' = 43%	70%	100%	
3-Ship Bottom borough	1,177	3,455	52.0%	minimum-opportunity	2020	4' = 3%	52%	100%	
4-Surf City borough	1,177	3,455	0.0%	minimum-opportunity	2020	4' = 3%	17%	100%	
5-Harvey Cedars borough	169	1,045	0.0%	minimum-opportunity	2020	4' = 4%	27%	100%	
6-Barnegat Light borough	274	1,008	0.0%	minimum-opportunity	2020	4' = 15%	32%	90%	
	% households with major/ severe damage from Sandy 1- AS	6 foot sea level by 2100 (damage %)	50% chance of 10 ft level (current sea level plus surge) (damage %)	municipal opportunity index (MOI) classification	total year-round households (housing stock) 1-M	past affordable housing production	past affordable housing production as % of current housing stock	potential new affordable housing under goal A	goal A as % of current housing stock
inlet/bay backup towns									
33-Little Egg Harbor township (balance)	5.1%	nf	nf	minimum-opportunity	8,060	211	2.6%	207	2.6%
census tract 7361.05	90.0%	na	na	na	1,735	na	na	na	na
1-Tuckerton borough	28.3%	1.5%	63%	minimum-opportunity	1,396	0	0.0%	147	10.5%
30-Stafford township (balance)	1.0%	nf	nf	high-opportunity	10,096	448	4.4%	441	4.4%
census tract 7351.03	68.0%	na	na	na	2,079	na	na	na	na
29-Barnegat township	1.1%	1%	5%	minimum-opportunity	8,128	1,085	13.3%	486	6.0%
high-and-dry towns									
Bass River township (Burlington)	0.0%	nf	nf	medium-opportunity	501	0	0.0%	23	4.6%
Woodland township (Burlington)	0.0%	nf	nf	medium-opportunity	439	0	0.0%	32	7.3%

NOTE 1: Sandy damage to Beach Haven, Surf City, Harvey Cedars, and Barnegat Light boroughs was probably attributed to Long Beach township and Ship Bottom ZIP codes.
NOTE 2: Percentages of major/severe damages to Little Egg Harbor and Stafford townships are net of two shoreline census tracts.

CAPE MAY TARGET AREA (SOUTHERN-MOST NEW JERSEY COUNTY) (rev. 9-16-13)									
municipalities (south to north) (numbers keyed to Wikipedia map)	total households (year-round) 1-M	total seasonal housing units 1-N	% households with major/ severe damage from Sandy 1- AS	municipal opportunity index (MOI) classification	50% chance of Sandy-type damage (decade)	50% chance of Sandy-type damage (feet above current sea level)	6 foot sea level by 2100 (damage %)	50% chance of 10 ft level (current sea level plus surge) (damage %)	
barrier island/oceanfront									
1-Cape May Point borough	1,076	1,121	0%	medium-opportunity	2020	1' = 16%	53%	98%	
2-West Cape May borough	1,076	1,121	1%	high-opportunity	2020	1' = 4%	53%	95%	
3-Cape May city	1,457	2,698	0%	high-opportunity	2020	1' = 20%	52%	100%	
4-Wildwood Crest borough	1,532	4,037	1%	medium-opportunity	2020	1' = 32%	85%	99%	
5-Wildwood city	2,527	5,209	8%	minimum-opportunity	2020	1' = 87%	100%	100%	
6-West Wildwood borough	1,655	3,959	0%	minimum-opportunity	2020	1' = 100%	100%	100%	
7-North Wildwood city	2,047	6,793	9%	low-opportunity	2020	1' = 37%	84%	100%	
8-Stone Harbor borough	441	2,806	7%	maximum-opportunity	2020	1' = 9%	61%	100%	
9-Avalon borough	1,107	5,354	6%	maximum-opportunity	2020	3'	10%	96%	
10-Sea Isle City city	1,041	5,859	20%	high-opportunity	2020	3'	67%	97%	
11-Ocean City city	5,890	14,981	25%	maximum-opportunity	2020	4'	65%	100%	
	% households with major/ severe damage from Sandy 1- AS	6 foot sea level by 2100 (damage %)	50% chance of 10 ft level (current sea level plus surge) (damage %)	municipal opportunity index (MOI) classification	total year-round households (housing stock) 1-M	past affordable housing production	past affordable housing production as % of current housing stock	potential new affordable housing under goal A	goal A as % of current housing stock
inlet/bay backup towns									
16-Lower township	0.4%	nf	nf	low-opportunity	10,236	0	0.0%	342	3%
15-Middle township	0.9%	nf	nf	maximum-opportunity	7,256	60	0.8%	466	6%
14-Dennis township	0.3%	nf	nf	maximum-opportunity	762	0	0.0%	224	29%
13-Upper township	0.4%	nf	nf	maximum-opportunity	4,566	0	0.0%	339	7%
high-and-dry towns									
12-Woodbine borough	0.0%	0%	>2100	minimum-opportunity	757	0	0.0%	89	12%

ASBURY PARK-LONG BRANCH TARGET REGION (MONMOUTH COUNTY)										
municipalities (south to north) (numbers keyed to Wikipedia map)	total households (year-round) 1-M	total seasonal housing units 1-N	% households with major/ severe damage from Sandy 1-AS	municipal index (MOI) classification	50% chance of Sandy-type damage (decade)	50% chance of Sandy-type damage (feet above current sea level)	6 foot level 2100 (damage %)	sea level plus surge (damage %)	50% chance of 10 ft level (current sea level plus surge) (damage %)	
barrier island/oceanfront										
8-Avon-by-the-Sea borough	901	420	3,0%	low-opportunity	na	na	na	na	na	
10-Bradley Beach borough	2,098	1,082	3,0%	minimum-opportunity	>2100	8'	0%	15%		
#-Ocean Grove (CDP) (tract 8074)	1,948	1,184	3,0%	low-opportunity	na	na	na	na		
11-Asbury Park city	6,725	1,351	1,8%	minimum-opportunity	>2100	8'	0%	7%		
12-Loch Arbour village (tract 8124)	82	77	0,0%	low-opportunity	na	na	16%	74%		
14-Allenhurst borough (tract 8124)	217	148	0,0%	low-opportunity	na	na	0%	9%		
15-Deal borough (tract 8124)	333	593	2,0%	low-opportunity	>2100	10'	0%	2%		
16-Long Branch city	11,753	2,417	9,5%	minimum-opportunity	>2100	na	0%	1%		
17-Monmouth Beach borough	1,494	487	42,0%	high-opportunity	?	?	?	1%		
	% households with major/ severe damage from Sandy 1- AS	6 foot level 2100 (damage %)	sea level plus surge (damage %)	50% chance of 10 ft level (sea level plus surge) (damage %)	municipal index (MOI) classification	total year-round households (housing stock) 1-M	past affordable housing production	past affordable housing production as % of current housing stock	potential new affordable housing under goal A	goal A as % of current housing stock
inlet/bay backup towns										
9-Neptune City borough	2,0%	0%	4,0%	minimum-opportunity	2,133	0	0,0%	46	2,2%	
45-Neptune township	3,0%	na	na	low-opportunity	11,201	197	1,8%	(93)	-0,8%	
13-Interlaken borough (tract 8124)	0,0%	1%	11,0%	minimum-opportunity	361	0	0,0%	40	11,1%	
23-West Long Branch borough	0,3%	0%	0,0%	maximum-opportunity	2,384	0	0,0%	233	9,8%	
22-Oceanport borough	13,6%	0%	1,0%	maximum-opportunity	3,693	108	2,9%	58	1,6%	
21-Little Silver borough	9,0%	0%	0,0%	maximum-opportunity	2,146	0	0,0%	209	9,7%	
high-and-dry towns										
46-Ocean township	0,1%	na	na	medium-opportunity	10,611	0	0,0%	1034	9,7%	
27-Tinton Falls borough	0,0%	0%	0,0%	high-opportunity	8,357	641	7,7%	114	1,4%	
24-Eatontown borough	0,0%	0%	0,0%	low-opportunity	5,497	452	8,2%	108	2,0%	
47-Colts Neck township	0,0%	na	na	maximum-opportunity	3,277	88	2,7%	186	5,7%	
25-Shrewsbury borough (tract 8123)	0,0%	0%	0,0%	minimum-opportunity	1,261	0	0,0%	287	22,8%	
48-Shrewsbury township (tract 8123)	0,0%	na	na	minimum-opportunity	583	0	0,0%	14	2,4%	

Using the projections of the federal National Oceanic and Atmospheric Administration, we have charted the percentage of year-round housing units that would suffer major/severe damage at six feet and ten feet above current sea level (the latter adds storm events).

We have also tabulated the degree to which nearby high-and-dry mainland communities have unfulfilled obligations to build affordable housing units under the Mount Laurel doctrine. These could help support relocation of low-income households under a policy of "managed retreat" – managed retreat at least affecting year-round residences. Clearly, other uses could continue in the face of rising sea levels and periodic hurricanes and storms, such as recreational enjoyment of the beach areas, seasonal residences (without publicly-aided flood insurance), temporary seasonal housing (RVs, tents, etc.) and commercial businesses that can be moved in advance of major weather events.

SEA BRIGHT-UNION BEACH TARGET REGION (MONMOUTH COUNTY)										
municipalities (east to west) (numbers keyed to Wikipedia map)	total households (year-round) 1-M	total seasonal housing units 1-N	% households with major/ severe damage from Sandy 1-AS	municipal index (MOI) classification	50% chance of Sandy-type damage (decade)	50% chance of Sandy-type damage (feet above current sea level)	6 foot level 2100 (damage %)	sea level plus surge (damage %)	50% chance of 10 ft level (current sea level plus surge) (damage %)	
barrier island/oceanfront										
18-Sea Bright borough	813	440	95%	low-opportunity	>2100	10'+	9%	13%		
# Sandy Hook	na	na	na	na	na	na	na	na		
28-Highlands borough	2,623	523	40%	minimum-opportunity	>2100	10'+	6%	21%		
29-Atlantic Highlands borough	1,870	132	3%	low-opportunity	>2100	10'	0%	3%		
30-Keansburg borough	3,805	513	34%	minimum-opportunity	2020	1'	64%	93%		
31-Union Beach	2,143	126	67%	minimum-opportunity	2070	6'	67%	79%		
32-Keypoint borough	3,067	205	4%	minimum-opportunity	2020	4'	7%	12%		
	% households with major/ severe damage from Sandy 1- AS	6 foot level 2100 (damage %)	sea level plus surge (damage %)	50% chance of 10 ft level (sea level plus surge) (damage %)	municipal index (MOI) classification	total year-round households (housing stock) 1-M	past affordable housing production	past affordable housing production as % of current housing stock	potential new affordable housing under goal A	goal A as % of current housing stock
inlet/bay backup towns										
19-Rumson borough	18%	5%	23%	maximum-opportunity	2,344	0	0,0%	282	12%	
20-Fair Haven borough	0%	0%	0%	maximum-opportunity	1,970	0	0,0%	138	7%	
26-Red Bank borough	1%	0%	0%	low-opportunity	4,929	222	4,5%	226	5%	
52-Middletown township (net)	1%	na	na	high-opportunity	24,754	529	2,1%	1,262	5%	
Middletown township (tract 8005)	42%	na	na	na	1,482	na	na	na	na	
Middletown township (tract 8006.01)	12%	na	na	na	1,865	na	na	na	na	
53-Hazlett township	0%	na	na	high-opportunity	7,140	0	0,0%	457	6%	
33-Matawan borough	0%	0%	0%	low-opportunity	3,358	0	0,0%	32	1%	
high-and-dry towns										
51-Holmdell township	0%	na	na	maximum-opportunity	5,584	307	5,5%	616	11%	
50-Aberdeen township	1%	na	na	minimum-opportunity	6,876	20	0,3%	229	3%	
49-Marlboro township	0%	na	na	maximum-opportunity	13,001	207	1,6%	1,173	9%	

Our analysis has covered all municipalities in Cape May, Atlantic, Ocean, and Monmouth Counties. They have been characterized by geographic location: barrier island and oceanfront towns, inlet/bay back-up towns, and high-and-dry towns. All have also been categorized under Building One New Jersey's Municipal Opportunity Index as maximum-, high-, medium-, low-, and minimum-opportunity towns (based on relative job opportunity, school opportunity, quality of municipal services, and local socioeconomic profile).

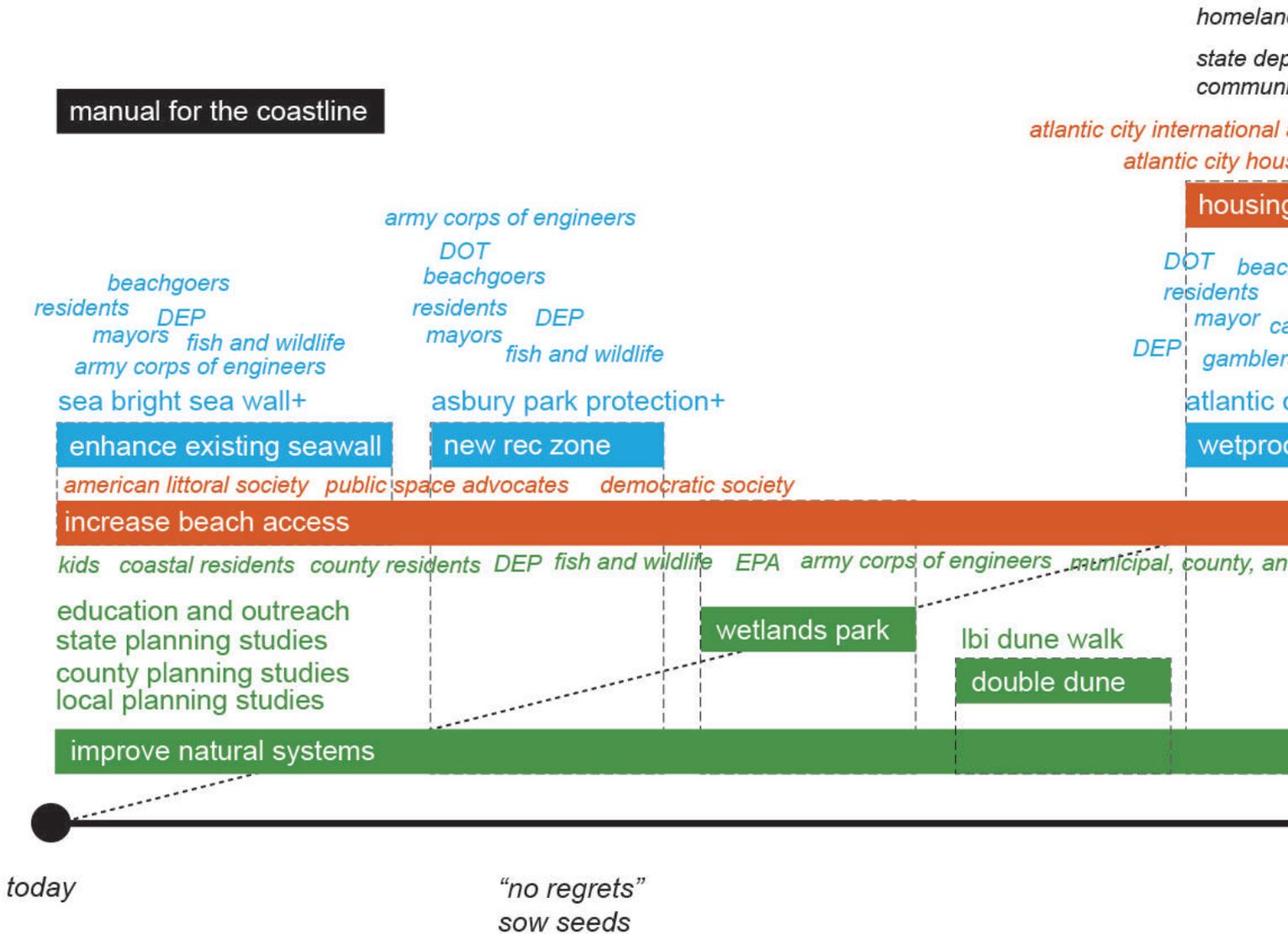
For the rest of the analysis, please see the appendix.

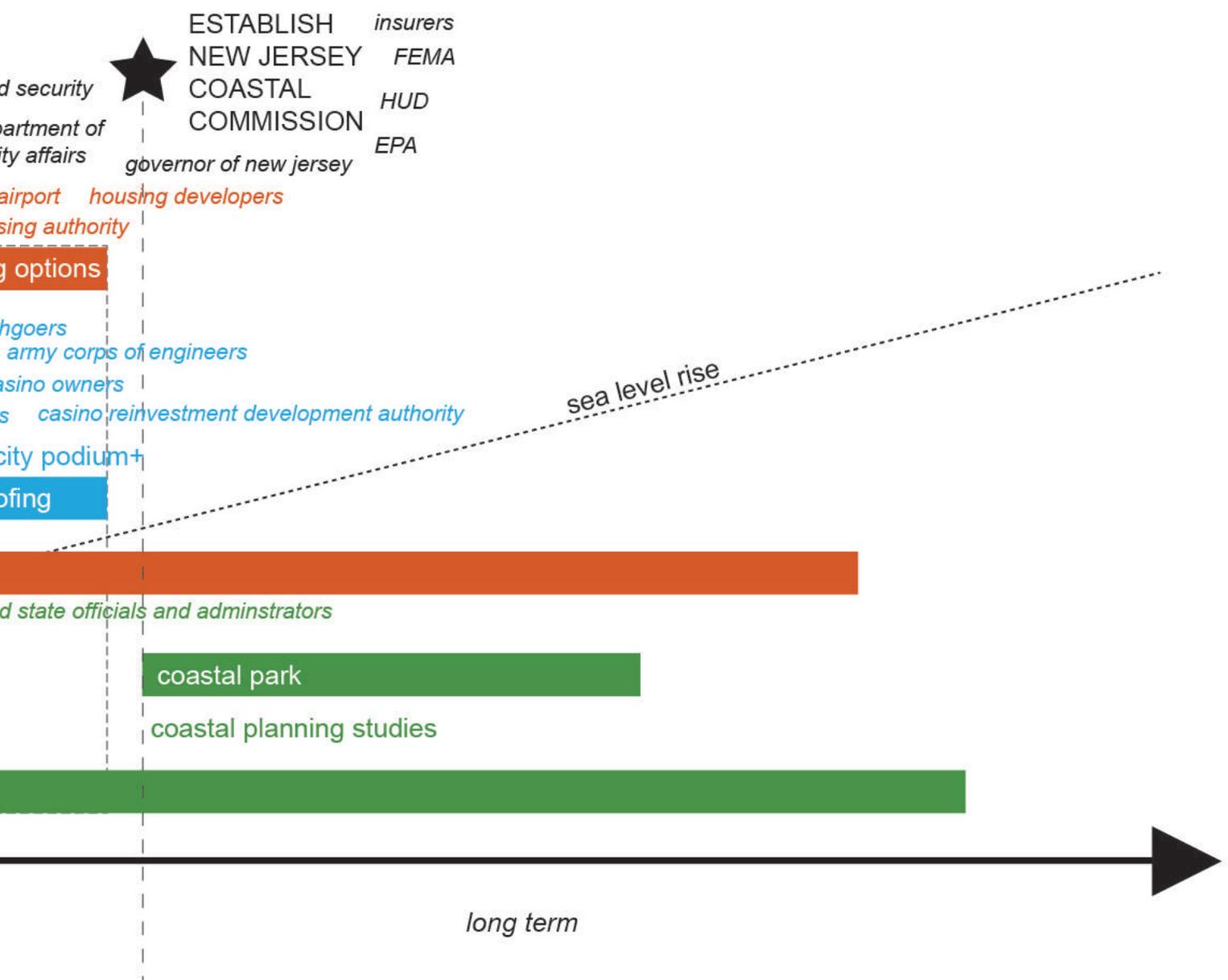
A Manual for the Coast

“The Coastline” presents 1) a policy guide for communities considering withdrawal manual for better beach building, and 2) a manual for better beach building.

		Geomorphological Landscapes										
		Foreshore		Beach	Dunes and beachfront		Bay		Creek			
Landcover	Natural	Supporting										
	Strengthen											
Non-natural	Boardwalk											
	Boulevard											
Streets												
Homes												

Timeline







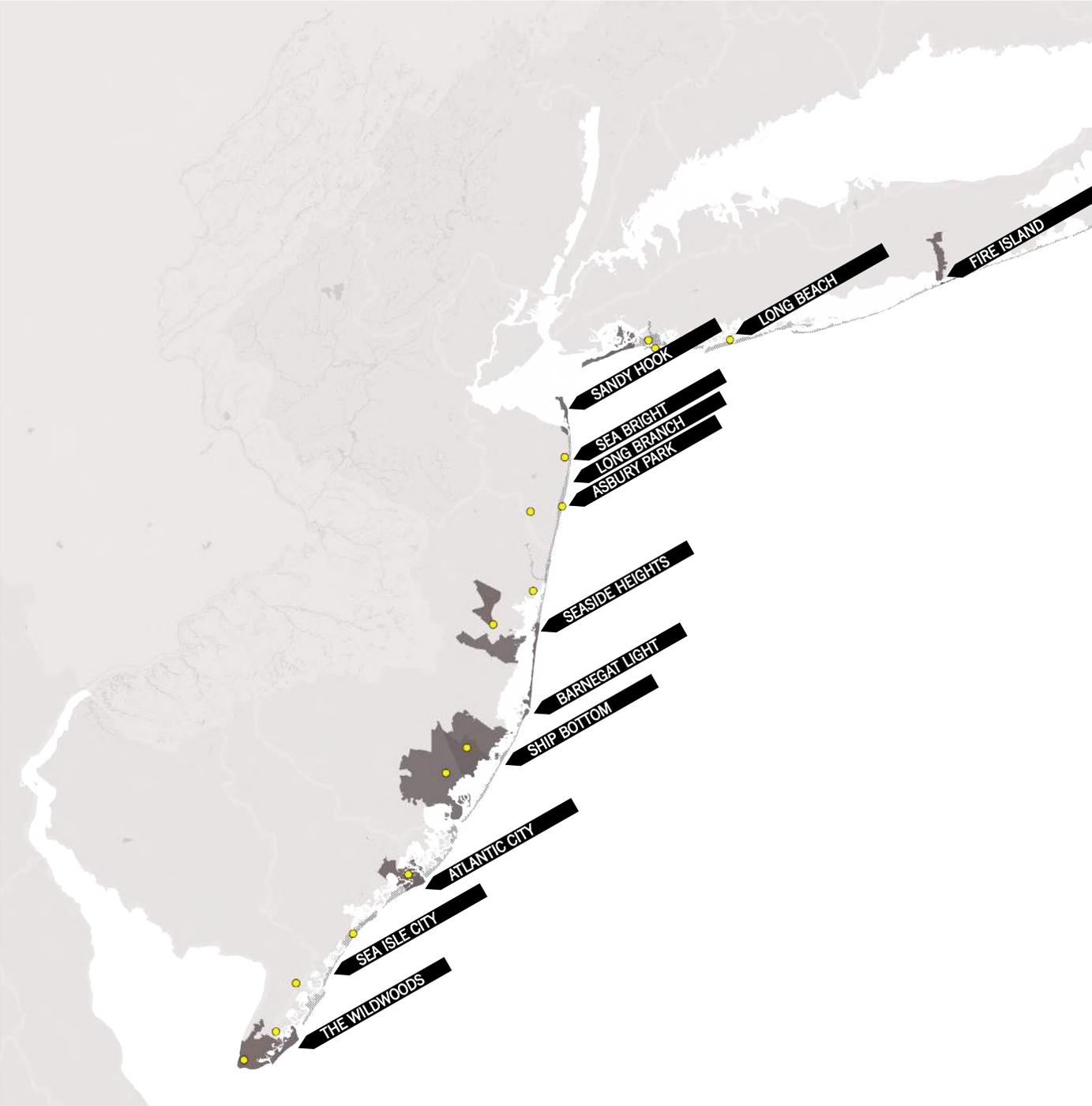
Regular funding

- Sandy Supplemental – USACE allocation (FEMA funded infra recovery support function)
- Hazard Mitigation Grant Program (HMGP) Elevation Program
- New Jersey Clean Energy Program / SmartStart Buildings
- The Hurricane Sandy New Jersey Relief Fund Inc. (HSNJRF)

Innovative funding & financing

- The beaches facilities can be organized as a national park. A fee provides access to the national park and parking facilities.
- Commitment of local retail tourism sector by contribution to plan development and investments, since they will benefit from more tourism.

Oceanfronts



Our general policy recommendations

Recommendation 1: To present a valid picture of longer-term SLR+ major storm risk, the Flood Insurance Rate Maps (FIRMs) should be re-calibrated by the Federal Emergency Management Administration (FEMA) to incorporate the best SLR projections of the National Oceanic and Atmospheric Administration (NOAA) and cooperating federal agencies. Moreover, such FIRM-SLRs should be regularly updated to reflect new scientific findings and projections.

Currently, even when reasonably up-to-date, by law the 100-year coastal flood zone maps are explicitly based on *current* sea level and not on projected sea level at some relevant point in the future (for example, the 25th year of a 30-year mortgage). Thus, FIRMs perpetuate a false sense of security regarding SLR consequences – that is, that a significant flood has only a 1% chance of occurring in a given year when two or three decades later the probability of a given flood level being reached would be significantly greater because of SLR.

The first recommendation of the federal Hurricane Sandy Rebuilding Task Force is to “facilitate the incorporation of future risk assessment, such as sea level rise, into rebuilding efforts with the development of a sea level rise tool.”

The Task Force reports that the sea level rise tool has been developed and is being continually refined. However, the sea level rise tool website [1] itself cautions “these maps and tools have no regulatory implications and do not affect National Flood Insurance Program requirements or rates.”

As a city budget director once advised me, “it’s never a priority until you put a dollar to it.” Merely advisory tools will not drive hard choices. The tools must determine federal regulatory standards.

Recommendation 2: All federal grants-in-aid for infrastructure projects should be required to meet locational and design criteria that conform to FIRM-SLRs for the duration of their design lives plus a prudent margin of error. The federal government should adopt official FIRMS-SLR projections.

In FY 2014 the federal government will make \$126 billion in grants-in-aid to state and local governments for transportation infrastructure, housing, and related programs. These grants should be conditioned on the facility’s design life falling well above the projected FIRM-SLR.

From various sources I have compiled ballpark estimates of the average lifespan of different infrastructure investments and types of buildings. (“Lifespan” is defined as the period before major renovations/rebuilding must occur.)

type of structure	average lifespan	max. lifespan
Railway	50 years	150 years
Airport	50 years	70 years
Sewer system	50 years	
Nuclear power plant	40 years	60 years
Bridge	30 years	75 years
Highway (concrete)	20 years	50 years
Commercial building	30 years	50-75 years
Office building	72 years	
Fast food restaurant	12 years	
Sewage treatment plant	15 years	20 years
Public schools	40 years	60 years

Residential buildings have much longer lifespans than most office and retail buildings since housing units (particularly owner-occupied homes) never lose their function or fall out of fashion – at least, for *some* group of households in the housing market. In New Jersey in 2012, the median age of an owner-occupied home was 45 years; the median age of an apartment unit, 48 years. One sixth of the owner-occupied homes were built before 1940; almost half of those were built before 1920. Roughly one out of every twelve owner-occupied homes in New Jersey is over 100 years old.

Returning to the federal Task Force, its second recommendation is to “develop a minimum flood risk reduction standard for major Federal investment that takes into account data on current and future flood risk.”

In its report the Task Force explains that “on April 4, 2013, HUD Secretary Shaun Donovan joined then DOT Secretary Ray LaHood to announce a minimum flood risk reduction standard that protects investments in Sandy-affected communities. This minimum flood risk standard addresses the increased flood risk that results from rising sea levels, more intense storms, increased urbanization in floodplains, and other factors. This standard, which is in line with standards that many State and local jurisdictions have adopted, *requires all major rebuilding projects that rely on Sandy-related Federal funding to be elevated or otherwise flood-proofed according to the best available FEMA guidance **plus one additional foot of freeboard.*** Where State or local building codes or standards already require minimum elevations, the

higher of the competing minimums apply.”

The implicit assumption of the Task Force recommendation is that all major rebuilding projects *should* be rebuilt. In light of the lengthy lifetimes of most major infrastructure projects and of owner-occupied homes, federal agencies should set the rebuilding bar at the maximum level of SLR projections for the 2050s (31-31 inches) and, more prudently, for the 2080s (59-60 inches) or 1990s (70-72 inches). “The best available FEMA guidance plus one foot of freeboard” is just not sufficient to guide longer-term decision-making.

Recommendation 3: All federal grants-in-aid for infrastructure projects, housing assistance, economic development, environmental protection and other development-related activities should be required to result in mixed-income housing that promotes greater racial, ethnic and economic integration.

Existing COAH standards can serve as a baseline for setting federal requirement.

Past federal policies were substantially responsible for segregating America. For decades, guided by Federal Housing Administration (FHA) residential security maps, mortgage lenders “red-lined” predominately Black and integrated neighborhoods. For decades federal agencies condoned segregated public housing projects. For decades the federal Interstate Highway system has promoted urban sprawl that concentrates minorities in central cities and inner suburbs while facilitating largely white outer suburbs.

Overt racial discrimination has been largely ended by the federal Civil Rights Act of 1968 and other laws, such as the mortgage lender-oriented Community Reinvestment Act of 1977. However, much the same result is achieved by “exclusionary zoning” practiced by many local jurisdictions under LUPZ authority delegated by state governments. In effect, Jim Crow by income is replacing Jim Crow by race.

Because of its obligation to end constitutionally-banned racial segregation, all federal agencies should adopt a policy of reducing economic segregation as a condition of state and local governments’ receiving federal grants- in-aid.

Recommendation 4: The federal government should create a Sea Level Rise Mitigation Assistance (SLRMA) program within FEMA parallel to FEMA’s existing Hazard Mitigation Assistance (HMA) program.

Because of the inexorable nature of SLR, eligible activities under SLRMA grants would only be for property acquisition and structure demolition or relocation rather than including the wide range

of flood-proofing activities under HMA grants.[1] Either program would involve the voluntary acquisition of an existing at-risk structure and, typically, the underlying land, and conversion of the land to open space through the demolition of the structure or its relocation to a non-SLR-at-risk location. The property must be deed-restricted in perpetuity to open space uses to restore and/or conserve the natural floodplain functions.

Recommendation 5: The Internal Revenue Code should be amended to permit landowners to depreciate the value of their land in areas within FIRMS-SLR coastal flood plains. Such depreciation should be scheduled to depreciate land to the acquisition price per acre established by the federal or state government for ultimate use as parkland or wildlife refuges.

“Land can never be depreciated,” the Internal Revenue Service (IRS) states bluntly. As explained by one tax authority, “*Land generally does not depreciate in value because it is a limited resource with an infinite life and can be used for a range of purposes. All assets wear out and eventually cease to exist, except land. Land is not considered to ever be able to be destroyed, so it can’t lose value and go down to zero value like other assets. The land generally retains or increases in value. Over the long term, land will go up in value because demand is always increasing, while they are not “making” any new land [emphases added].*

However, land *can* be destroyed (at least for society’s economic purposes) – in fact, land can be destroyed in the very blink of an eye (in geological time) as 50 miles of the former Jersey Shore now under the Atlantic Ocean can attest. On the barrier islands and in bay shore communities the land under houses and stores may be considered very valuable now, but in a foreseeable future (albeit several decades off) that same land’s only economic use will be as parkland and wildlife refuges.

Therefore, in federally designated coastal floodplains, the IRS should establish a schedule for depreciating land value. At a minimum land value depreciation might parallel the current depreciation schedules for residential rental property (27.5 years) and/or commercial real property (39 years).

“IT’S NOT NICE TO FOOL MOTHER NATURE.”

Beaches for Everyone through Managed Withdrawal on the Jersey Shore

“Ten thousand years ago the Jersey Shore was 50 miles east of where it is now.”

---Tom Dillingham, American Littoral Society (September 19, 2013)

“The sea level will be 6 feet higher by 2100, with a 90% confidence factor.”

--- Dr. Klaus Jacob, Columbia University Earth Institute (August 9, 2013)

“Erecting a building on a beach is like building on an active volcano. You take your chances, and, sooner or later, you lose.”

--- Lim Vallianos, former U.S. Corps of Engineers (March 8, 2000)

Sea level rise (SLR) is the 800-lb. gorilla in the room. In New Jersey the Christie Administration will not allow sea level rise to be discussed within state government. The federal Hurricane Sandy Rebuilding Task Force cautiously highlights sea level rise but does not propose significantly altering federal policies, de-emphasizing SLR projections by its own agencies.

This paper will apply projected SLR to two regions on the Jersey Shore: ¹

a. The Long Beach Island region:

- Long Beach Island, a barrier island (six municipalities);
- mainland communities with bayshore and riverfront exposure (four municipalities) on Manahawkin Bay and Little Egg Harbo
- mainland communities that are “high and dry” (two municipalities in adjacent Burlington County)

b. The Barnegat Bay Island region

- Barnegat Bay Island, a barrier island (nine municipalities); ²
- mainland communities with bayshore and riverfront exposure (eleven municipalities) on Barnegat Bay; and
- mainland communities that are “high and dry” (five municipalities).
- We have compiled official records of
- the degree to which each of these municipalities reported “major/severe damage” from Superstorm Sandy; ³
- the projected impact of SLR at 6 feet and at 10 feet (a level that includes weather events) by 2100; ⁴
- the relative Municipal Opportunity Index (MOI) devised by Building One New Jersey, based on job opportunity, school opportunity, municipal services quality, and municipal socioeconomic status; ⁵ and
- the degree to which nearby mainland communities have unfulfilled obligations to build affordable housing units under the state’s Mount Laurel doctrine. ⁶ These yet-to-be-built affordable housing units could help support relocation of low-income households under a policy of “managed withdrawal” (at least, affecting year-round residents).

1. We have also developed similar analyses of the Cape May region, the Absecon Island (Atlantic City) region; the Manasquan-Belmar region; the Asbury Park-Long Branch region; and the Sea Bright-Union Beach region.

2. Since the Point Pleasant Canal was built in 1925 connecting the Manasquan Inlet with the Barnegat Bay, the peninsula is technically an island.

3. New Jersey Department of Community Affairs: Community Development Block Grant Disaster Recovery Action Plan: Appendix B: Demographics of Impacted Counties by Census Tract.

4. According to the National Oceanic and Atmospheric Administration (NOAA) – see <http://sealevel.climatecentral.org/surgingseas/>, hereafter referred to as NOAA surging seas.

5. Contact David Rusk for MOI details at davidrusk@verizon.net

6. For this purpose we have used two reports of the New Jersey Council on Affordable Housing (COAH): “Rehabilitation Share, Prior Round Obligation, & Growth Projections (October 2008) and “All Projects Summary (March 2009). Though dated, these are the latest available COAH reports.

Part I will assess the future of these two regions in the face of sea level rise.

Part II will outline how a regional strategy of managed withdrawal connects all three types of communities. Part III will recommend reforms in federal and state policies and programs and changes in municipal practices in order to

7. Why a 6-foot SLR? See Climate Risk Information (2009) of the New York City Panel on Climate Change (NPCC) (http://www.nyc.gov/html/om/pdf/2009/NPCC_CRI.pdf) of which Dr. Jacob is a member. Appendix C: Sea Level Rise Methods & Projections sets forth in Table 10 four alternative projections for the 2090s: 10.4 to 23.4 inches by the International Panel on Climate Change (IPCC) plus local subsidence; 14.9 to 30.0 inches by the IPCC-adapted Methods for the New York City Region; 22.6 to 33.7 inches by the Rahmstorf/Horton Method plus local subsidence; and 48 to 70 inches by the Rapid Ice Melt-Sea Level Rise Method. Without taking into account the acceleration of ice cap and glacier melting reported in recent decades, the average increase in sea level over the past 11,000 years has been 43 inches per century. At that historic rate, the current sea level would rise by 37.4 inches by 2100. We have chosen a 6-foot SLR (the high side of the four projections) because a) that is Dr. Jacob's expert judgment, and b) because news media reports since the 2009 study indicate accelerating rapid ice melt in the Arctic Sea, Antarctic Ice Shelf, and Greenland's Ice Cap.

8. According to Wikipedia, "Long Beach Island is approximately 18 miles (29 km) in length, which includes three miles (5 km) of nature reserve located on the southern tip. The island is about a half-mile wide (800 m) at its widest point in Ship Bottom, and spans a fifth of a mile (300 m) at its narrowest point in Harvey Cedars." However, from my personal observation, in the last block of the Holgate section of Long Beach township (just before entering the national wildlife reserve), any NFL quarterback could throw a football from the Atlantic Ocean to Manahawkin Bay.

According to Wikipedia, Barnegat Bay Island "is a 20-mile (32 km) long, narrow barrier peninsula located on the Jersey Shore ... that divides the Barnegat Bay from the Atlantic Ocean. The southern 10 miles (16 km) of the barrier island is preserved in its natural state as Island Beach State Park, New Jersey's longest stretch of undeveloped coastline." Barnegat Bay Island appears to be marginally wider than Long Beach Island.

9. The US Geological Survey reports the average elevation of barrier island municipalities is either zero feet or three feet above current sea level with only Barnegat Light rising to seven feet.

10. "nf" means "not found." Like too many federal documents, the NOAA surging seas website treats townships as non-existent governmental units even though in New Jersey townships are fully empowered municipal governments like cities, boroughs, and towns. (Only four of 27 townships in which the state document reports Sandy damage are recognized by NOAA and have SLR estimates provided.) However, the website does identify some unincorporated places within some townships that provide some basis for projecting SLR consequences in some townships. These unincorporated places will be referred to here as "Census-Designated Places (CDP)" even though some do not have that official status as designated by the Census Bureau.

implement a strategy of managed retreat. Part IV will apply these policies to the Jersey Shore. Part V will present concluding observations about the challenges faced from rising sea level.

Part I(a): The Barrier Islands

Many news media pictures of Sandy's destruction focused on the dramatic impact of mountainous surf breaking on the Atlantic shoreline, breaching some dunes (where they existed) and smashing ocean front houses. The greater damage, however, resulted from the storm surge (up to fourteen feet in some areas) and torrential rains that less dramatically raised the level of the bays and tributary rivers and creeks behind the barrier islands. In effect, the most pervasive threat came from flooding from the west and not from surf from the east.

Sea level rise is a Sandy-like storm surge in slow motion – an inexorable, month-by-month, year-by-year, decade-by- decade phenomenon that never creates a sense of immediate crisis. Tables 1a and 1b project the level of long-term damage caused by SLR on the barrier island municipalities of Long Beach Island and Barnegat Bay Island. "Damage" is defined as to "households" (that is, year-round dwelling units) suffering "major/severe" damage. Thus, the statistics do not apply to seasonal housing. However, as year-round residences and seasonal housing are generally intermixed, the estimates can be reasonably applied to both.

These tables understate SLR reality. In table 1a, for example, a 6-foot SLR ⁷ doesn't just cause "major/severe damage" to 70% of houses in Beach Haven borough. No matter how high homeowners may elevate their property, at least 70% of the streets in Beach Haven borough will be permanently under water. In fact, driving the length and breadth (such as it is) of Long Beach Island ⁸ and Barnegat Bay Island, one's impression is that there will be few streets whatsoever that will not be permanently under water with a 6-foot (or even a 3-foot) SLR. ⁹

Table 1a – SLR impact: % houses damaged on Long Beach Island

Municipality (south to north)	6 feet	10 feet
Holgate division – National Wildlife Refuge	nf	nf ¹⁰
Long Beach township	nf	nf
North Beach Haven CDP	64%	99%
Beach Haven borough	70%	100%
Ship Bottom borough	52%	100%
Surf City borough	17%	100%
Harvey Cedars borough	27%	100%
Barnegat Light borough	32%	90%

Table 1b – SLR Impact: % houses damaged on Barnegat Bay Island

Municipality (south to north)	6 feet	10 feet
Island State Park	nf	nf
Seaside Park borough	70%	96%
Berkeley township (pt.)	nf	nf
Seaside Heights borough	75%	99%
Dover Beaches South CDP (Toms River twp)	82%	97%
Lavallette borough	84%	94%
Dover Beaches North CDP (Toms River twp)	72%	90%
Mantoloking borough	74%	88%
Brick township (pt.)	nf	nf
Bay Head borough	72%	93%
Point Pleasant Beach borough	51%	83%

Adding four feet of surf (from the east) and four feet of flood waters (from the west) caused by any run-of-the-mill hurricane on top of a 6-foot SLR creates

a 10-foot water level. At that level 90-100% of houses on Long Beach Island and 83-99% of houses on Barnegat Bay Island would suffer major/severe damage – and the streets (albeit temporarily) would be under four more feet of water. As a consequence, from 89% (Barnegat Light) to 100% (everywhere else) of the “dry land” on Long Beach Island and from 81% (Mantoloking) to 97% (Seaside Heights) of the “dry land” on Barnegat Bay Island would be submerged.

Even at just the 6-foot SLR water level without storm water on top, how are these barrier island communities to function? Are all homes, stores, churches, schools, etc. to be raised on stilts while environmentally-concerned, year-round residents and summer beachgoers paddle around in canoes and kayaks and everyone else putters along with outboard motorboats? (Indeed, some traditional fishing villages in Southeast Asia function in just that way.)

Or with incantations like “stronger than Sandy” and “Jersey Strong,” will some modern-day King Canute presume to hold back the rising tides? ¹¹

Or, lacking divine intervention, should we place our faith in the US Army Corps of Engineers who would probably propose a “beach replenishment” program based on piling up 22-foot high, 30-foot wide dunes on the ocean side ¹² and anti-SLR protection by building a vertical sea wall rising 15-20 feet above current sea level on the bayside (to hedge against another Sandy-type surge)?

And what kind of a living environment would be created by these engineering fixes? The barrier island communities would be squeezed between towering dunes and sea walls (sometimes just a couple of the proverbial stone’s throws apart). Outside these protective barriers would be the ever-present threat of a catastrophic breach whether during a storm or just as a result of rising water levels – another Ninth Ward in New Orleans East just waiting to happen any day ... or night.

For any responsible citizens or any responsible public officials who are not slaves to their own four-year re-election cycle, *the rational long-term policy must be to gradually phase out permanent, man-made structures on the barrier islands and convert them into state and national parks and wildlife refuges like Virginia’s barrier islands. In effect, New Jersey’s barrier islands must be converted from beach resorts for those who can afford it into beaches for everyone.*

This conversion can be accomplished by a phased, managed withdrawal from the barrier islands that can expand public access to the beaches while substantially preserving employment and income generated by the beach economy. Managed withdrawal can also open new opportunities for upward mobility for the barrier islands’ current year-round, low-income residents while potentially holding them harmless in terms of the value of their current homes and businesses on the barrier islands. In the process, hundreds of millions of dollars of ultimately fruitless public infrastructure investments and potentially billions of dollars of public disaster aid can be avoided. Federal, state, and municipal policies that can aid long-term conversion of the barrier islands will be explored in Part III. However, let’s turn to examining the position of the barrier islands’ mainland neighbors.

Part I(b): The Bayshore Towns

Five municipalities¹³ front on Manahawkin Bay and Little Egg Harbor behind Long Beach Island and 11 municipalities¹⁴ front on Barnegat Bay and its major tributaries, such as Toms River. Though they are without direct exposure to the pounding of ocean surf, three boroughs and low-lying sections of seven of nine townships are under serious jeopardy from SLR, as shown in tables

11. The legend of the Viking King Canute of England (1016-1035) is probably misrepresented. According to the *Historia Anglorum* (ca. 1095), the king had his chair carried down to the shore and ordered the waves not to break upon his land. When his orders were ignored, he pronounced: “Let all the world know that the power of kings is empty and worthless and there is no King worthy of the name save Him by whose will heaven and earth and sea obey eternal laws.”

12. Since 2005, the Corps of Engineers has had a \$75 million beach replenishment program underway on Long Beach Island. Beach replenishment has been a hugely controversial topic. Many surfers and swimmers argue that pumping the sand destroys the sandbars that create waves and provide a better swimming environment. Some homeowners claim that dunes will reduce property value, while island officials argue that dunes are necessary to counter beach erosion and protect the island from storms (which, of course, do not protect against floodwaters from Manahawkin and Barnegat bays.)

13. Tuckerton borough and Little Egg Harbor, Eagleswood, Stafford, and Barnegat townships

14. Ocean Gate, Island Heights, Pine Beach, Beachwood, South Toms River, and Point Pleasant boroughs and Ocean, Lacey, Berkeley (pt.), Toms River (pt.), and Brick (pt.) townships.

2a and 2b.

The Jersey Shore’s boroughs are extreme examples of “little boxes” municipalities. The nine boroughs on the barrier islands (excluding Point Pleasant Beach, a semi-mainland town) average 0.75 sq. mi. in size and 1,338 year-round residents. Similarly, Ocean Gate borough (average elevation: 7 feet) and three neighboring riverfront boroughs somewhat higher and farther up the Toms River (Island Heights – 36 feet; Pine Beach – 16 feet; and South Toms River – 52 feet) share the “micro-municipality” characteristics of the barrier island boroughs; they average 0.71 sq. mi. and 2,374 residents.

Whether barrier island or bayshore/riverfront, such micro-municipalities cannot successfully implement strategies of managed withdrawal within their own boundaries. They are too small geographically. They contain no safe havens.

Table 2a – SLR impact: % houses damaged on Manahawkin Bay/Little Egg Harbor

Municipality (south to north)	Sandy	6 feet	10 feet	size (sq mi)
Little Egg Harbor twp (tract 7361.05)	90%	nf	nf	47.4 (nf)
Tuckerton borough	28%	15%	63%	3.4
Eagleswood township	15%	nf	nf	16.0
Stafford twp (Beach Haven West CDP 7351.03)	68%	56%	97%	45.8 (1.6)
Barnegat township (Barnegat CDP)	2%	43%	62%	34.4 (2.7)

Table 2b – SLR impact: % houses damaged on Barnegat Bay/Toms River

Municipality (south to north)	Sandy	6 feet	10 feet	size (sq mi)
Ocean twp (Waretown CDP)	9%	72%	88%	20.6 (0.9)
Lacey twp (Forked River CDP)	7%	70%	86%	83.3 (2.7)
Berkeley twp (tracts 7301.01-.02)	30%	nf	nf	42.9 (nf)
Ocean Gate borough	55%	87%	100%	0.4
Toms River twp (tracts 7234 & 7224.02)	72%-65%	nf	nf	40.5(nf)
Brick twp (tract 7143)	66%	nf	nf	25.7 (nf)
Point Pleasant borough	12%	17%	42%	3.5

15. These are identified either as specific census tracts or as Census Designated Places (CDPs)

16. The highest points above current sea level in the four South Jersey counties we've analyzed in this study are 60 feet (Cape May), 150 feet (Atlantic), 230 feet (Ocean), and 380 feet (Monmouth). If in coming centuries, global warming totally melted the Arctic and Antarctic and all glaciers, sea level is projected to rise by 300 feet. The only point is South Jersey poking its peak above the waves would be Crawford Hill in Monmouth County. All the rest of South Jersey would be added to the submerged continental shelf.

17. In Southern Burlington County NAACP et al v. Mount Laurel township (1975) the New Jersey Supreme Court prohibited municipalities from discriminating against the poor through exclusionary zoning and, as a constitutional obligation, required all 565 municipalities to provide their fair share of a region's need for affordable housing. Frustrated at the legislature's failure to act, the court in Mount Laurel II (1983) provided guidance to lower courts to enforce its decision. Finally, the legislature enacted the Fair Housing Act of 1985, creating the Council on Affordable Housing as the regulatory agency but providing escape clauses for wealthy suburbs. The Housing Reform Act of 2008 successfully repealed so-called "Regional Cooperation Agreements (RCAs)" by which wealthy suburbs bribed poor cities and boroughs to take over half the suburbs' Mount Laurel obligations.

Two other threatened bayshore boroughs (Tuckerton and Point Pleasant) contain a little elbow room, covering 3.4 sq. mi. and 3.5 sq. mi., respectively. However, townships are more spacious (at least, by New Jersey standards), ranging in land area from Ocean township (20.6 sq. mi., or Newark-sized) to Lacey township (83.3 sq. mi., or Baltimore-, Cleveland-, or Seattle-sized) Part of each of the townships in tables 2a and 2b have neighborhoods built by the bayshore or along river fronts.¹⁵ These areas either already suffered severely from Sandy or are facing devastation from SLR/future storms. Townships could gradually withdraw development back from the water's edge to higher ground farther from the bay and its tributaries within their own boundaries. Managed withdrawal would not necessarily mean loss of residents, economic activity, or tax base.

Part I(c): High-and-Dry Towns

There really isn't any truly high-and-dry land in South Jersey.¹⁶ Townships listed in table 3a are simply somewhat higher in elevation above current sea level (average: 98 feet) and farther removed from the ocean, bays and riverine tributaries affected by SLR. However, these townships are primary locations to which residents of the barrier islands might relocate while still retaining jobs in the regional economy and connections to their bayshore/ocean beach lifestyle. Table 3a sets forth the “high-and-dry” townships’ current, year-round housing stock, the number of affordable housing units produced by 2009 under the Mount Laurel doctrine,¹⁷ the number of required affordable housing units not yet built,¹⁸ and the percentage that future Mount Laurel

units represent of the current year-round housing stock. Table 3b provides the same information for the bayshore/riverfront towns.

Table 3a – Mount Laurel obligations of high-and-dry-towns

municipality	total	aff. units	aff. units	% of
	units	built	to be built	total units
Bass River township (Burlington)	501	0	23	4.6%
Woodland township (Burlington)	439	0	32	7.3%
Manchester township (Ocean)	22,854	179	1,203	5.3%
Lakewood township (Ocean)	24,283	26	897	3.7%
Jackson township (Ocean)	20,448	199	2,225	10.9%
Plumsted township (Ocean)	7,962	0	202	2.5%

Table 3b – Mount Laurel obligations of bayshore/riverfront towns in Ocean County

municipality	total	aff. units	aff. units	% of	total
	units	built	zto be built	total units	
Little Egg Harbor township (balance)	8,060	211	207	2.6%	
Eagleswood township	621	0	69	11.1%	
Stafford township (balance)	10,096	448	441	4.4%	
Barnegat township	8,128	60	486	6.0%	
Ocean township	3,485	135	193	5.5%	
Lacey township	11,593	306	629	5.4%	
Berkeley township	22,560	469	573	2.5%	
Beachwood borough	3,682	0	165	4.5%	
Toms River township (balance)	35,705	857	3,097	8.7%	
Brick township (balance)	29,842	863	812	2.7%	

On the western edge of the Long Beach Island region, Bass River and Woodland townships in Burlington County are sparsely populated rural areas with small *Mount Laurel* targets but plenty of land. Manchester, Lakewood and Jackson are geographically large, populous townships with many times greater future Mount Laurel obligations than the minimal number of past units built. Of the bayshore/riverfront townships Little Egg Harbor, Stafford, Ocean, Berkeley and Brick substantially fulfilled past *Mount Laurel* obligations. Future targets are based primarily on their steadily growing housing markets. Barnegat, Lacey, and fast-growing Toms River have very substantial, past unmet obligations.

In all, the 16 towns listed in tables 3a and 3b have a projected constitutional obligation to build 11,254 housing units that would be affordable for households at less than 80% of South Jersey's area median income (AMI) with one-quarter of those units needing to be affordable for households at less than 30% of AMI.

Part II: A Strategy for Managed Withdrawal

In the face of SLR, managed withdrawal on the Jersey Shore can best be achieved by coordinated policies targeted on all three categories of communities:

- Decade-by-decade, the barrier islands must shift from being based on fixed, permanent, hard infrastructure (houses, stores, offices, etc.) to being based on removable, temporary, soft infrastructure (marinas, houseboats, trailers, tents, food trucks, etc.) to, in a century's time, a chain of state and national parks and wildlife refuges where there is no permanent human presence but, through maintaining transportation linkages both hard (bridges) and soft (ferries, marinas) millions of visitors can still enjoy the beaches as the barrier islands slowly shift westward in their millennial migration.

18. "Affordable housing units to be built" combines unmet Mount Laurel obligations from 1985-2003 plus 20% of new housing projected for 2004-18.

- Decade-by-decade, the bayshore areas face the same transition as the barrier islands – only much less so. While managed withdrawal means the gradual disappearance of a low-lying micro-borough like Ocean Gate, for the geographically much larger townships it means the gradual dismantling of low-lying, hard infrastructure neighborhoods like Beach Haven West and their re-creation on higher ground. On higher ground new developments in the bayshore towns also serve as resettlement areas for former residents of the barrier islands who would still be within easy commute of jobs and recreational activities on the barrier islands.
- The principal area for resettlement of former residents and businesses from the barrier islands, however, are the high-and-dry townships. While substantial growth was already projected for these townships, as land-rich jurisdictions one or more might become the high-ground site of a major public-private, planned new town (“Jersey Shore City”) like Columbia MD or Reston VA. The new town would allow awarding transferable development rights (TDRs) for both residential and commercial purposes in the new town to former residents and businesses from the barrier islands and threatened bayshore neighborhoods. With the money generated from sale of such development rights to private developers seeking higher density in the new town, the market-based value of such development rights would supplement whatever “buy-outs” would be forthcoming from public funds. In addition, with new transit or highway connections, a new town could tap into the wealth generated by the New York City-North Jersey economy – a dimension that Ocean County towns largely have lacked except for three months per year.

If there is one overarching guiding principle of managed withdrawal, it is *that federal, state, and local governments must end policies and practices that encourage people to put themselves in harm’s way.* A key reform is to incorporate long-term projections regarding SLR and its consequences into land use planning and zoning decisions (at state and local levels), public infrastructure investments (at all three levels), and various subsidy programs for residential housing and small businesses assistance (at federal and state levels).

A second guiding principal is that *federal and state housing assistance must be limited to year-round residences, particularly of low-income households, and not extended to seasonal housing.* Seasonal housing should be viewed as depreciable commercial investments with limited lifespans.

A third guiding principle is that *while the Jersey Shore’s seasonal economy must be adapted to SLR, it will not be abandoned.* All of the natural assets of land, sea and air that are so attractive to human societies will still be present. Managed withdrawal must expand public access to their enjoyment while yet better fulfilling society’s accommodation to nature.

A fourth guiding principle is that *all policies and programs undertaken by federal, state, and local governments must enhance economic, educational, and social opportunity for low-income families and other marginalized groups.*

A fifth guiding principle is that *while, within realistic time frames, public policies should honor individuals’ freedom of choice, critical benchmarks do arrive when an overriding responsibility to protect public health and welfare must be exercised through the use of eminent domain and other “police powers.”*

Part III: Reforms in Federal, State and Local Policies and Practices

“In post-Sandy public hearings, local elected officials didn’t reflect the same diversity of opinion as their constituents,” observed the American Littoral Society’s Tom Dillingham. “Local officials were totally for rebuilding everything as it was. Many residents, however, were just asking “Where’s my buy-out money? I don’t want to go through this again.” (RBD Jersey Shore meeting on September 19, 2013)

Borough officials will never support managed withdrawal. Managed withdrawal means population and commercial shrinkage, steady tax base erosion, and their communities’ eventual disappearance. For township officials phasing out popular residential neighborhoods and retail districts on the water’s edge and re-establishing them on higher ground will be very difficult politically but not impossible. State officials will face substantial opposition to managed withdrawal until, after more devastating weather events that accelerate resettlement, the balance of electoral power shifts from those who don’t want to move to those that have already moved (or want to) and all those who aren’t prepared to continue subsidizing the costs of SLR denial with their taxes.

In concept, the federal government represents a national constituency. In practice, the federal government breaks down into 50 different senatorial constituencies (whose popular will can be interpreted in greatly different ways by each state’s two senators) and a dizzying mosaic of constituencies within 435 congressional districts. Interacting with these 535 legislators is a myriad of industry associations, environmental groups, taxpayer organizations, etc. that make changing any “rules of the game” a complex and difficult undertaking.

Moreover, the federal government has no direct authority over land use planning and zoning (LUPZ). Under the Tenth Amendment, as LUPZ is not a specifically enumerated federal power under the constitution, LUPZ is reserved to the states who, in turn, typically delegate broad LUPZ powers to local governments; only a dozen states have enacted meaningful state standards (i.e. Smart Growth laws) governing how local governments exercise that delegation of power.

Nevertheless, the federal government does have significant influence over patterns of development, particularly in coastal areas through

- Environmental protection laws such as the Environmental Policy Act of 1969, the Clean Air Act of 1970, the Clean Water Act of 1972, and the Coastal Zone Management Act of 1972;
- Its immense influence in shaping the national housing mortgage and property insurance markets;
- Its ability to reward (or penalize) types of investments through the Internal Revenue Code; and
- Its ability to attach conditions to grants-in-aid to state and local governments. (HUD, DOT and EPA, the three federal agency Partners for Sustainable Communities, are making grants-in-aid totaling \$115 billion in FY 2014. To that core are added another \$11 billion development-related grants and loans from a half dozen other federal agencies, such as the Small Business Administration.)

Thus, the federal government must provide leadership in shaping a strategy of managed withdrawal from coastal areas and inland waterways affected by SLR. The following are a list (though hardly exhaustive) of recommended key policy changes at the federal level, followed by recommendations for changes in state policies. (Changes in municipal government practices will be illustrated in Part IV.)

Part III(a): Federal Policy Reforms

Recommendation 1: To present a valid picture of longer-term SLR+ major storm risk, the Flood Insurance Rate Maps (FIRMs) should be re-calibrated by the Federal Emergency Management Administration (FEMA) to incorporate the best SLR projections of the National Oceanic and Atmospheric Administration (NOAA) and cooperating federal agencies. Moreover, such FIRM-SLRs should be regularly updated to reflect new scientific findings and projections.

Currently, even when reasonably up-to-date, by Congressional statute the 100-year coastal flood zone maps are explicitly based on current sea level and not on projected sea level at some relevant point in the future (for example, the 25th year of a 30-year mortgage). Thus, FIRMs perpetuate a false sense of security regarding SLR consequences – that is, that a significant flood has only a 1% chance of occurring in a given year when two or three decades later the probability of a given flood level being reached would be significantly greater because of SLR.

The first recommendation of the federal Hurricane Sandy Rebuilding Task Force is to “facilitate the incorporation of future risk assessment, such as sea level rise, into rebuilding efforts with the development of a sea level rise tool.”

The Task Force reports that the sea level rise tool has been developed and is being continually refined. However, the sea level rise tool website¹⁹ itself cautions “these maps and tools have no regulatory implications and do not affect National Flood Insurance Program requirements or rates.”

As a city budget director once advised me, “it’s never a priority until you put a dollar to it.” Merely advisory tools will not drive hard choices. The tools must determine federal regulatory standards.

Since they take into account regional phenomena such as subsidence, the SLR estimates of the New York City Panel on Climate Change (NPCC) are the most relevant for the Jersey Shore. In its latest report (June 2013), NPCC projects SLR for the New York-New Jersey region for the 2020s and 2050s as follows (using 2000-04 as the starting point).

sea level rise	NPCC (2013)		
	low-estimate (10th percentile)	middle-range (25th-75th percentile)	high-estimate (90th percentile)
baseline 2000-04			
2020s	2 inches	4-8 inches	11 inches
2050s	7 inches	11-24 inches	31 inches

In its 2009 report, NPCC’s maximum SLR projections for the 2020s and 2050s were one inch lower, but the projections extended into the 2080s and 2090s. An inch or two would probably be added to the longer-range projections now.²⁰

NPCC (2009)

	<u>lowest</u>	<u>highest</u>
2020s	4 inches	10 inches
2050s	17 inches	30 inches
2080s	37 inches	59 inches
2090s	48 inches	70 inches

19. <http://www.globalchange.gov/what-we-do/assessment/coastal-resilience-resources>

20. Additionally, the National Research Council (November 2012) has projected global SLR by 2100, based on different scenarios ranging from “lowest” (linear extrapolation of historical SLR from 1900-2010) to “highest” (incorporating maximum possible glacier and ice sheet loss). By 2100, under different scenarios and using mean sea level of 1992 as the starting point, SLR is projected to be: lowest: 8 inches; intermediate-low: 19 inches; intermediate-high: 47 inches; and highest: 79 inches.

Recommendation 2: All federal grants-in-aid for infrastructure projects should be required to meet locational and design criteria that conform to FIRM-SLRs for the duration of their design lives plus a prudent margin of error. The federal government should adopt official FIRMS-SLR projections.

As noted, in FY 2014 the federal government will make \$126 billion in grants-in-aid to state and local governments for transportation infrastructure, housing, and related programs. These grants should be conditioned on the facility's design life falling well above the projected FIRM-SLR.

From various sources I have compiled ballpark estimates of the average lifespan of different infrastructure investments and types of buildings. ("Lifespan" is defined as the period before major renovations/rebuilding must occur.)

type of structure	average lifespan	maximum lifespan
Railway	50 years	150 years
Airport	50 years	70 years
Sewer system	50 years	
Nuclear power plant	40 years	60 years
Bridge	30 years	75 years
Highway (concrete)	20 years	50 years
Commercial building	30 years	50-75 years
Office building	72 years	
Fast food restaurant	12 years	
Sewage treatment plant	15 years	20 years
Public schools	40 years	60 years

Residential buildings have much longer lifespans than most office and retail buildings since housing units (particularly owner-occupied homes) never lose their function or fall out of fashion – at least, for some group of households in the housing market. In New Jersey in 2012, the median age of an owner-occupied home was 45 years; the median age of an apartment unit, 48 years. One sixth of the owner-occupied homes were built before 1940; almost half of those were built before 1920. Roughly one out of every twelve owner-occupied homes in New Jersey is over 100 years old.

Returning to the federal Task Force, its second recommendation is to “develop a minimum flood risk reduction standard for major Federal investment that takes into account data on current and future flood risk.”

In its report the Task Force explains that “[o]n April 4, 2013, HUD Secretary Shaun Donovan joined then DOT Secretary Ray LaHood to announce a minimum flood risk reduction standard that protects investments in Sandy-affected communities. This minimum flood risk standard addresses the increased flood risk that results from rising sea levels, more intense storms, increased urbanization in floodplains, and other factors. This standard, which is in line with standards that many State and local jurisdictions have adopted, *requires all major rebuilding projects that rely on Sandy-related Federal funding to be elevated or otherwise flood-proofed according to the best available FEMA guidance plus one additional foot of freeboard.* Where State or local building codes or standards already require minimum elevations, the higher of the competing minimums apply.”

The implicit assumption of the Task Force recommendation is that all major rebuilding projects should be rebuilt. In light of the lengthy lifetimes of most major infrastructure projects and of owner-occupied homes, federal agencies should set the rebuilding bar at the maximum level of SLR projections for the 2050s (30-31 inches) and, more prudently, for the 2080s (59-60 inches) or

1990s (70-72 inches).²¹ “The best available FEMA guidance plus one foot of freeboard” is just not sufficient to guide longer-term decision-making.

Recommendation 3: All federal grants-in-aid for infrastructure projects, housing assistance, economic development, environmental protection and other development-related activities should be required to result in mixed-income housing that promotes greater racial, ethnic and economic integration. Existing COAH standards can serve as a baseline for setting federal requirement.²²

Past federal policies were substantially responsible for segregating America. For decades, guided by Federal Housing Administration (FHA) residential security maps,²³ mortgage lenders “red-lined” predominately Black and integrated neighborhoods. For decades federal agencies condoned segregated public housing projects. For decades the federal Interstate Highway system has promoted urban sprawl that concentrates minorities in central cities and inner suburbs while facilitating largely white outer suburbs.

Overt racial discrimination has been largely ended by the federal Civil Rights Act of 1968 and other laws, such as the mortgage lender-oriented Community Reinvestment Act of 1977. However, much the same result is achieved by “exclusionary zoning” practiced by many local jurisdictions under LUPZ authority delegated by state governments. In effect, Jim Crow by income is replacing Jim Crow by race.

Because of its obligation to end constitutionally-banned racial segregation, all federal agencies should adopt a policy of reducing closely-related economic segregation as a condition of state and local governments’ receiving federal grants- in-aid.

Recommendation 4: The federal government should create a Sea Level Rise Mitigation Assistance (SLRMA) program within FEMA parallel to FEMA’s existing Hazard Mitigation Assistance (HMA) program. Because of the inexorable nature of SLR, eligible activities under SLRMA grants would only be for property acquisition and structure demolition or relocation rather than including the wide range of flood-proofing activities under HMA grants.²⁴ Either program would involve the voluntary acquisition of an existing at-risk structure and, typically, the underlying land, and conversion of the land to open space through the demolition of the structure or its relocation to a non-SLR-at-risk location. The acquired property must be deed-restricted in perpetuity to open space uses to restore and/or conserve the natural floodplain functions.

Recommendation 5: The Internal Revenue Code should be amended to permit landowners to depreciate the value of their land in areas within FIRMS-SLR coastal flood plains. Such depreciation should be scheduled to depreciate land to the acquisition price per acre established by the federal or state government for ultimate use as parkland or wildlife refuges.

“Land can never be depreciated,” the Internal Revenue Service (IRS) states bluntly.²⁵ As explained by one tax authority, “Land generally does not depreciate in value because it is a limited resource with an infinite life and can be used for a range of purposes. All assets wear out and eventually cease to exist, except land. Land is not considered to ever be able to be destroyed, so it can’t lose value and go down to zero value like other assets. The land generally retains or increases in value. Over the long term, land will go up in value because demand is always increasing, while they are not “making” any new land [emphases added].²⁶

21. In its updated flood hazard maps NPCC uses its SLR projection of six feet by 2100.

22. Current COAH standards are a) 20% of all new housing must be affordable for households below 80% AMI with one quarter of these, or 5%, being affordable to households below 30% AMI; and, beyond the new housing quota, at least one affordable housing unit must be created for every 16 new jobs created.

23. The maps were originally devised by the Home Owners Loan Corporation (HOLC), FHA’s predecessor agency.

24. Examples of eligible FMA “flood-proofing” activities are structure elevation, dry flood-proofing of historic residential structure and of non-residential structures, and non-structural retrofitting of existing buildings and facilities.

25. http://www.irs.gov/pub/irs-regs/depreciation_faqs_v2.pdf

26. <http://www.principlesofaccounts.com.sg/why-is-there-no-depreciation-for-land/>

However, land can be destroyed (at least for society's economic purposes) – in fact, land can be destroyed in the very blink of an eye (in geological time) as 50 miles of the former Jersey Shore now under the Atlantic Ocean can attest. On the barrier islands and in bayshore communities the land under houses and stores may be considered very valuable now, but in a foreseeable future (albeit several decades off) that same land's only economic use will be as parkland and wildlife refuges.

Therefore, in federally designated coastal floodplains, the IRS should establish a schedule for depreciating land value. At a minimum land value depreciation might parallel the current depreciation schedules for residential rental property (27.5 years) and/or commercial real property (39 years).

Recommendation 6: In collaboration with New Jersey state government, the federal government should designate the barrier islands (and possibly some bayshore areas) to become national or state parkland and wildlife refuges as of a specific future date.

The date specified should be based on SLR projections of that period at which fixed residential and commercial structures will be under a very high probability of suffering major/severe damage from SLR plus recurring, major weather events. In effect, this is the point at which it would no longer be rational public policy to permit permanent residential and commercial structures in such areas under constant, catastrophic environmental threats. Efforts to hold back the natural process of beach erosion should be ended and human society's enjoyment of shore area should be shifted to "soft" uses as the Jersey Shore follows its slow westward movement.

Recommendation 7: Federal, state, and one or more township governments should acquire a site for master planned new town (Jersey Shore City). The site should be sold or leased to one or more private developers for multi-decade implementation.

Jersey Shore City would serve as a primary community for residents resettling from the barrier islands and bayshore communities. It would become a substantial job center in itself, absorbing much of the growth projected for Ocean County in a higher-density, more environmental friendly manner. With new rail and highway connections Jersey Shore City could also become home to higher-income households commuting into the New York City-North Jersey job market.

Recommendation 8: The federal government should amend federal laws regarding the Pinelands National Reserve to incorporate managed retreat from the Jersey Shore.

27. The Pinelands National Reserve (PNR) was created by Congress under the National Parks and Recreation Act of 1978. The PNR is the first National Reserve in the nation. The PNR covers approximately 1.1 million acres (22% of New Jersey's land area) in portions of seven counties and all or parts of 53 municipalities. It is the largest body of open space on the Mid-Atlantic seaboard between Richmond and Boston and is underlain by aquifers containing 17 trillion gallons of some of the purest water in the land. In 1979, New Jersey formed a partnership with the federal government to preserve, protect and enhance PNR's natural and cultural resources. In 1983 the area was designated a U.S. Biosphere Reserve by UNESCO an agency of the United Nations and in 1988 it was recognized as an International Biosphere Reserve

The Pinelands National Reserve is an invaluable state, national, and international resource.²⁷ However, some of its policies are in direct conflict with SLR impacts. Accommodating both environmental challenges requires some trade-offs.

Part III(b): State Policy Reforms

Recommendation 9: State government should vigorously implement its mixed-income housing requirements under the Mount Laurel doctrine and subsequent state legislation.

Creating mixed-income housing is not only a constitutional obligation under the Mount Laurel rulings of the New Jersey Supreme Court, it is also sound economic development policy. Regional job markets have become one of the most racially and economically integrated institutions of American society

(second, probably, only to America's military services). Being able to live near where you work is both sound economic development policy and sound environmental protection policy. A successful process of managed retreat for the Jersey Shore requires a range of alternative housing opportunities for households at all income levels being resettled. Unmet Mount Laurel obligations among the mainland towns of the barrier island regions could accommodate all lower income households needing resettlement.

Recommendation 10: State government should establish a Jersey Shore Commission similar to the Pinelands Commission²⁸ and the New Jersey Meadowlands Commission to coordinate policies and practices of a multi-decade managed withdrawal from the Jersey Shore.²⁹

The Jersey Shore Commission should represent a balance between state and federal members. State members would be nominated by the Governor and confirmed by the State Senate. State members should not be exclusively from the affected counties (i.e. Cape May, Atlantic, Ocean, and Monmouth) in order to interject the more disinterested perspective of the state's taxpayers. The Secretary of the state Department of Community Affairs (DCA) should be an ex officio member and Commission chair.

The federal members should probably be the Secretaries (or their designees) of Agriculture (U.S. Fish & Wildlife Service), Commerce (NOAA), Interior (National Park Service, Housing and Urban Development, Transportation, Environmental Protection Agency, and Homeland Security (i.e. FEMA)). The federal agencies will probably provide the preponderance of public funds for managed withdrawal by some combination of direct grants, loans, and "tax expenditures" (special provisions of the Internal Revenue Code).

28. The Pinelands Commission is comprised of 15 Commissioners - 7 appointed by the Governor of New Jersey; one appointed by each of the seven Pinelands counties; and one appointed by the U.S. Secretary of the Interior. The gubernatorial appointees are subject to the review and consent of the NJ Senate. The Pinelands Commission was charged by the New Jersey Pinelands Protection Act of 1979 with developing and administering the Comprehensive Management Plan. The initial plan was approved by Governor Brendan Byrne and US Secretary of the Interior Cecil Andrus in 1981.

29. The Hackensack Meadowlands Reclamation and Development Act (N.J.S.A. 13:17-1 et seq), effective Jan. 13, 1969, recognized the importance of the Meadowlands as a unique place for new jobs, thriving communities and recreational opportunities in New Jersey. The Act created the Hackensack Meadowlands Development Commission (HMDC). The agency was renamed the New Jersey Meadowlands Commission on Aug. 27, 2001.

The Meadowlands Commission's jurisdiction includes portions of Carlstadt, East Rutherford, Little Ferry, Lyndhurst, Moonachie, North Arlington, Ridgefield, Rutherford, South Hackensack, and Teterboro in Bergen County and Jersey City, Kearny, North Bergen, and Secaucus in Hudson County.

The Meadowlands Commission consists of seven members: the state Department of Community Affairs Commissioner, ex officio, or his/her alternate, traditionally serving as chairperson and six citizens from Bergen and Hudson counties appointed by the Governor with the advice and consent of the State Senate. The Executive Director of the NJMC, appointed by the Board, is responsible for the day-to-day operations and the implementing Commission policies.

Meadowlands Municipal Committee consists of the chief executive of each of the 14 Meadowlands municipalities or a designated alternate. This body is charged with reviewing all proposed codes and standards, master plans or amendments, development and redevelopment, improvement plans or other major decisions of the NJMC. It has the authority to veto proposed zoning or variances.

The basic powers of Jersey Shore Commission would be

- To develop and adopt a multi-decade Comprehensive Management Plan (CMP) for managed withdrawal from the Jersey Shore and relocation of residential and commercial activities on higher ground in a manner consistent with SLR projections by 2100;
- By state commission members, to review and approve municipal zoning actions for consistency with the multi-decade managed withdrawal plan;
- By federal commission members, to review and approve federal grants-in-aid, loans, and regulations governing "tax expenditures; and
- To oversee the development of a master plan for Jersey Shore City, including baseline zoning and provisions for the use of transferable development rights (TDRs) awarded to residential and commercial residents of the barrier islands and other managed withdrawal locations.

Recommendation 10: State government should modify policies of the Coastal Management Program and related regulatory authority to bring them into conformance with the Jersey Shore Comprehensive Management Plan

New Jersey has a long and extensive history in land use experimentation that that began with the passage of the Wetlands Act of 1970, followed by the Coastal Area Facilities Review Act of 1973 (CAFRA), and elaborated into the Coastal Management Program in response to the federal Coastal Zone Management Act of 1972. Housed within the state Department of Environmental Protection, the existing Coastal Management Program has certainly protected many marshlands against being drained and developed and regulated potential sources of pollution. However, it appears not to have curbed the intensive development of barrier islands and many bayshore communities that antedated the current era of environmental protection laws.

Recommendation 11: The state should establish a Managed Withdrawal Fund to receive and disperse revenues from increased real estate transfer fees as the state share of federal SLRMA grants.

Recommendation 12: The state should establish a Jersey Shore Development Credit Bank to purchase Transfer of Development Rights (TDRs) from residential households and commercial property owners after a designated period of time and re-sell the TDRs to private developers of the proposed Jersey Shore City.

Recommendation 13: State government should establish criteria by which to measure the continued viability of micro-borough governments and, at appropriate milestones, dissolve a micro-borough government and have responsibility for local services and regulatory powers revert to the township governments from which the boroughs were originally organized.

Recommendation 14: State government should establish criteria by which school districts serving barrier islands and other managed withdrawal locations should be merged with appropriate mainland school districts.

Part IV: Implementing Managed Retreat on the Jersey Shore

Part IV(a). The barrier islands

Background: Residents: The islands are seasonally bi-furcated societies:

- On Long Beach Island and Barnegat Bay Island, in 2010, there were 4,774 and 7,486 year-round resident households, respectively; by contrast, there were 20,547 and 14,446 seasonal housing units on the two islands – roughly a 1:5 ratio on Long Beach Island and a 1:2 ratio on Barnegat Bay Island. The two barrier islands' combined year-round population of about 25,000 swells to 150,000-175,000 during the summer season.
- Within the islands' year-round populations are wide economic disparities.
- On the northern island, in 2010, Seaside Heights had a 29.3% family poverty rate, \$34,845 median family income, and 70% of the children qualified for **Free And Reduced-price Meals (FARM)** in the Seaside Heights Borough School District. At the other extreme, Mantoloking had no poor families, \$168,646 median family income, and undoubtedly none of the 12 children under 18 years sent to the adjacent Point Pleasant Beach School District (5% FARM) were low-income.
- On the southern island, economic disparities were not as great. At the low end, Surf City (3.2% family poverty rate, \$77,796 median family income; at the high end, Harvey Cedars (2.6% family poverty rate, \$114,610 median family income). Elementary school children from five municipalities attend the 250-student Long Beach Island Elementary School (22% FARM); Beach Haven's 75 pupils attend 75-student Beach Haven Elementary School (no FARM pupils reported). Island students attend middle school and high school of the Southern Regional School District
- Census-type data are not available regarding the occupants of the 35,000 seasonal housing units, but few are probably owned by families (much less within multi-general clans) who occupy their "family beach home" during the entire season. The vast majority of seasonal housing units are characterized as "investment properties." Indeed, for 2013-14 the average weekly rental on Long Beach Island varies from \$2,860 to \$6,038 (depending on the time of year with July and August commanding the highest rates).³¹ These rentals are rated as sleeping eleven persons on average so if multiple households are sharing a beach house, the weekly cost per household drops significantly. Nonetheless, a week on the Jersey Shore is an expensive proposition so most sunbathers are likely well up the income scale.

30. In 2010, Mantoloking was the richest community in New Jersey as ranked by per capita income (\$114,017) and fourth in average household income (\$232,991). Of its 296 residents, 85% were 50 years or older and 37% were 65 years or older.

31. Compiled from a survey of the first 100 rentals listed on-line by VRBO Realty. The cheapest accommodation is a motel-like room (sleeping four) for \$72 a night. The most eye-catching rental property (though not the most pricey) is "the Grand Dame of Beach Haven," the 11-bedroom, 6.5 bath mansion built for the president of the Pennsylvania Rail Road in 1880. It potentially sleeps 22 to 28 and rents for \$9,000 to \$13,000 per week.

32. Using data probably from the State Planning Office, COAH projected that 296 new housing units would be built between 2004-16 (barely 0.6% of total housing market and far short of any reasonable replacement rate). Over the same period a projected 904 jobs on the two islands would be lost.

As popular as the Jersey Shore's barrier islands are, in 2003 a state agency projected stagnation in their homebuilding market and slow decline in their job market.³² Though the expected stagnation/decline may reflect a conventional judgment that the barrier islands are already "built-out," it may also reflect a growing sense almost a decade before Superstorm Sandy that the barrier islands will be increasingly vulnerable to recurrent storms on top of SLR.

Background: Businesses: Since the latest US Census of Business has not been available on-line because of "the lapse on finding" (as the Census Bureau website informs data seekers), I've turned to the business directory of the Southern Ocean County Chamber of Commerce-Long Beach Island Region to develop a profile of business activity.

The chamber lists 596 businesses of which 70% are located in the Long Beach Island Region as defined in tables 1(a) and 2(a). Of these 224 are located on the barrier island and 198 on the mainland – two-thirds in Manahawkin CDP which is the business center of the region (and on relatively high

ground in the interior of Stafford Township).³³

Among major business sectors are (with some double-counting)

- 26 restaurants on the island and 10 on the mainland (seven in Manahawkin, including national chains like IHOP and TGI Fridays);
- 22 other fast food outlets, ice cream parlors, etc. , primarily on the island;
- 21 rental offices (all but two on the island); and, (categories that I'm unable to allocate between the island and mainland)
- 116 commercial and residential building services companies (e.g. repair and remodeling, heating and air conditioning, etc.)
- 91 retail stores, including 29 specializing in boating, fishing, water sports;
- 116 professional services (e.g. accountants, lawyers, insurance agents, etc.
- 49 locations offering health services that range from exercise classes to the Southern Ocean Medical Center in Manahawkin (however, three of the four physicians' groups and 4 of the five dental groups have their offices on the mainland); and
- 37 churches (17 on the island and 20 on the mainland).

In summary, within the regional economy, not surprisingly, businesses located on the island are focused substantially on seasonal consumer demand whereas retail business and services essential for year-round residents of the region are primarily located on the mainland. Of course, the largest business sector is the summer rental business involving more than 20,000 seasonal rental units on Long Beach Island.³⁴

Background: property valuation: New Jersey is one of only nine states that taxes residential property and commercial property at the same rate.³⁵ Thus, owner-investors of seasonal rental properties should be indifferent as to whether such houses were listed as commercial or residential property. Moreover, statewide, 39% of property taxes revenues come from commercial and industrial property and 61% from residential property. The percentage attributable to residential property could well rise to 70-75% on Barnegat Bay Island and 80-85% on Long Beach Island in light of the disproportionate ratios of seasonal housing to year round housing to commercial property.

Tables 4(a) and 4(b) list the state equalized valuation (SEV) in 2012 in the municipalities of Ocean County divide into the two different regions. Ocean County's SEV totaled \$96.9 billion, third highest among New Jersey's 21 counties (behind Bergen's \$165.3 billion and Monmouth's \$112.4 billion and just ahead of Middlesex's \$86.5 billion). Overall, the statewide SEV was \$1.18 trillion.

Table 4(a)

SEV of Long Beach Island Region as Pct of County and State SEV

<u>Municipality</u>	<u>SEV (\$ billions)</u>	<u>pct of county SEV</u>	<u>pct of state SEV</u>
Long Beach Island towns	\$15.4	15.9%	
1.3%			
Barnegat Light borough	\$1.0	1.1%	0.1%
Beach Haven borough	\$2.0	2.0%	0.2%
Harvey Cedars borough	\$1.3	1.3%	0.1%
Long Beach township	\$8.2	8.5%	0.7%
Ship Bottom borough	\$1.3	1.3%	0.1%
Surf City borough	\$1.6	1.7%	0.1%
Manahawkin Bay towns	\$9.9	10.2%	0.8%
Barnegat township	\$2.4	2.4%	0.2%
Eagleswood township	\$0.3	0.3%	0.0%
Little Egg Harbor township	\$2.5	2.6%	0.2%
Stafford township	\$4.2	4.4%	0.4%

33. 63 other businesses are listed in the directory without an address, typically labeled as "serving southern Ocean County" or "serving Long Beach Island." Many appear to be businesses run from home offices without an office location to meet customers.

34. A business profile of Barnegat Bay Island region could not be constructed as readily as of the Long Beach Island region. The Toms River Ocean County reports 475 members (which would be a lesser number than a full business directory). The distribution of businesses would tilt much more towards the mainland rather than the barrier island as the northern region's economy is markedly less seasonally-dependent.

35. <http://taxfoundation.org/article/state-and-local-property-taxes-target-commercial-and-industrial-property>

Table 4(b)
SEV of Barnegat Bay Island Region as Pct of County and State SEV

Municipality	SEV (\$ billions)	pct of county SEV	pct of state SEV
Barnegat Bay Island towns	\$9.5	9.8%	0.8%
Bay Head borough	\$1.6	1.6%	0.1%
Lavallette borough	\$2.2	2.2%	0.2%
Mantoloking borough	\$1.6	1.6%	0.1%
Point Pleasant Beach borough	\$2.2	2.3%	0.2%
Seaside Heights borough	\$0.7	0.7%	0.1%
Seaside Park borough	\$1.2	1.3%	0.1%
Barnegat Bay towns	\$43.3	44.7%	3.7%
Beachwood borough	\$0.9	1.0%	0.1%
Berkeley township	\$5.3	5.4%	0.4%
Brick township	\$11.3	11.6%	1.0%
Toms River township	\$16.1	16.6%	1.4%
Island Heights borough	\$0.4	0.4%	0.0%
Lacey township	\$4.0	4.1%	0.3%
Ocean Gate borough	\$0.3	0.3%	0.0%
Pine Beach borough	\$0.3	0.3%	0.0%
Point Pleasant borough	\$3.3	3.4%	0.3%
South Toms River borough	\$0.2	0.2%	0.0%
Barnegat Bay high-and-dry towns	\$18.8	19.4%	1.6%
Jackson township	\$6.7	6.9%	0.6%
Lakehurst borough	\$0.2	0.2%	0.0%
Lakewood township	\$7.3	7.6%	0.6%
Manchester township	\$3.7	3.8%	0.3%
Plumsted township	\$0.9	0.9%	0.1%
Total – Ocean County	\$96.9	100.0%	8.2%
Total – New Jersey	\$1,184.9	---	100.0%

Relocating 12,000-plus year-round households and about 400 businesses from the barrier islands is a daunting challenge – far greater than anything yet undertaken under FEMA’s Hazard Mitigation Assistance Program.³⁶ Tables 4(a) and 4(b) place some parameters on the task. Property values on the two barrier islands represent over one-quarter of Ocean County’s total (\$24.9 billion of \$96.9 billion, or 25.7%) but far less of New Jersey’s total (\$24.9 billion of \$1,184.9 billion or 2.1%).

Moreover, we are talking about a process extending over several decades and the greater part of the total property valuation (i.e. seasonal rental properties) would not (and should not) qualify for federal and state relocation assistance.

Thus, if we assume that 80% of assessed valuation on Long Beach Island is residential, but 80% of the residential property is seasonal rentals, then roughly two thirds of Long Beach Island’s properties (in value) would not be eligible for relocation assistance. That reduces the need for buy-out and relocation assistance to about \$5 billion for Long Beach Island.

Similarly, if we assume that 70% of assessed valuation on Barnegat Bay Island is residential, but two-thirds of the residential property is seasonal rentals, then about 55%, or also about \$5 billion in residential and commercial property owners would qualify for buy-out and relocation assistance.

36. Since the floods of 1993, FEMA has distributed more than \$1 billion in grants to fund the removal or relocation of about 12,000 structures in flood-prone areas across the Midwest, most of them along the Mississippi and its tributaries. Helping 900 residents leave flood-destroyed Valmeyer, IL to a new location a mile away (and 400 feet higher) cost \$45 million (including the 25% local share). “Ill. town does find life goes on after floods,” USA Today (June 20, 2008).

That's a lot of money *if it were needed for immediate buy-out payments*. However, let us take a closer look at the residential market of Long Beach Island. Table 5 summarizes an analysis of the 42 residential properties listed for sale in October 2013 by G. Anderson agency, one of the principal realtors of Long Beach Island (whose business seems to be concentrated on the southern half of the island – Ship Bottom, Beach Haven, and more than a dozen neighborhoods of Long Beach township). What leaps out of the table is the fact that land values are substantially greater than the value of structures on them. The average assessed valuation of lots is \$577,742 – over twice the assessed valuation of the structures on them (\$278,480). The average asking price (\$937,502), of course, was 10% above the total assessed valuation of the average residential property (\$856,222).

Table 5: Characteristics of homes for sale on Long Beach Island

House age	land valuation	structure valuation	lot (acres)	house (sq. ft.)	valuation per acre
Average (42)	\$577,742	\$278,480	0.14	2,064	\$4,895,571
>50 years (16)	\$548,377	\$99,573	0.11	1,391	\$5,398,027
26-50 years (13)	\$502,334	\$273,090	0.17	1,901	\$4,140,303
1-25 years (13)	\$667,826	\$506,757	0.15	3,057	\$4,564,902
Vacant lots (5)	\$457,000	---	0.19	---	\$2,435,765 ³⁷

Lots are small on Long Beach Island. None exceeds one-quarter acre (0.25). Yet land values are astronomical. Grossing up lot sizes to a hypothetical full acre, land valuation averages almost \$5 million per acre, ranging from \$1.2 million per acre to \$10.8 million per acre. The land developed more than 50 years ago is valued at 5 ½ times the small bungalows that sit on it. By contrast, the land developed (most often redeveloped) in the last 25 years is valued at only 30% more than the beach McMansions that cover it.

Clearly land values are being driven by a multi-decade speculative craze as owning a beach home (or investing in a rental property) has attracted well-heeled buyers/investors mostly from New York City and environs. The skyrocketing land values seem fueled by buyer optimism that a) there will always be another buyer for the existing property (including house) at a higher price,³⁸ or b) the land can be redeveloped in a manner that produces a significant gain (such as has occurred with many original bungalow properties that have been torn down and the land redeveloped for much bigger houses or subdivided into multiple condo units).

In federal recommendation #5 (p. 15) I proposed that *The Internal Revenue Code should be amended to permit landowners to depreciate the value of their land in areas within FIRMS-SLR coastal flood plains. Such depreciation should be scheduled to depreciate land to the acquisition price per acre established by the federal or state government for ultimate use as parkland or wildlife refuges.*

37. The “lower” value of the five vacant lots for sale is probably explained by their location in either Ship Bottom or Brant Beach – both more modest, less sought after communities.

38. The epitome of such optimism must be the owner/seller of the most expensive property listed with the Anderson agency – a 5-bedroom, 4,100 square foot “exquisite bay front gem with spectacular views, deep water dockage and heated pool with spa” listed for \$2,995,000. Built in 2000 but newly renovated, the house is assessed at \$821,212 but the 0.18 acre of land is assessed at \$1,549,607. (That's \$8,608,928 per acre!)

This reform is one of the keys to a successful managed retreat from the Jersey Shore. In the face of SLR, coastal land is not an indestructible resource. In a half century's time the combination of SLR and periodic storms will render the barrier island unsuitable for permanent structures. In a century or two later, this land (as defined by fixed coordinates) will have eroded and disappeared under the ocean's waves while new barrier islands will have been created somewhat to the westward of their current location.

Depreciation is an accounting technique that recognizes the declining value of an asset through time. Depreciation reduces a business's tax liability. Commercial property (but not currently the land under it) is usually depreciated over 39 years. Residential rental property (but not currently the land under it) is depreciated over 27.5 years. In effect, when a property is fully depreciated, *taxes not paid have "paid off" all (or substantially) the book value of the property/investment* even if the property still has a useful life. In the context of a multi-decade managed withdrawal from the Jersey Shore, redefining SLR-subject land as a depreciable asset allows the federal and state governments to pay off the value of the land year-by-year, decade-by-decade until the target fee-simple acquisition price is reached.

Let's work out a step-by-step scenario for managed withdrawal from Long Beach Island. A similar process would be carried out with regard to Barnegat Bay Island and SLR-affected bayshore and river front communities. (Many steps are concurrent and not necessarily sequential).

Step 1: The federal and state government would issue a joint finding that in light of projected SLR, fixed residential and commercial structures on Long Beach Island would become unsustainable as of a future date certain (let's say January 1, 2055, for our example).

Step 2: The federal and state governments would jointly announce that as of January 1, 2055 they would acquire all remaining privately-owned land on Long Beach Island for public beaches parks and wildlife refuges.

a) For management of the public lands, the state government would expand the Island Beach State Park to the southern barrier island (becoming Island Beaches State Park) and the U.S. Fish and Wildlife Service would expand the Forsyth National Wildlife Refuge (now occupying the southernmost three miles) to appropriate locations on the 18-mile long island; and

b) The federal and state governments would jointly set a common "salvage price" of, for example, \$10,000 per acre (in 2013 dollars) for all privately held land as of January 1, 2055. This salvage price would reflect the finding that, as of that date, the only economic use of the land would be for purposes of public beaches and wildlife refuges. The salvage price would be adjusted annually by the national Consumer Price Index to maintain its real value at the 2013 level. (With roughly 3,200 acres of private land to acquire, \$10,000 per acre would require an expenditure of \$32 million by the federal and state governments; at a fixed price of \$100,000 per acre, \$320 million would be required, etc.)

Step 3: At federal and state direction, all beach nourishment operations (oceanside) or sea wall building (bayside) for Long Beach Island would be terminated and permits would not be issued in the future for any such privately financed efforts to hold back the waters.

Step 4: By statute, the state would declare that the assessed valuation of land under all residential and commercial structures and vacant lots on Long Beach Island would be frozen at their assessed valuation as of January 1, 2013, for example. (A retroactive date before steps 1 and 2 would be necessary to prevent local assessors from artificially inflating assessed valuation in anticipation of managed withdrawal policies.) Valuation of residential structures and commercial structures, however, would be allowed to be adjusted in response to market conditions.

Step 5: In accordance with the amended federal Internal Revenue Code, all Long Beach Island landowners would be allowed to depreciate their land by the straight-line method over a period of 39 years (i.e. the same

length of time as the current depreciation rate of commercial structures). By January 1, 2055, their lots would have depreciated to the point of reaching the salvage price of \$10,000 per acre (in 2013 dollars adjusted for inflation).

Step 6: In accordance with the current Internal Revenue Code, owners of residential rental property (the great bulk of housing units on Long Beach Island) would depreciate their houses by the straight-line method over the current 27.5 year period. Owners of commercial property would depreciate their buildings over the current 39 year period. Upon sale of all such property the basis for future depreciation should be made the depreciated book value of the property and not the new purchase price. (This provision should help dampen the speculative fever on Long Beach Island.)

Step 7: By statute, the state would triple the current real estate transfer tax covering future sales of land and structures on Long Beach Island.³⁹ The added revenues would be deposited in the state Managed Withdrawal Fund to help cover the state share of the Sea Level Rise Mitigation Assistance (SLRMA) program and other state costs associated with managed withdrawal.

Step 8: State law would direct that, in approving any building permit for new construction or substantial remodeling, municipal governments would require that owners/investors execute deed covenants a) acknowledging that, as of January 1, 2055, the value of any improvements would be zero and the underlying lot would be valued at the established salvage price, and b) waiving any future right to contest the federal or state government's acquisition of the property at that time in federal or state courts. Such deed covenants would be automatically transferable to and enforceable against any future purchaser of the property.

Step 9: The above covenants would also apply to the re-sale of any residential, residential rental or commercial property during the period leading up to January 1, 2055.

Step 10: With FEMA providing 75% of the funds, the state would offer an advance "buy-out" option for low- and moderate-income residents for up to a three year period under the new SLRMA program. Unlike the existing HMA "buy-out" program, eligible homeowners under the SLRMA program could apply directly to the state rather than be required to receive the endorsement of their municipal government.

Under regulations established by the Jersey Shore Commission the SLRMA advance buy-out program would offer eligible homeowners three options:

- Option A: purchase of the house (but not the underlying lot) at fair market value (FMV) as determined by an independent appraiser. To the house's FMV would be added the current value of the salvage price of the land.
- Option B: half of the Option A purchase price plus that number of Transfer of Development Rights (TDRs) for use in Jersey Shore City that represents the difference between the full FMV and half of the FMV. At the end of five years if not already sold, the eligible homeowner can continue to hold the TDRs or sell them to the state Jersey Shore Development Credit Bank at the original issuance value.
- Option C: half of the Option A purchase price plus free tenancy for life on the property (or until January 1, 2055, whichever comes first). Title would be vested in the state and, as a result, the property would be exempted from local property taxes. The tenant-for-life would be responsible for utility costs and the desired level of property maintenance.

39. According to <http://www.state.nj.us/treasury/taxation/lpt/rffaqs.shtml> the current real estate transfer fee schedule for great bulk of transactions on Long Beach Island is REALTY TRANSFER FEES IMPOSED ON SELLER, TOTAL CONSIDERATION IN EXCESS OF \$350,000

1. \$2.90/\$500 of consideration not in excess of \$150,000;
2. \$4.25/\$500 of consideration in excess of \$150,000 but not in excess of \$200,000;
3. \$4.80/\$500 of consideration in excess of \$200,000 but not in excess of \$550,000;
4. \$5.30/\$500 of consideration in excess of \$550,000 but not in excess of \$850,000;
5. \$5.80/\$500 of consideration in excess of \$850,000 but not in excess of \$1,000,000;
6. \$6.05/\$500 of consideration in excess of \$1,000,000.

Thus, the current realty transfer fee for sale of the average house listed by G. Anderson Agency (asking price: \$937,500) would be \$8,850. The current real estate transfer fee for the most expensive residential property listed (\$2,995,000) would be \$30,335. Tripling the fees and assuming that all 42 properties sold would yield \$743,400 for the state Managed Withdrawal Fund. That would provide the state 25% matching share for SLRMA grants totaling \$2,973,600.

A discounted fee schedule is provided for sellers who are senior citizens, blind/disabled, or low and moderate income. For such a seller the realty transfer fee for the average home listed would be \$4,281 (as compared to \$8,850).

40. Area Median Income (AMI) in 2013 for Ocean County is \$79,500. "Low-income" is defined as less than 80% AMI, or \$63,600, and moderate-income is defined as less than 120% AMI, or \$95,400.

41. Managed withdrawal means the ultimate disappearance of barrier island municipalities as entities. It is highly unlikely that most municipal authorities will willingly endorse advance "buy-out" applications that will accelerate the disappearance of their borough or township. "Local government is in an unholy alliance with speculators and banks to develop their tax base, and has a strong interest in promoting shorefront development. It's their economy," observed Rutherford H. Platt, a coastal expert at the University of Massachusetts (quoted in Gilbert M. Gaul and Anthony R. Wood, "A flawed program facilitates building in hazardous areas," *The Philadelphia Inquirer* (March 8, 2000)).

42. Precedents already exist with the Pinelands Development Credit (PDC) program and the Pinelands Development Credit Bank. As of October 2013, the current price for a PDC was \$9,500.

Under all three options SLRMA would absorb all transaction costs but transaction cost would be lower as the realty transfer fee would be waived.

Very importantly, after an initial three-year period, FEMA would remove all federal subsidies of flood insurance in SLRMA-designated areas. After that date, resident homeowners of all income levels and owners of seasonal rental and commercial property would have to rely on flood insurance provided by private insurance at full market rates for risk.

Option A allows the eligible resident homeowner to move immediately into comparable housing in a non-SLR-affected location probably without any mortgage obligation for the new home. (FMV of barrier island homes is higher than the FMV of comparable mainland homes.)

Option B probably allows the eligible resident homeowner to make the same move as Option A but possibly with a mortgage obligation if the new home costs more than half the value of the barrier island home. However, awarding TDRs covering the difference of 50% reduction in FMV price provides a risk-free upside as sale of TDRs into a private developer-powered market may yield more money (combined with the 50% FMV cash payment) than option A's 100% FMV buy-out.

Option C allows the resident homeowner to have (half) their cake and eat it (the other half), too. The resident homeowner would get immediate cash but would continue to live in the home rent- and property-tax free for the balance of the owner/seller's lifetime (or until January 1, 2055, whichever came first). However, Option C would be a gamble for the tenant-for-life (one that many would be willing to take) as the tenant-for-life would be unprotected against SLR + storm damage by any federally-subsidized coastal flood insurance.

Of course, there would always be an implicit "Option D" available – that is, the resident/homeowner simply sells the property at whatever price the market will bear to a new investor. This is the traditional path that many long-time residents on Long Beach Island have taken. It is likely to be the most common choice under managed withdrawal as well.

From the public policy perspective, Option A is the most expensive to taxpayers but does leave state government with immediate title to the land and the right to remove all improvements immediately.

Option B also leaves state government with immediate title and structure demolition rights but initially at half the cost. Even if after five years the former resident opts to cash out TDRs by sale to the Jersey Shore Development Credit Bank at their original (i.e. non-inflation adjusted) value, the state agency would possess a valuable asset that could be sold to future developers of Jersey Shore City. Option B is the best deal for the federal and state taxpayer.

Option C also allows the state government to acquire immediate title at half FMV ... but not actual use of the property. The house would continue to be occupied by the tenant-for-life. However, the tenant-for-life would not be covered by what was formerly federally-subsidized flood insurance though, when evacuated in the face of major storm events, the tenant-for-life would receive short-term humanitarian aid.

From the taxpayer's perspective, while not involving any governmental body in the transaction (except the recorder of deeds under Step 8), "Option D" converts the property of a resident homeowner who qualifies for

various public subsidies into the property of an investor in seasonal rental property who receives no public subsidies and must pay for any private flood insurance priced at full market risk. Based on the mandated deed covenants, such property will revert to state government on January 1, 2055 with the state's only obligation to pay for the established value of the lot for public beach and wildlife refuge purposes (i.e. an inflation-adjusted \$10,000 per acre in 2013 dollars).

Step 11: The state would offer an advance “buy-out” option to non-residential commercial property owners as would be offered to low- and moderate-income resident homeowners under step 10 with the following modifications.

- Under Option B, the TDRs allocated to commercial property owners would be for commercial development in Jersey Shore City and would be valued accordingly.
- Under Option C, rather than tenancy-for-life, commercial property could continue to be leased until fully depreciated under the depreciation schedule. Title would then revert to state government that could only use the property for purposes of public beaches and wildlife refuges or activities in support of these activities.

Step 12: The state would direct SLR-affected municipalities to amend zoning and building codes to facilitate the transition from “hard” commercial and residential structures to “soft” commercial and residential structures in support of public beaches and wildlife refuges. “Soft” infrastructure would include infrastructure that can float (e.g. bayside marinas, floating restaurants and stores, houseboats, etc.), infrastructure that can be stored (e.g. tents both for residential and commercial purposes)⁴³ in relatively SLR + storm-proofed facilities, and infrastructure that can be removed to higher ground on relatively short notice (e.g. recreational vehicles (RVs), food trucks and other retail vehicles, food and souvenir carts, etc. State government (or, by delegation, municipal governments) would be responsible for providing necessary support facilities for “soft” infrastructure (e.g. parking lots, public restrooms, utility hookups, etc.).

Step 13: At the adoption of the Comprehensive Management Plan (CMP) for the Long Beach Island region by the Jersey Shore Commission, state government would dissolve the five borough governments and merge them into the existing Long Beach Township government. The barrier island already is experiencing a steady decline in resident households (almost 12% since Census 2000 alone). The rate of decline would undoubtedly accelerate with the announcement of federal and state long-term policies of managed withdrawal. Merging six micro-sized, municipal governments⁴⁴ into one small-sized, municipal government⁴⁵ would be the most effective and efficient way to manage a multi-decade process and continue to provide municipal services to year-round residents and seasonal visitors. The township government itself would be dissolved on January 1, 2055 when state and federal governments assume full control of all land on the barrier island.

Step 14: At the CMP's adoption, the New Jersey Department of Education would direct that the Long Beach Island Consolidated School District and the Beach Haven School District be merged with the Stafford Township School District. The barrier island's three schools – Ethel Jacobsen School (127 k-2 pupils), Long Beach Island Grade School (123 3-6 pupils) and Beach Haven Elementary School (74 pk-6 pupils) – would attend elementary schools in Stafford township. Older students on the island already attend the middle school and high school in Manahawkin operated by the Southern Regional School District (as do older students in Stafford township). Thus, managed retreat simply means extending current school arrangements to the younger students

43. According to Wikipedia, since 1869, in Ocean Grove, “the Queen of Religious Resorts,” there have been 114 rental tents, which are occupied from May to September. These rustic throwbacks adjoin to rear sheds containing a kitchen and bathroom. The tents are stored in the sheds during the winter. They are in such demand that there is a waiting list of some ten years for summer rentals.

44. As of Census 2010, Harvey Cedars had 169 resident households, Barnegat Light 274, Beach Haven 531, Ship Bottom 555, Surf City 622, and Long Beach township 2,513.

45. After the mergers, the expanded Long Beach township (4,664 resident households) would still be the 4th smallest of 13 townships in Ocean County (which average over 15,000 resident households).

Part IV(b): Manahawkin Bay towns

I've stated that a similar process would be carried out with regard to SLR-affected bayshore communities. In the Long Beach Island region, these endangered Manahawkin Bay communities would include:

- Beach Haven West (CDP) which is most of census tract 7351.03 in Stafford township. Some 68% of the 2,072 year-round housing units suffered major/severe damage during Superstorm Sandy. Though not covered by FEMA aid, the 2,704 seasonal housing units probably were similarly damaged. A projected 10-foot water level (SLR + storm surge) would cause major/severe damage to 97% of the housing units. Densely-packed townhouses and apartment buildings are built right up to the bayshore with what appears to be only a two-three foot elevation above current high tide. Beach Haven West is one of the worst examples of SLR-heedless development yet it was built up in accordance with the Pinelands Comprehensive Management Plan. The Pinelands CMP identified this portion of the State 72 highway corridor ramping up to the Dorland J Henderson Memorial Bridge linking the mainland with Long Beach Island for intensive development.⁴⁶
- Bonnet Island (which appears also to be part of census tract 7351.03) in Stafford township. Part of the island serves as foundation for the highway bridge arching high over it, but a motorist sees substantial commercial and some residential development on the island. It also includes Bonnet Islands Estate, a prestigious (even idyllic) wedding center. (Visit <http://www.weddingsofdistinctionnj.com/country-estate/destination-weddings.php>) Whatever parts of the island are not reed-filled marshlands appear to be about one foot above high tide.
- Lower-lying portions of Tuckerton borough. As a whole, the 3.4 sq. mi. borough suffered major/severe damage to 28% of its housing units, but a 10-foot water level would impact 63%. It is highly probable that, long-term, Tuckerton would not survive as a viable municipality but should revert to Little Egg Harbor township (from which it was carved out by the state legislature in 1901).
- Though geographically large (47.4 sq. mi.), Little Egg Harbor township suffered 90% major/severe damage to the homes of 1,735 year-round residents in bayshore census tract 7361.05 and probably equivalent damage to 1,537 seasonal housing units in the same neighborhood. This area contains about one-fifth of the township's year-round residents.
- Though somehow Barnegat township's lower-lying areas escaped major damage from Sandy (1.6% of the Barnegat CDP), the Barnegat CDP is projected to have high vulnerability to SLR and future storms (43% major/severe damage at 6 feet, 62% at 10 feet). Barnegat CDP (most of census tracts 7340.02-.03) contains about 58% of the 34.4 sq. mi. township's year-round residents.
-

How would managed retreat for these low-lying bayshore communities differ from the process outlined above for its barrier island?

First, though unmet Mount Laurel obligations could be reasonably ignored for barrier island municipalities projected to disappear, that is not the case with regard to the Manahawkin Bay towns.

As shown on table 3(b) on page 8, Little Egg Harbor and Stafford townships have sought to meet their past Mount Laurel obligations, building 211 and 448 affordable units, respectively; based on projected rapid growth in both housing and employment, they would have almost equal amounts to build in the future (207 and 441 units, respectively).

46. Wikipedia reports that "As the sole access point to/from Long Beach Island and a vital coastal evacuation route in the case of a hurricane, the rapidly deteriorating condition of the bridge was of serious concern. From 2009 to 2010, NJDOT completed a rehabilitation of the deck surface to extend the life of the existing bridge. This project was completed at a cost of \$5.5 million and financed through the American Recovery and Reinvestment Act... From 2010-2012 NJDOT completed reviews, design, and planning for a complete \$350 million overhaul of the bridge to include a second parallel span to be built just south of the existing span [emphasis added]."

However, Barnegat township made only a token effort to meet past obligations (60 units) and Eagleswood township and Tuckerton borough have never reported any Mount Laurel units built. The three jurisdictions have substantial obligations of 483, 67 and 147 affordable units still to be built. In all, the five Manahawkin Bay towns have an outstanding obligation to build over 1,200 affordable housing units. This represent about one-eighth of the number of households of all income levels that would be relocated from the barrier island (4,664 households), the low-lying portions of Barnegat, Little Egg Harbor, and Stafford townships (4,669 households) and Tuckerton borough (1,396 households) if the borough were to be totally abandoned (which would probably not be the case).

Thus, there is the prospect that the townships could re-house on higher ground most of their own low-income households now living in SLR-affected areas of their own jurisdictions.

Some other modifications in policies for the bayshore towns would be:

Step 1: The federal and state governments would direct the townships to develop a multi-decade plan for managed withdrawal from the bayshore as a condition of continuing federal and state aid. These plans would be better fine-tuned in designating areas for withdrawal than the entire census tracts this study uses. The municipal plans would also set varying target dates for completing the process of withdrawal. Municipal plans would be reviewed and approved by the Jersey Shore Commission.

Step 2: With federal and state aid the cleared, low-lying areas could become municipal parks and beaches rather than state- or federally-owned public land. The municipal plan would propose the salvage price for land to be acquired.

Step 3: In accordance with a Jersey Shore Commission-approved plan, municipalities could institute protective measures such as seawalls but totally locally financed without federal or state aid.

Step 4: No change

Step 5: No change except for target dates

Step 6: No change

Step 7: No change

Step 8: No change except for target dates

Step 9: No change except for target dates

Step 10: No change except for target dates

Step 11: No change except for target dates

Step 12: No change

Step 13: No change in local government organization except that it is highly probable that long-term Tuckerton would not survive as a viable municipality but should revert to Little Egg Harbor township (from which it was carved out by the state legislature in 1901).

Step 14: No change in the townships' school organization would be required though the Tuckerton Borough School District's single elementary

47. Indeed, the latter three townships extend across Barnegat Bay to claim substantial portions of the barrier island: Berkeley (South Seaside Heights), Brick (Brick beaches I, II, and III), and Toms River (Dover Beach South and Dover Beach North).

school (274 pupils) could be merged into the Little Egg Harbor Township School District. Older students from Tuckerton, Little Egg Harbor, and Eagleswood township already attend middle and high schools of the Pinelands Regional School District.

Part IV(c): High-and-dry townships

The high-and-dry townships have two roles in the regional plan for managed withdrawal from the Jersey Shore:

- As the source of housing opportunities for former residents of the barrier island and SLR-affected bayshore communities, especially for low-income households through fulfilling their Mount Laurel obligations to build their fair share of the regional need for affordable housing; and
- As a potential site for Jersey Shore City, the planned new town.

Though two townships in abutting Burlington County (Bass River and Woodland) are due west of Long Beach Island/Manahawkin Bay communities, they are basically sparsely populated rural areas with minimal Mount Laurel obligations (23 and 32 affordable housing units, respectively). Furthermore, they are so distant from New York City and Philadelphia and potential rail linkages to them that they would probably not be suitable sites for Jersey Shore City.

Thus, I will focus this discussion on the townships in Ocean County that lie to the northwest of this region and due west of the Island Beach Island/Barnegat Bay region (Manchester, Lakewood, Jackson, and Plumsted).

In addition, though they are classified as Barnegat Bayshore towns as they have low-lying, endangered areas, Ocean, Lacey, Berkeley, Brick and Toms River townships also could play roles in relocating Long Beach Island residents as well as their own Barnegat Bay Island residents.⁴⁷ Moreover, with their lesser distance from New York City and readier access to established transportation routes, western portions of these townships might provide the best location for Jersey Shore City.

The Importance of Mount Laurel

Of the high-and-dry townships, all have significant unfulfilled Mount Laurel obligations: Jackson (2,225 units), Manchester (1,203 units), Lakewood (897) and Plumsted (202), totaling 4,527 units.

Also in the picture would be the Barnegat Bayshore townships and their unfulfilled Mount Laurel obligations: Toms River (3,097 units), Brick (812), Lacey (629), Berkeley (373), and Ocean (193), totaling 5,104 affordable units. These obligations are largely based on new housing construction as all these townships built affordable housing meeting significant percentages of past Mount Laurel obligations (cumulatively, 2,630 affordable units).

Relocation needs for the Barnegat Bay Island region would be for 7,486 households from the barrier island itself, low-lying Ocean Gate borough (831 households facing 100% damage from a 10-foot water level), and some portion of over 15,000 households from low-lying portions of Ocean (Waretown CDP), Lacey (Forked River CDP), Berkeley, Brick, and Toms River.

However, it must be emphasized that these figures include households of all income levels. Households eligible to qualify for Mount Laurel assistance (less than 80% AMI) would probably total 9,000 households at most from the Barnegat Bay Island region and 4,000 at most from the Long Beach Island region. Against this estimated 13,000 low-income households qualifying for

Mount Laurel housing would be unmet obligations to build over 10,000 affordable units.

Thus, hypothetically, much of the affordable housing required by low-income households relocating from the barrier islands and SLR-affected bayshore towns could be met by the townships' fulfilling their Mount Laurel obligations.

The Potential of Jersey Shore City

The other alternative would be Jersey Shore City. Over several decades (and with effective transit ties to New York City/Northern New Jersey) Jersey Shore City could develop to the scale of Reston VA (25,000 households) or Columbia MD (35,000 households) in the greater Washington, DC area. Applying the proportion of affordable housing required by the New Jersey Housing Reform Act of 2008 would yield 5,000 to 7,000 affordable units with 1,250 to 1,750 being priced for extremely low-income households (less than 30% AMI).

In addition to the additional affordable housing provided, the new town would be the arena in which former barrier island residents and businesses could market Transferable Development Rights (TDRs) awarded under Option B. Alternatively, it would be the market in which the Jersey Shore Development Credit Bank could sell TDRs that it acquired from residents and businesses. Either way, cashing out TDRs with private, for-profit land developers greatly reduces the taxpayer cost of managed withdrawal.

Governmentally, a future Jersey Shore City could be initially organized just as an unincorporated area (CDP) within its host township⁴⁸ or, as it matured, as a self-governing municipality. In whichever form, Jersey Shore City would become one of New Jersey's ten largest communities.

Part V: Concluding observations

"It's too late to retreat," says James Mancini, mayor of Long Beach Township for 35 years, and a former developer. "It's a pipe dream of these pseudo-environmentalists [emphasis added]." ⁴⁹

Mayor Mancini was speaking in March, 2000. He has now served as Long Beach Township's mayor for 48 years and, finishing his current term in 2016, will have been mayor for over half a century. During this half century the ocean around Long Beach Island has risen about two feet.

Superstorm Sandy was remarkable for its breadth but was hardly the most violent storm to hit the Jersey Coast. Mayor Mancini first took office just three years after the Ash Wednesday hurricane of 1962.

48. Columbia is an unincorporated area within Howard County MD and Reston is an unincorporated area with Fairfax County VA. County government is the general local government for both. However, both have large homeowner associations supported by mandatory fees. In fact, for FY 2014, the Columbia Association's operating budget is \$61 million and its capital improvement budget (also supported by property owner fees) is \$13.4 million. (The Reston Association is much smaller with an annual budget slightly over \$1.2 million for FY 2014.)

49. Quoted in Gilbert M. Gaul and Anthony R. Wood, "Along the waters, disasters waiting for their moment," Philadelphia Inquirer (March 5, 2000)

[The Ash Wednesday hurricane,] the most devastating coastal storm in New Jersey history, inundated Long Beach Island, drowning seven people, uprooting 600 houses, and tearing the slender barrier island into six pieces.

Along the Eastern Seaboard, from North Carolina to New York, the great Ash Wednesday Storm of 1962 killed 22 people, pounded 50,000 houses, and left \$1.3 billion in damage.

So shocking was the destruction that state and federal officials suggested the unthinkable: restoring the vulnerable shoreline to its natural state - a buffer zone off-limits to risky development.

But no one listened.

Aided by generous disaster dollars, federal loans, and a grab bag of other taxpayer subsidies, beach towns built back bigger and closer than ever before.

Instead of a natural buffer, a barricade of pricey real estate now lines the nation's endangered coasts.

Today, Long Beach Island is crowded from dune to bay with vacation homes and investment properties worth nearly \$5 billion [\$16 billion in 2013]. It is one piece of a building boom that has transformed the nation's shoreline from seaside hamlets to exclusive resorts worth an estimated \$2 trillion [in 2000].

The unchecked development of America's fragile coasts in the last half-century, a frenzy of building with little national forethought, has come at a hefty price.

The American dream of a house at the beach has turned into a taxpayer nightmare: billions of federal dollars to repair resorts damaged again and again. Billions more to monitor and fix environmental problems - water pollution, unchecked runoff, leaky sewers, vanishing wetlands. And still billions more in decades to come in an endless struggle to guard beachfront real estate from rising seas and inevitable storms.⁵⁰

I have quoted the introductory paragraphs to the Philadelphia Inquirer's masterful five-part series 13 years ago because it could be written today – just tripling the dollar numbers. And 13 years ago these journalists and most of the people they interviewed were more conscious of periodic hurricanes and nor'easters than of the inexorable sea level rise that would magnify the effects of any major weather events.

In the preceding 39 pages I've tried to lay out the scope of the challenge on the Jersey Shore. To relocate 12,000 households from the barrier islands alone, for example, would represent a greater task than FEMA accomplished in the first decade and a half of the Hazard Mitigation Assistance program nationally.

Yet consider some other numbers presented. In 2013, the assessed valuation of all residential and commercial property on the two barrier islands totaled \$25.9 billion. That's a lot of money, and yet

- it is barely two percent of New Jersey's total assessed valuation;
- at least two-thirds of that \$25.9 billion is the imputed value of the lots under houses and stores – the result of a speculative market in the supposed “indestructability” of land that will disappear under the ocean waves in the next century; today's land values are classic “paper wealth.”
- by all anecdotal testimony, an ever increasing majority of that property is owned not by New Jersey residents for their own use but by out-of-state investors as seasonal rentals and for speculative purposes; and
- both because of soaring home prices and high weekly rents during the summer season, the “public” beaches of the Jersey Shore are effectively closed to greater and greater numbers of New Jersey residents.

I propose managed withdrawal from the Jersey Shore not because I am a “pseudo-environmentalist,” nor would I even consider myself an “environmentalist.”

50. Ibid.

Indeed, I am a former mayor myself – mayor of Albuquerque, New Mexico.

Albuquerque is certainly located far from any ocean, but we have our own types of natural hazards. Yet, by contrast with Long Beach Island, consider Albuquerque's record. Over the decades our citizens/property tax payers/voters have spent upwards of \$150 million in local taxes to purchase over 20,500 acres of open space.

- Over 10,000 acres of all privately-owned land in the foothills and slopes of the Sandia Mountains, including \$25 million in cash in 1982 for the 8,000-acre Elena Gallegos Land Grant;
- Hundreds of acres of riverine floodplain that now comprise the city-managed Rio Grande State Park; and
- The five volcanic cones and 4,000 acres surrounding them that punctuate the western horizon of the city.

The primary purpose of the Open Space program has been to preserve Albuquerque's setting as "an island of civilization in a sea of nature" and to create parklands and natural areas accessible to all residents and visitors. Indeed, Albuquerque is the only major city in America where, in stepping across the city limits into the mountain lands, one literally steps into a designated official national wilderness.

Yet a very explicit argument in support of the open space program has been *to prevent development in environmentally sensitive, even hazardous areas where development should not be allowed.* Thus,

- After the open space program's inception, there have been no more multi-million houses built climbing up the sides of the Sandia Mountains, subject to flash brushfires during the dry season and mudslides from torrential storms that can hit the mountain sides during the wet season;
- Since the open space program's inception, there are no more houses (much less any subdivisions) being built in the floodplain of the Rio Grande, imperiled by winter runoff-driven floods and fires in the bosque; and
- Secured by the open space program, there is no housing development on the volcanic escarpment that would be devastated if the volcanos ever erupted again. Moreover, development below the volcanic escarpment was halted a sufficient distance away to preserve over 20,000 Indian rock carvings in what is now the Petroglyph National Monument.

Not only did each of these initiatives represent a considerable outlay of local taxpayer dollars, they also meant the perpetual sacrifice of millions of dollars annually in property taxes from expensive homes in these highly sought-after sites.

I and, I am sure, most Albuquerqueans recognize our mutual responsibilities to our fellow citizens throughout the nation, particularly those who have suffered unforeseeable natural disasters. But why through our federal tax dollars should Albuquerqueans be subsidizing very foreseeable hazards?

- Expensive homes perched on Pacific Ocean cliffs that, lashed by regular storms, slide into the sea through mudslides; or
- Similarly expensive homes on one-, two-, and five-acre lots scattered throughout scenic, but tinder-dry, western pine forests; or
- Houses (even whole towns) located in floodplains of the Mississippi River and its tributaries that are subject to almost predictable periodic flooding; or

- Oceanfront and bayshore development up and down oceanic coasts, of which this discussion of the Jersey Shore is just one example.

Drenching storms and hurricanes, forest fires, river plain flooding – “These are not random acts of God. *It’s only when people build in dangerous places that it becomes a natural disaster* [emphasis added].”⁵¹

Superstorm Sandy revealed not so much design deficiencies as a massive failure of public policy.

51.Ibid. quoting Gregory E. van der Vink, who teaches a course on disasters at Princeton University.

Appendix A:

NJIT Research

Master of Infrastructure Planning

Introduction

The subject of this studio is the rebuilding of New Jersey in the aftermath of Hurricane Sandy. Working in seven different coastal areas, the students in the Master of Infrastructure Planning Program (M.I.P) at the New Jersey Institute of Technology developed bold visionary regional strategies, and innovative mapping techniques that address the challenges of sea-level rise and climate change.

The studio's efforts were dedicated to developing visionary regional strategies, with students working in teams to construct four-dimensional urban systems models.

These models visualize, overlay and integrate layers such as geology and topography, hydrology, governments and jurisdictions, development, land use and property value/building typology, and demography.

NJIT Infrastructure Planning Program

Through interdisciplinary teaching, research and practice made possible by NJIT's resources in architecture, civil and environmental engineering, transportation, management, and environmental policy studies, the program addresses the global need to train planning and design professionals capable of acting across the spectrum of disciplines involved in infrastructure development.

The goal of the Master of Infrastructure Planning Program (M.I.P.) is to gain a coherent understanding of the interrelationships between those components and to develop the potential of integrally planned and designed infrastructure systems to deal more effectively with the critical problems confronting our cities.

Capitalizing on NJIT 's multidisciplinary resources and location at the center of the nation's greatest regional concentration of urban infrastructure. At NJIT, a number of notable research facilities are engaged in specialized work related to infrastructure planning and design.

Acknowledgements

The students would like to thank Professor Georgeen Theodore, partner at Interboro Partners and director of the M.I.P. Program, and Dean Urs Gauchaut, of the College of Architecture and Design at the New Jersey Institute of Technology, for their continual support of the students, the M.I.P. Program, and research done for the Rebuild by Design Competition.

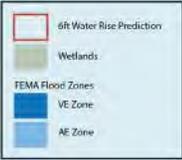
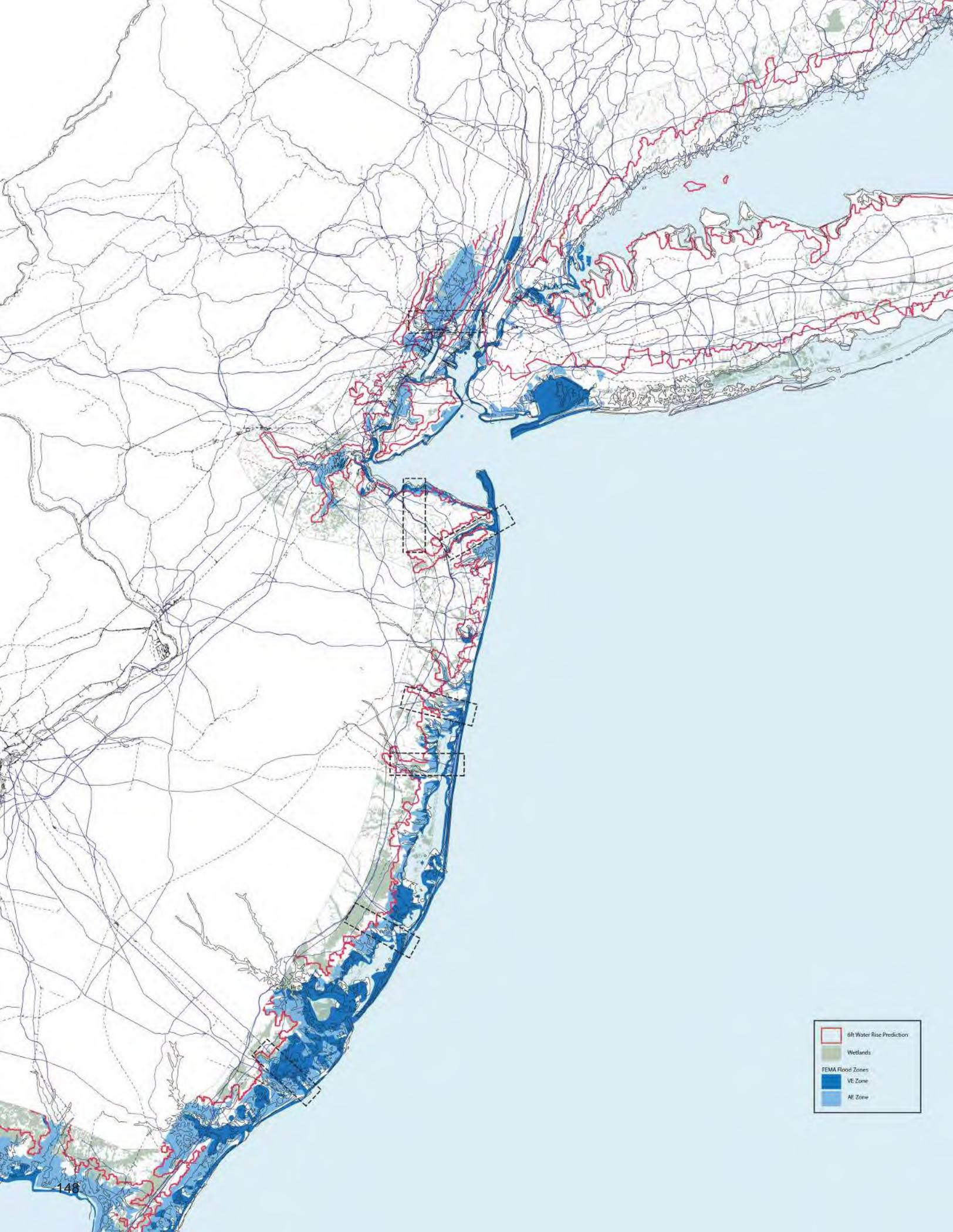


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Vulnerable areas along the New Jersey coast

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Ruben Petrela

THE BARRIER ISLAND to TOMS RIVER
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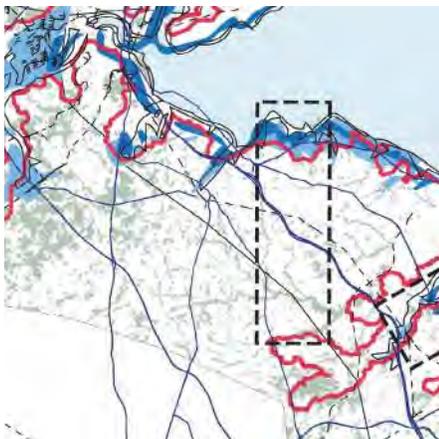
ATLANTIC CITY to PLEASANTVILLE
Janice Siu
Gabrielle Whalen

The regional map, left, shows the coast and areas hardest hit by Sandy.

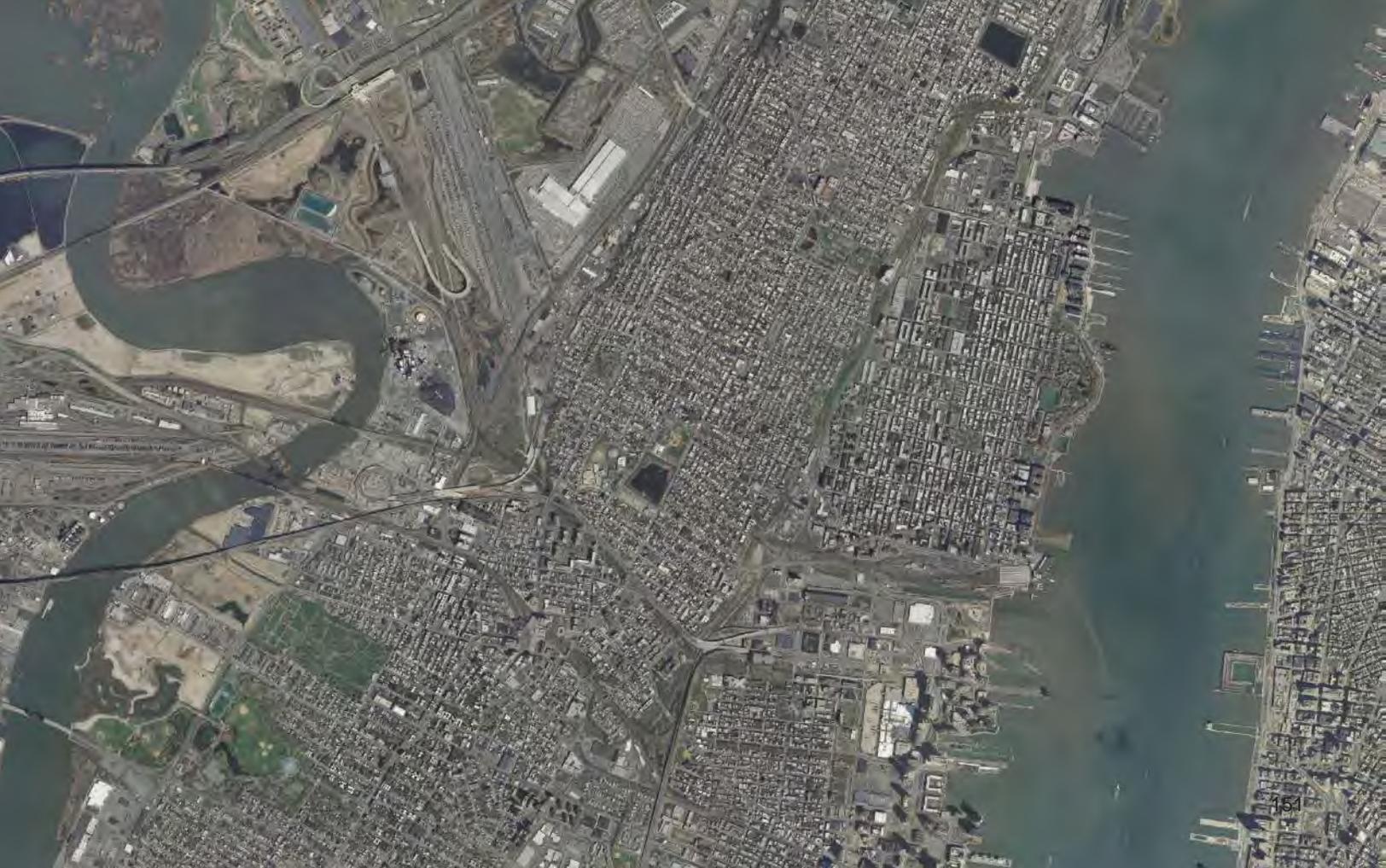
Ecological areas of wetlands and marshes as well the hard infrastructure of the major highways within the region are overlaid with the predicted rise of sea level as well as the FEMA flood zone.

The black rectangles are the areas of research done by the students.

Below, three zoom in of the seven slices are shown.







About Hoboken and the Meadowlands

Context

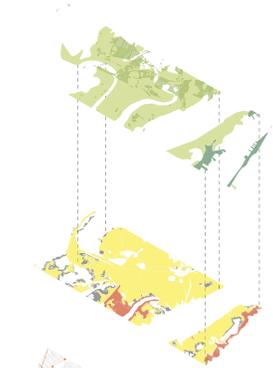
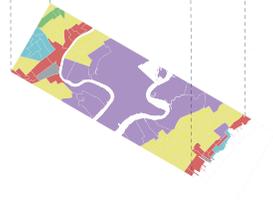
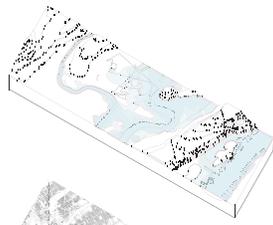
Situated along the northeast corner of New Jersey, the Meadowlands serves as the industrial core for the metropolitan area of Manhattan, Jersey City, Hoboken, Kearny and Newark. The region is popular for recreational centers, outlet shopping and warehousing. Historically, the Meadowlands has changed from a wetlands zone to an industrial port. The majority of the land in the Meadowlands has shifted from being agricultural sites to landfills primed for future development. This change in usage has destroyed the natural landscape of the Meadowlands, affecting ecological processes like natural water mitigation and watershed systems.

Risk + Need

During Superstorm Sandy, perimeter areas that were developed more densely flooded extensively. Due to the nature of these industrial sites, a lack of impermeable surfaces prevented water absorption and resulted in more property damage. As a major contributor to the metropolitan economy, the Meadowlands must continue to serve as the region's main industrial hub while remaining in low lying areas prone to natural flooding.

Design Opportunity

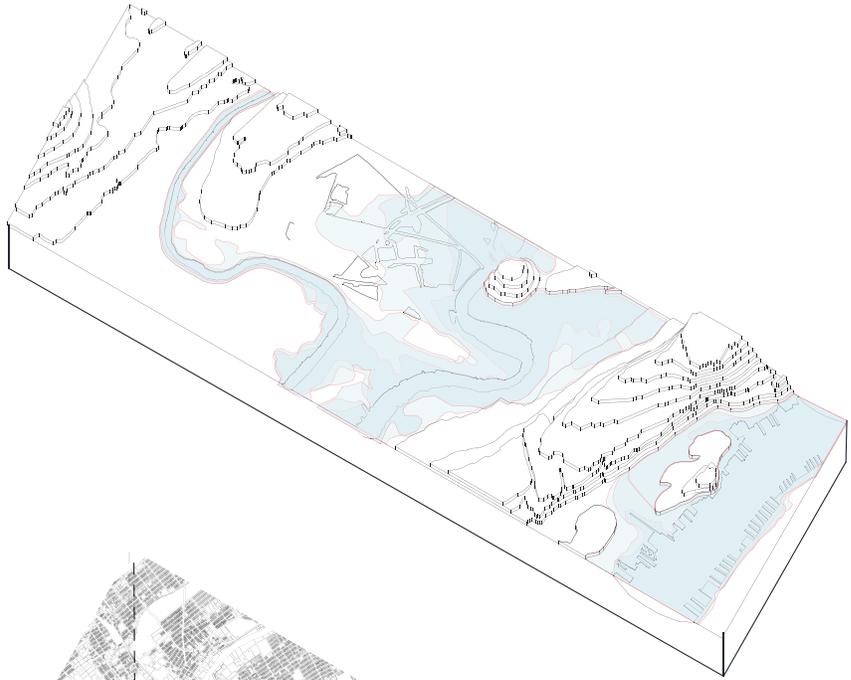
Overlaying key layers of information mapped at the scale of our specific slice, both potential areas of risk and need can be identified. An opportunity exists to address the problem of flooding exacerbated by the lack of permeable surfaces. Current efforts to maintain the Meadowlands fail to integrate existing patterns of development with natural ecological processes. Proposing a solution that reevaluates this disconnect helps enhance the relationship between natural landscapes and the built environment.



Layers

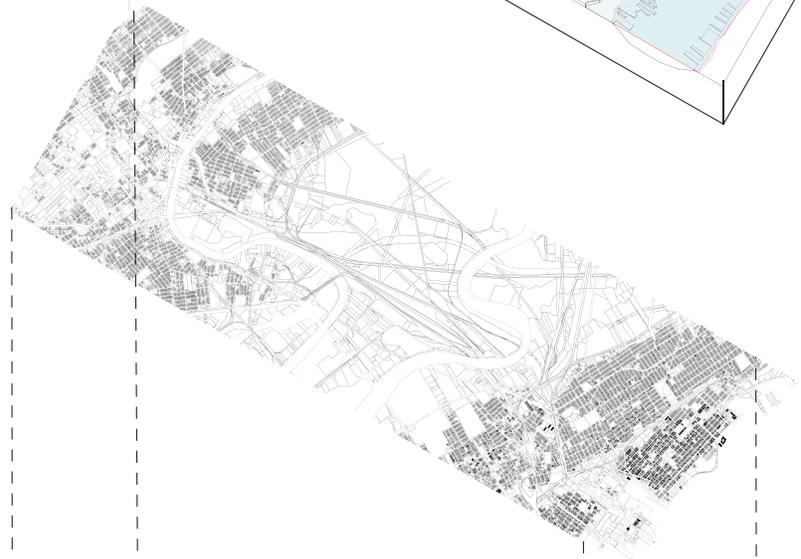
SEA LEVEL RISE

Projecting future sea rise of 2'-0" and +4'-0" and +6'-0" shows that many of the most developed areas will become partially, if not completely, submerged in water.



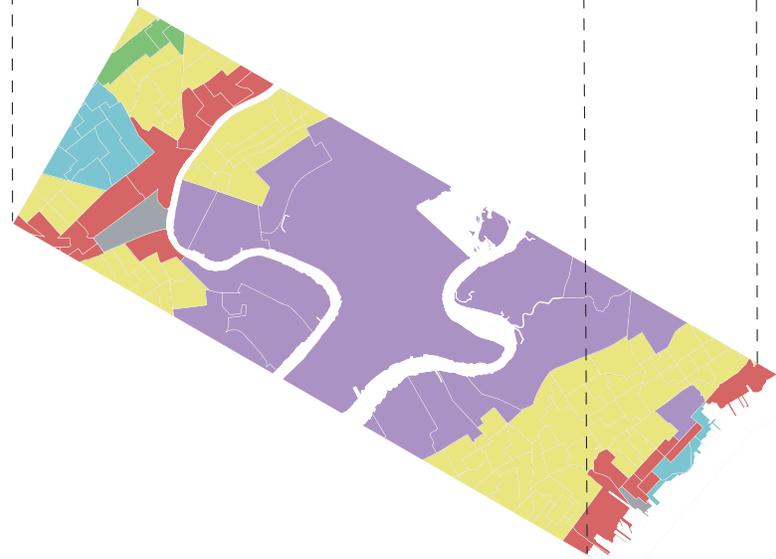
DEVELOPMENTAL DENSITY

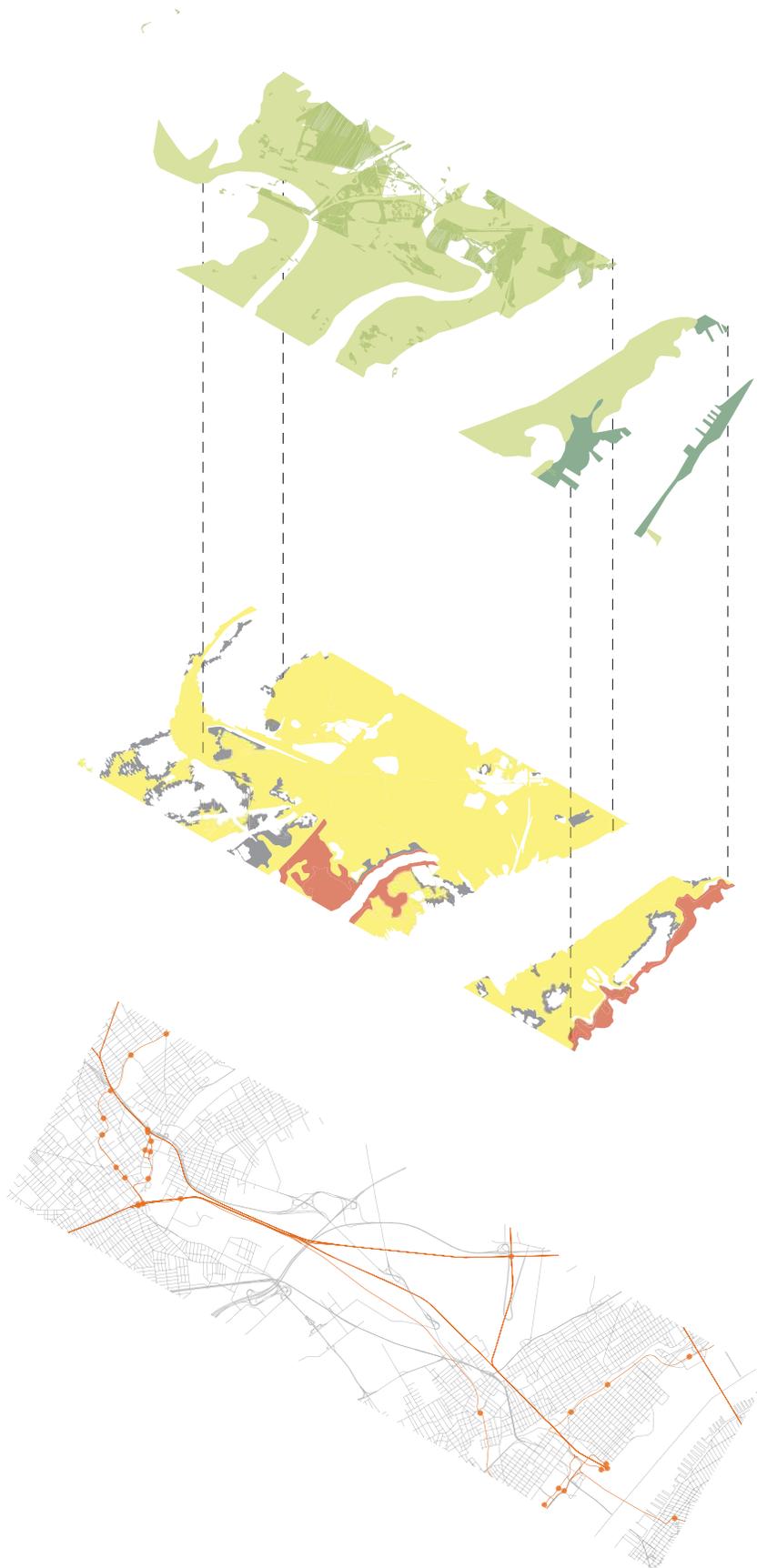
The perimeter of the Meadowlands is typified by smaller parcel sizes and denser zones. The central zone consists of larger paved lots.



LAND USE

The outer most developed areas on higher ground are used for residential purposes, whereas the inner, wetland areas have been used for warehousing and industrial purposes.





WETLANDS

The central zones were historically all wetlands which recently have been converted to industrial warehousing sites greatly decreasing the amount of natural wetlands.

FEMA FLOOD ELEVATIONS

The central area of Kearny, historically wetlands, was most affected by FEMA's new zoning as a result of major flooding.

TRANSPORTATION

Running north to south is the Turnpike I-95, directing most traffic into Manhattan. The Meadowlands serves an artery providing the necessary means of transportation of good and people to the metropolitan region.

HISTORICAL FILL

As the land use of the region changed over time, the central part of the slice has been filled in through time, which can be a potential risk.



TOPOGRAPHY

The drastic change in topography of this slice from the high ground, the Palisades, to the low lying marshes, the Meadowlands, makes this region a potential risk.



OVERLAY

The combination of land use development, historic ecologies and economic importance make this site vulnerable to potential risk.



RECREATION
PATCH

RESIDENTIAL
PATCH

MEADOWLANDS

HISTORIC WETLANDS

- PHRAGMITE DOMINATE COASTAL WETLANDS
- INTERIOR PHRAGMITE DOMINATE WETLANDS
- MANAGED WETLANDS
- DECIDUOUS WETLANDS
- SALINE MARSH
- BUILT OUT LAND
- HISTORIC WETLANDS

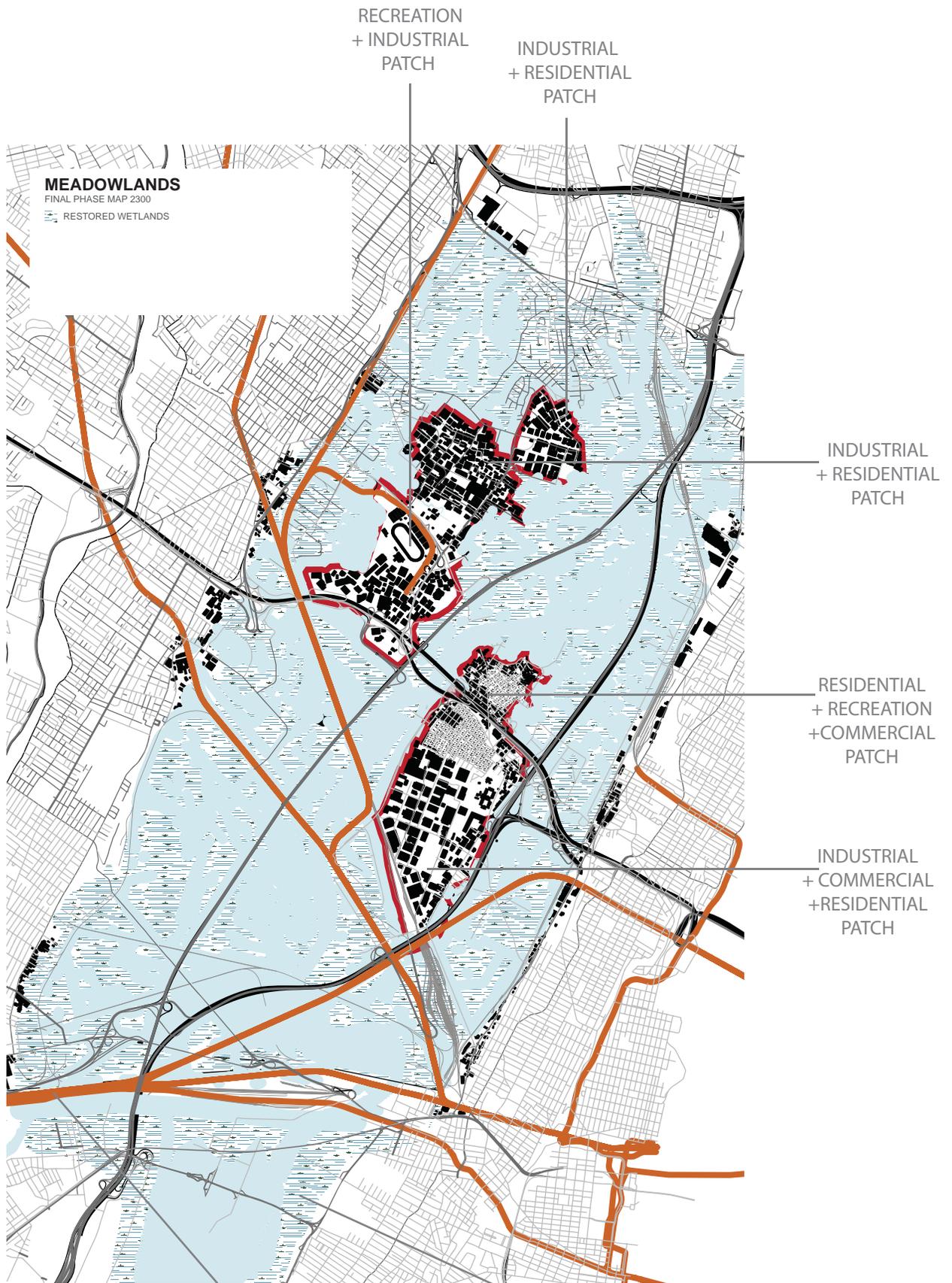


INDUSTRIAL
PATCH

RESIDENTIAL
PATCH

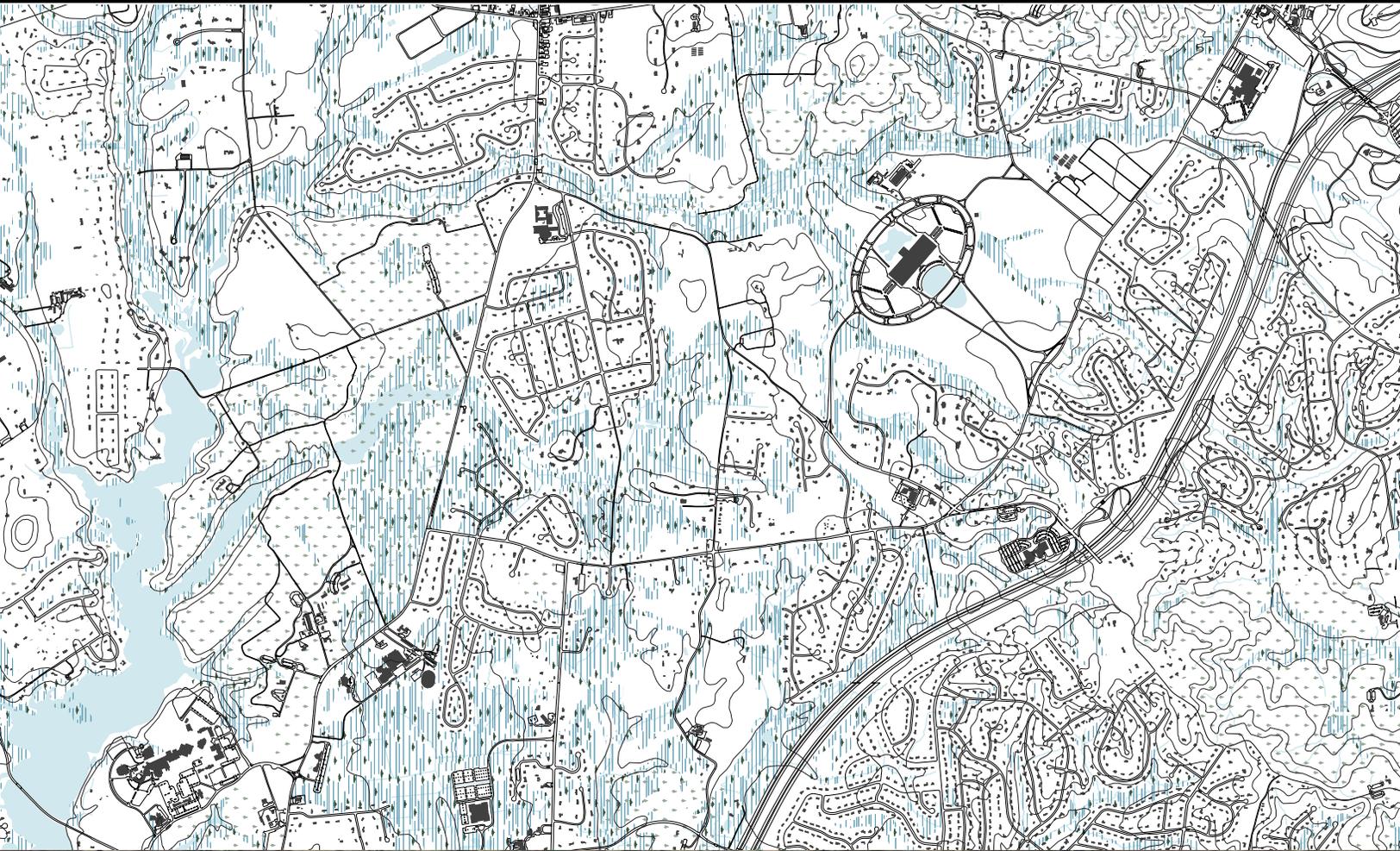
INDUSTRIAL
PATCH

INDUSTRIAL
PATCH



The Infrastructure is made permeable to allow the integration of the ecological processes and developed zone.

Introduce new wetlands zones while changing the land use for mixed use zones





About the Raritan Bay

Context

New Jersey's Northern Coast is obscured by the more popular 'shore'. Stretching from South Amboy to Sandy Hook, it is the closest beach to New York, a geographical condition that led to Keansburg's rise as a recreational retreat. What started as a settlement of summer rentals became more permanent over time, though never losing its character as a primarily rental community. Union Beach, adjacent to the west of Keansburg, primarily consists of full time homeowners. Further inland, on the border of Hazlet, two local highways (Rt. 36 & Rt. 36) serve as the primary retail corridors.

Risk + Need

The two coastal towns have one thing in common: poverty. The region is characterized by a slow rise into the hills of the highlands and a subsequent rise in real estate value, educational opportunities, and income, not to mention safety from rising water.

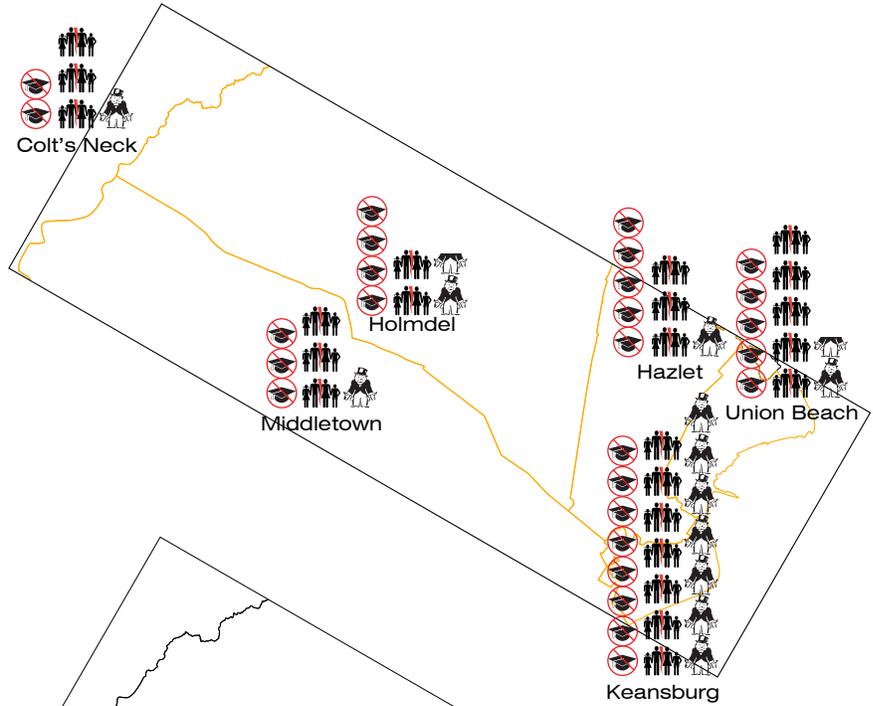
Design Opportunity

Taking as a starting point the inevitable loss of the coastal recreation economy and dwellings, changes in the aftermath of flooding can be used to wash away the inequality that dominates the character of the region. Densifying the more vibrant of the two retail corridors (Rt. 35), relocating dwellings and increasing rental stock, will give those at risk better access to education, retail, transportation, and subsequently, jobs. By controlling the degradation of Rt. 36, it can serve a new purpose as a hotbed of ecotourism doubling as soft storm water barrier and flood water run off gutter.

Layers

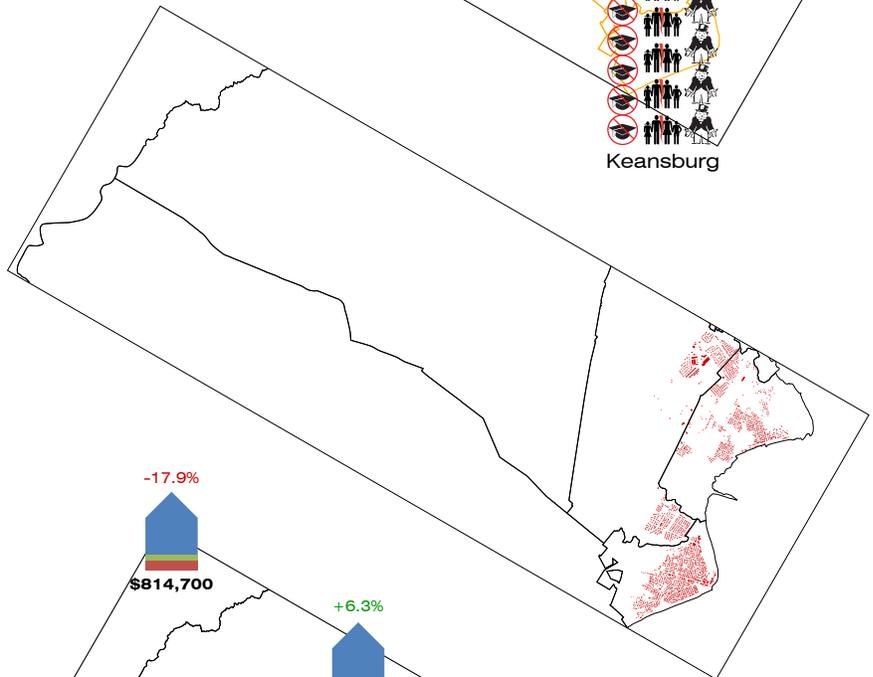
DEMOGRAPHICS

As the blue collar societies of Keansburg and Union Beach struggle through the economic contraction, the vulnerability is polarized. Communities such as Hazlet and Holmdel, on higher ground, are less affected by high school drop-out rates, broken homes, and poverty.



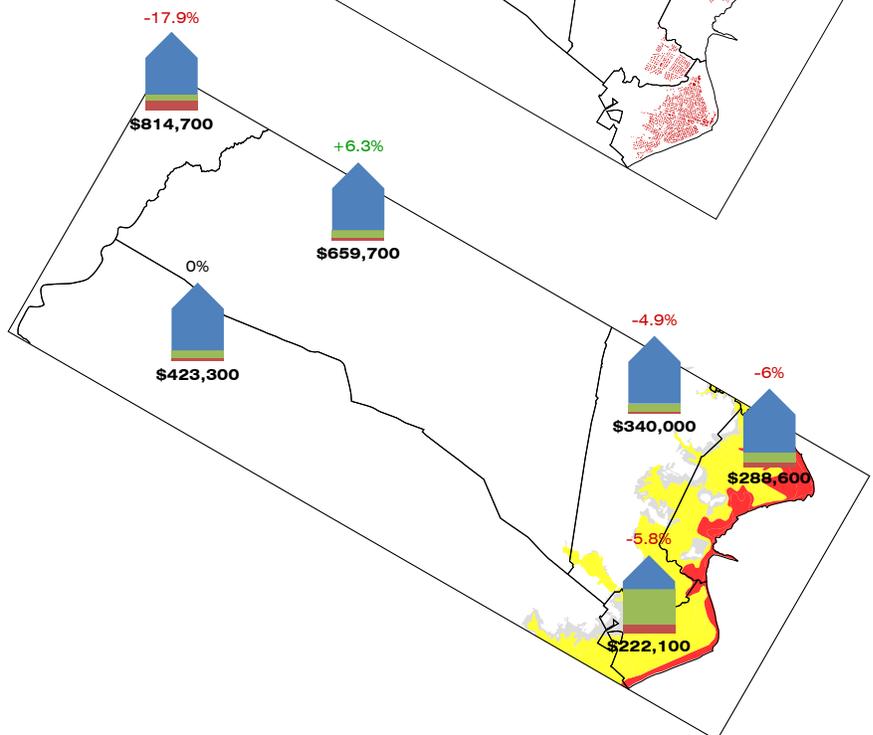
SANDY DAMAGE

Most of the land in Keansburg and Union Beach is below 10'-0" in elevation. When the water came on land there was little to stop it resulting in widespread inundation and destruction of houses.



FEMA FLOOD ELEVATION

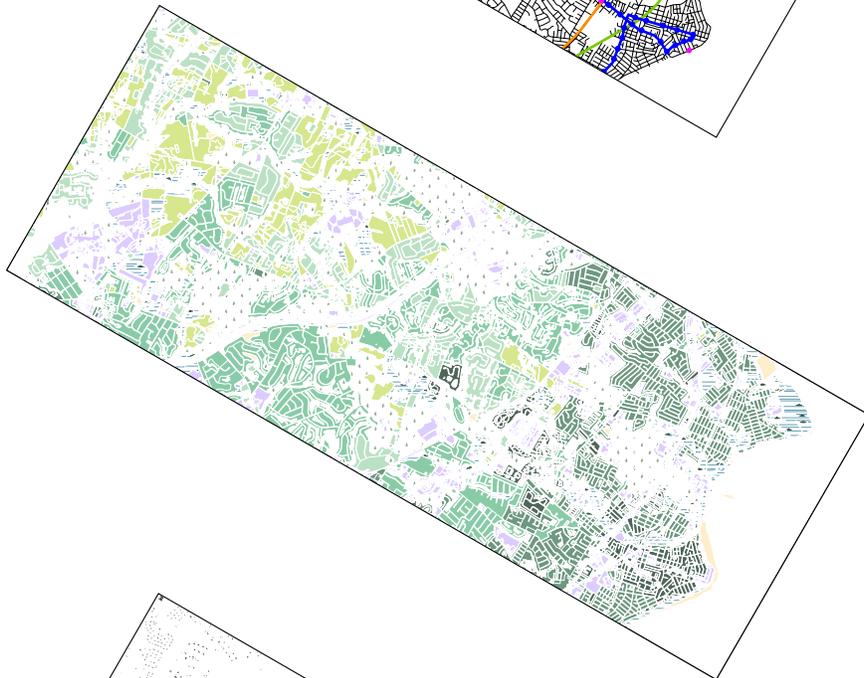
Keansburg and Union Beach, some of the poorest municipalities in the region, will have to cope with the brunt of rising insurance costs. Renters (the green section of the house diagram) will not have access to the kind of compensation Union Beach residents have and vacant properties (red in the house diagram) highlights the poverty of this particular area.





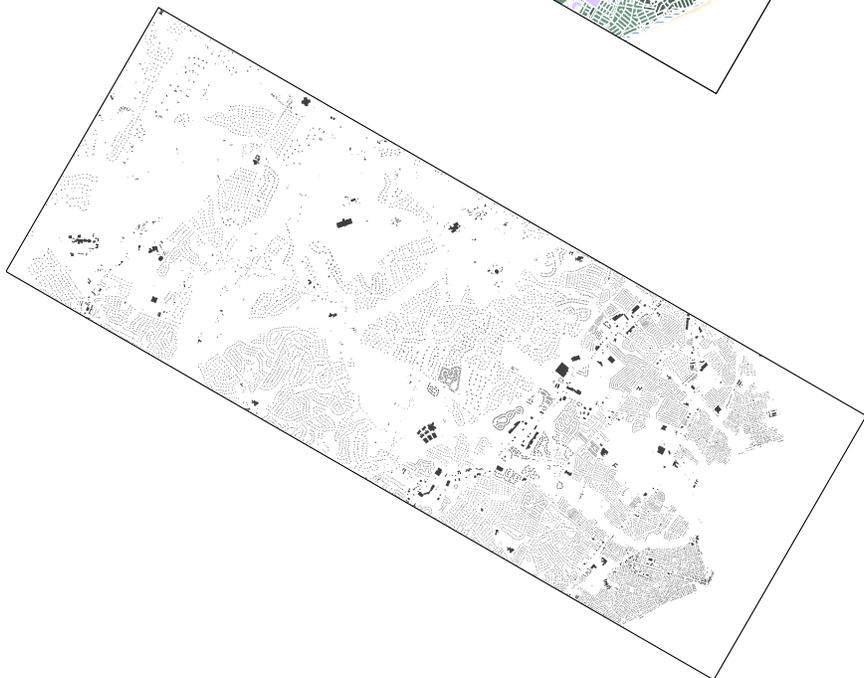
TRANSPORTATION

While the area is characterized by an inland rise in opportunity, public transportation only moves perpendicular to this. Also notable is the dramatic loss in density coupled with slight rise in elevation.



LAND USE

Following the lines of transportation, retail corridors (in purple) have developed along primary evacuation routes. Rt. 36 is rife with empty lots and Rt 35 consists of big-box retail and a commuter bus stop.



BUILDINGS

The coast is more densely developed than in-land, with larger building footprints. This exacerbates flooding in low-lying regions less capable of coping with excess storm water.

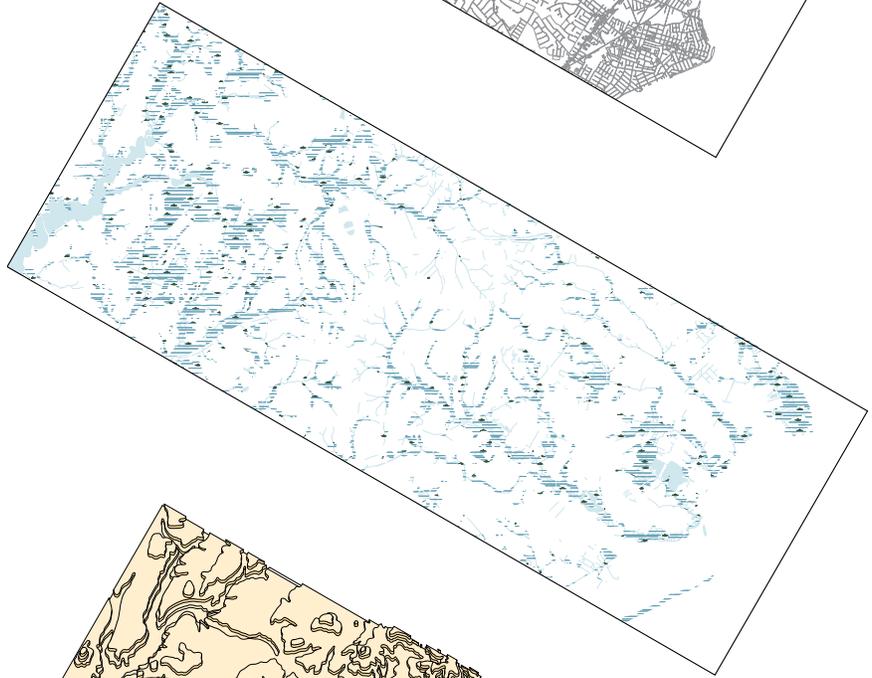
ROADS

There is higher percentage of impermeable surface by the coast.



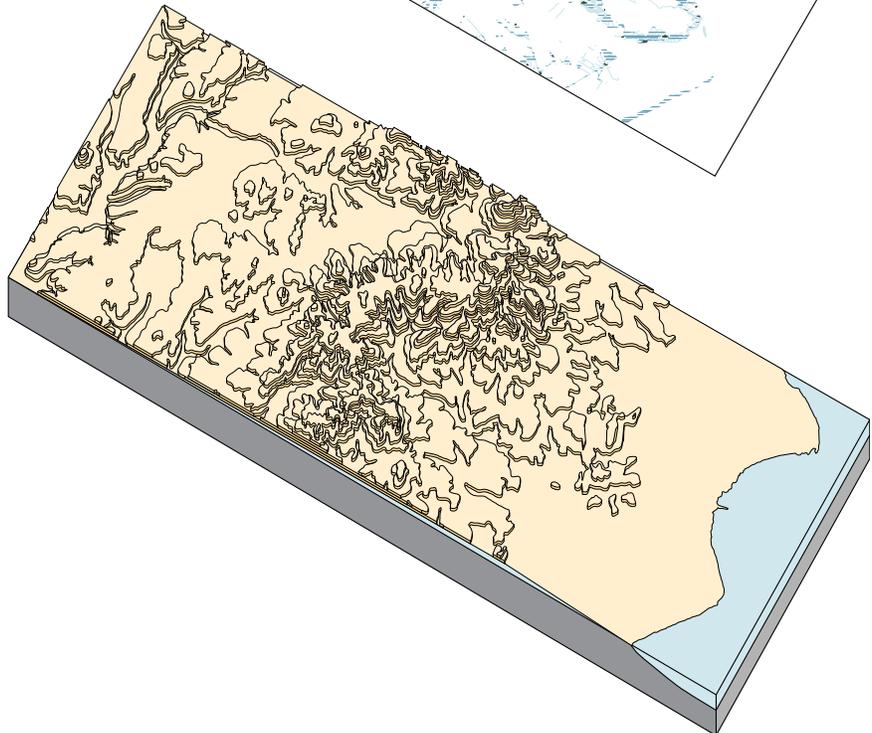
HYDROLOGY

On the coast, the creeks play an important role in channeling water from higher elevations into the wetlands that have not been paved over. However the increase in runoff has not been met with an increased capacity for the creeks to move water.

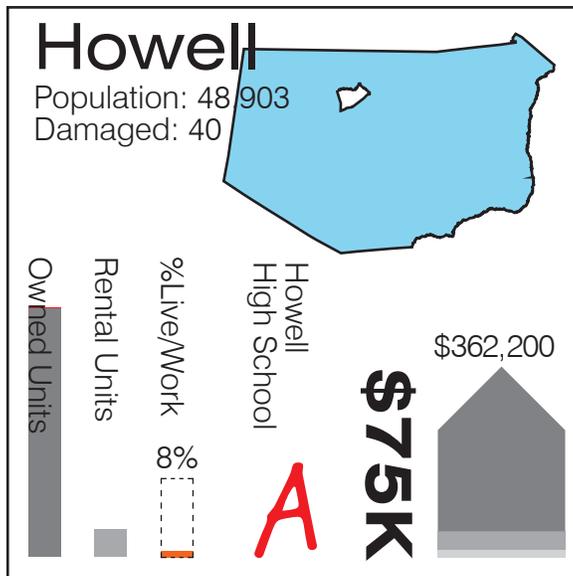
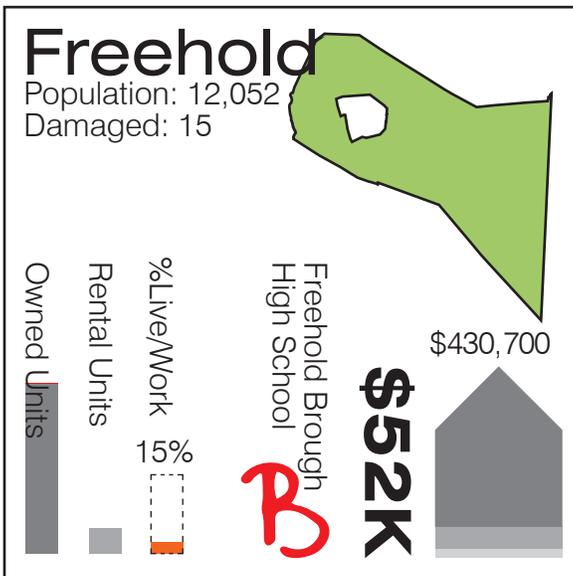
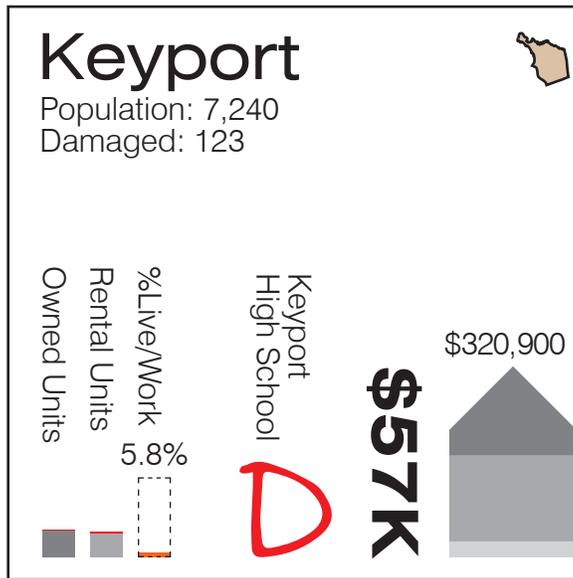
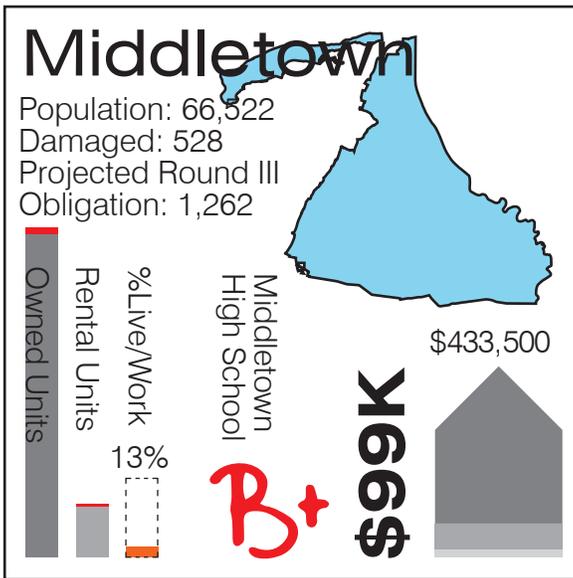
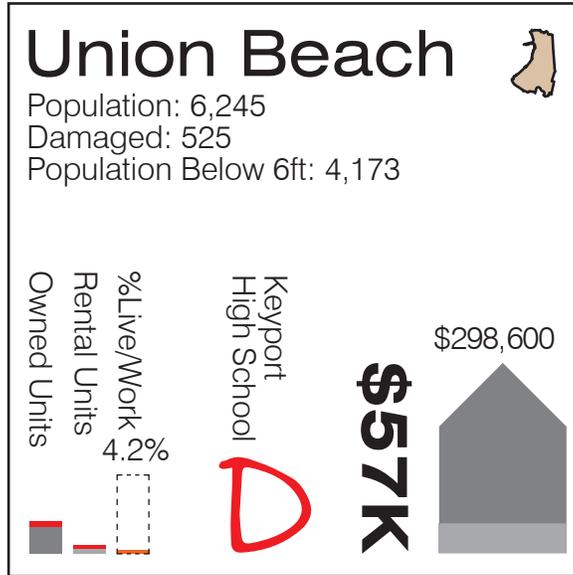
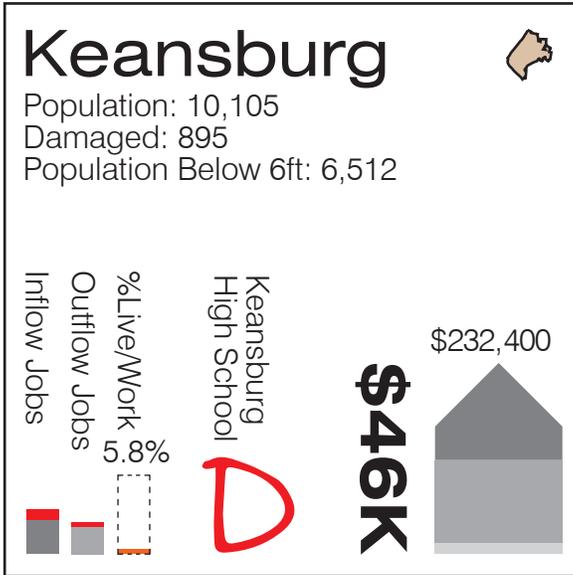


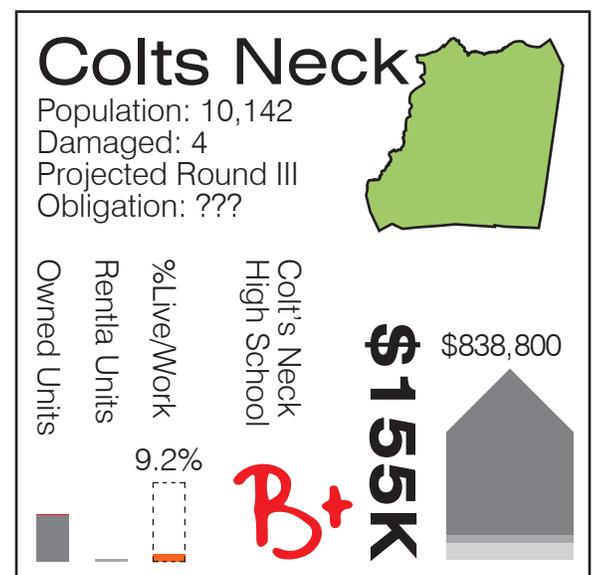
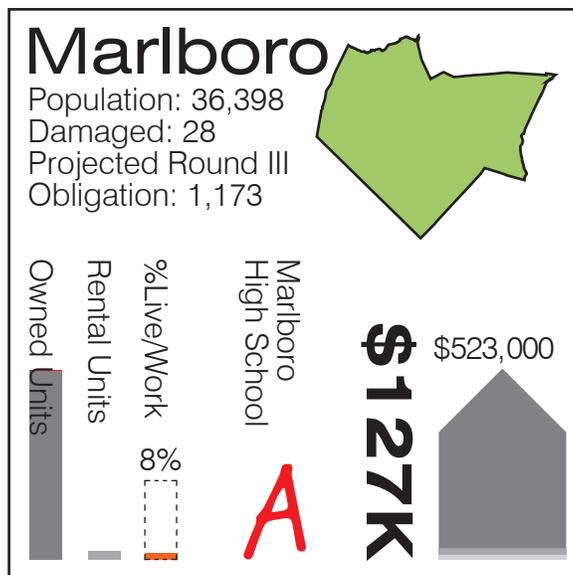
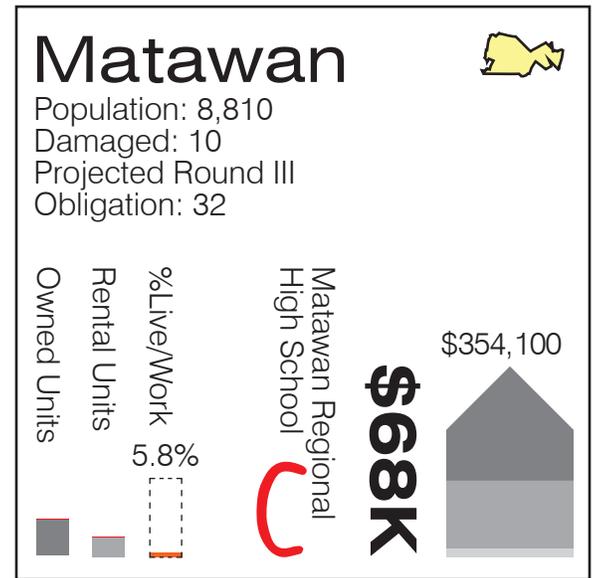
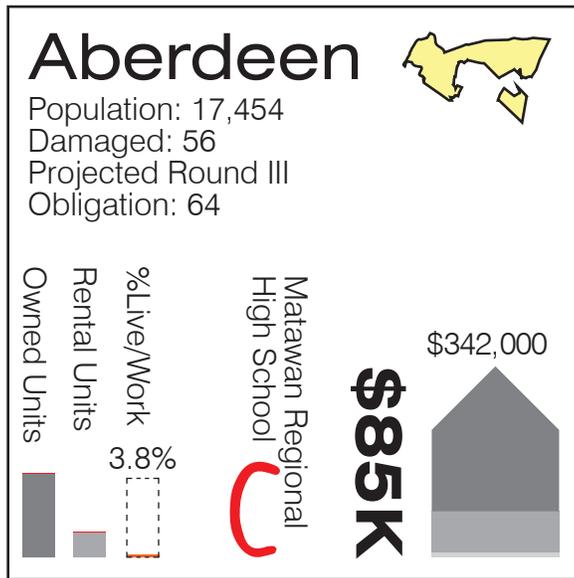
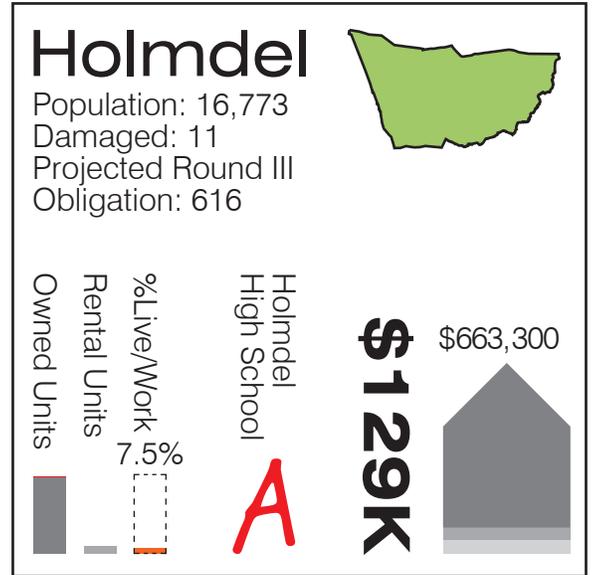
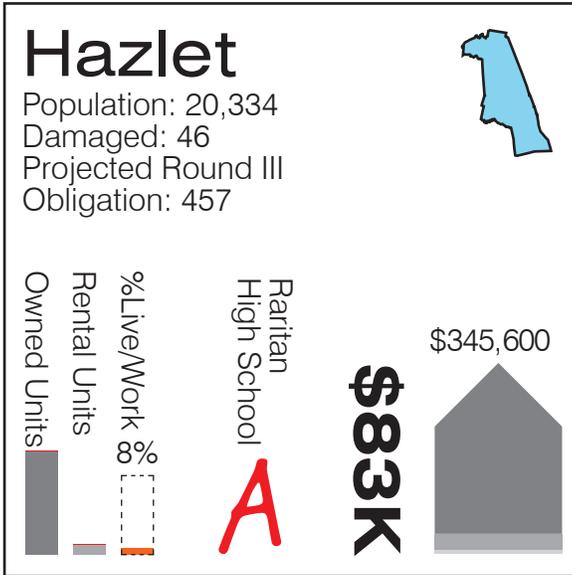
TOPOGRAPHY

As one moves in-land from the coast, elevation rises. A ridge in the south is the highpoint of the area, dividing watersheds draining into the Raritan Bay versus those which drain into the Navesink River.

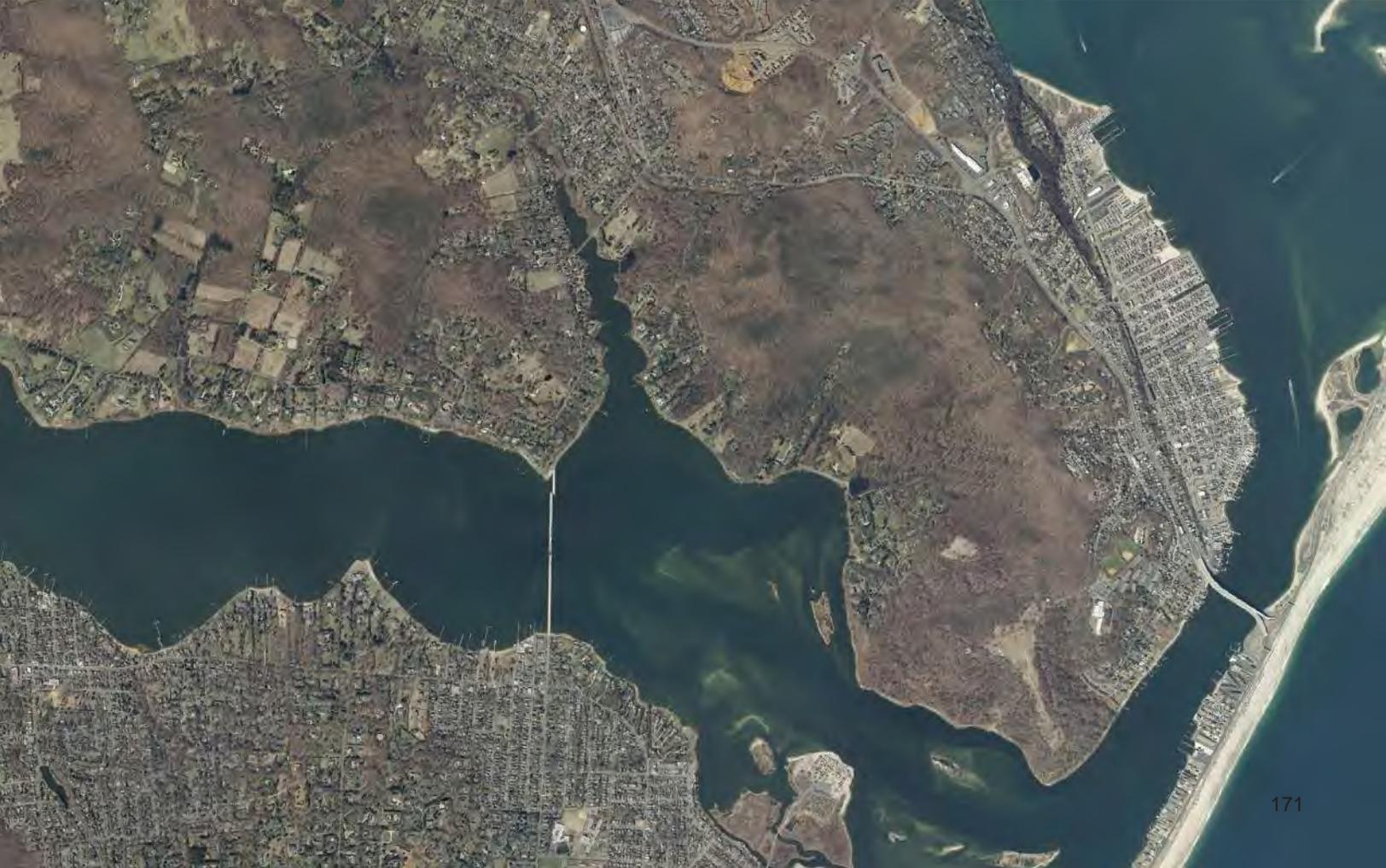
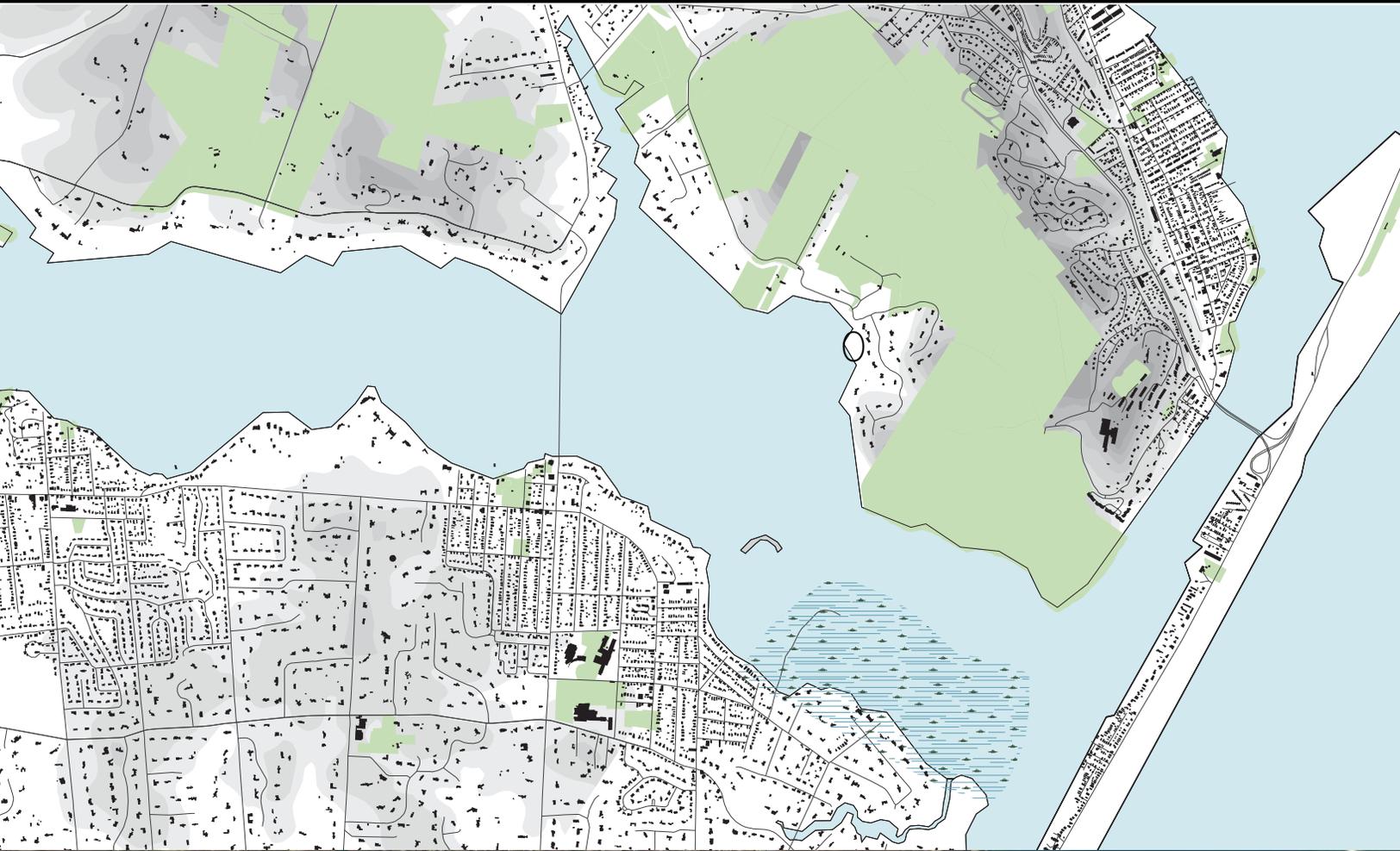


Municipal Report Cards









About Sea Bright and the Highlands

Context

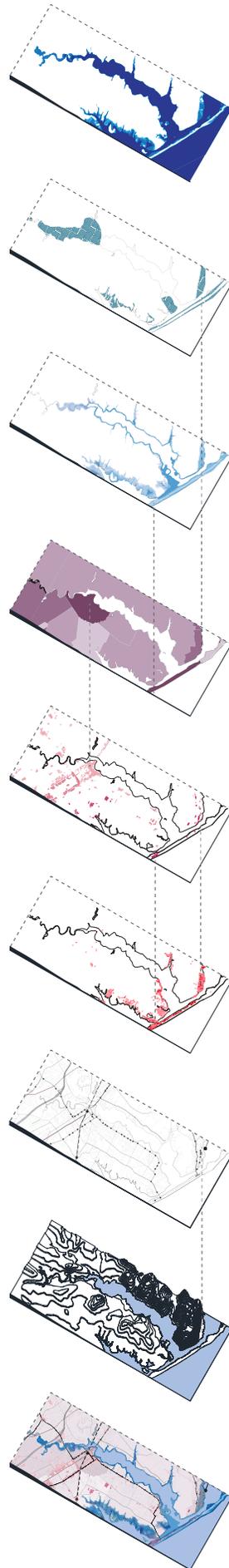
Situated in Central New Jersey by the Sandy Hook peninsula, the Navesink River area is a draw to many in the surrounding areas for its recreational resources. The beaches in Sandy Hook and Sea Bright are two of the biggest draws to the area along with fishing, boating and crabbing in both the river and ocean. The residents in the slice live together with very strong ties to the area and communities. A majority of the economic activity in the area is focused on the tourism industry with many restaurants, bars, and beach clubs catering to the tourists and residents that come into the area.

Risk + Need

With demographic and economic research, we were able to document areas in the slice that indicated zones of high risk and high need. We discovered that the areas around Highlands and Sea Bright were the hardest hit from Sandy, with most of the damage resulting from flooding and storm surge. These two areas are also areas of low income, high renter occupancy, and low economic activity. These characteristics discovered from our research confirm that these areas have a low resiliency to rebuild and rebound after a disaster.

Design Opportunity

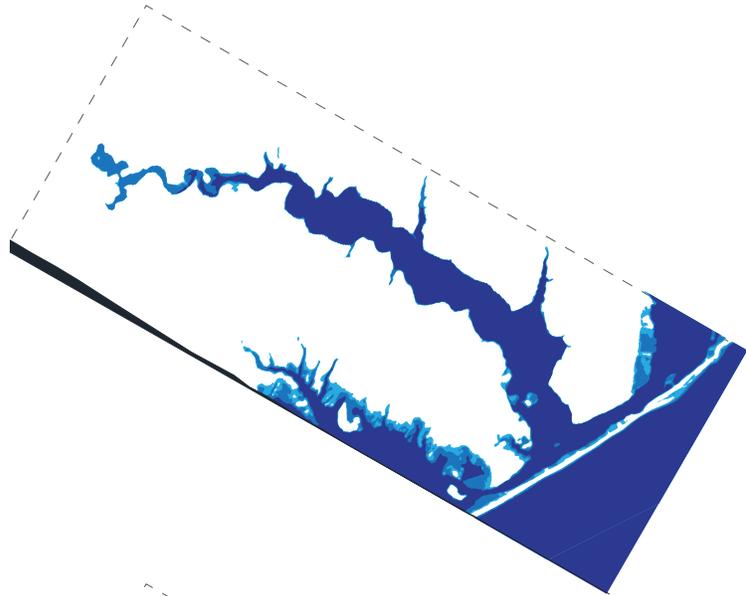
After the areas of risk and need were identified, a design opportunity arose to aid these communities in becoming more resilient in the face of an increase in flooding and storm events. The first concern for the design opportunity is to adapt the existing economic infrastructure to increase economic activity, and protect against future flooding and storms. This requires building up and strengthening the economy and economic resiliency of the two areas. A strengthened economy can facilitate policy changes to protect the existing housing and structures from flooding and storm surge with seawalls, bulkheads, and revetments.



Layers

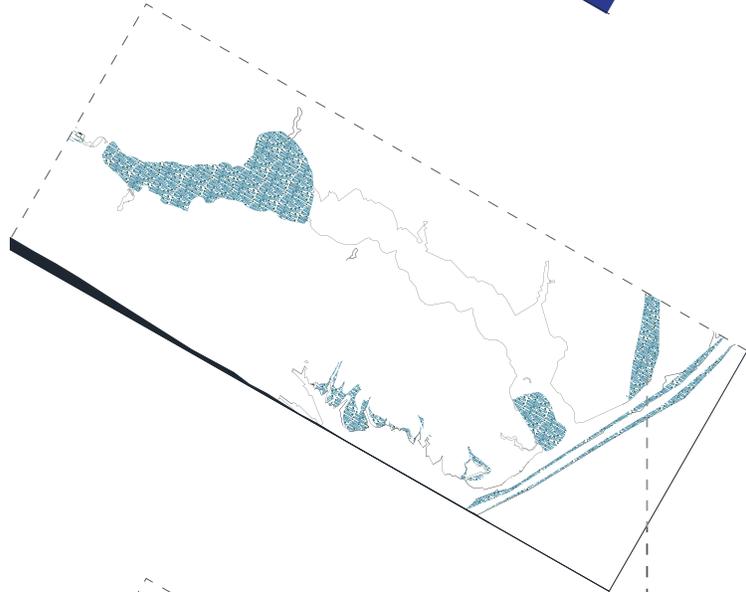
SEA LEVEL RISE

Sea Bright and the Highlands areas are very vulnerable to potential future sea level rise.



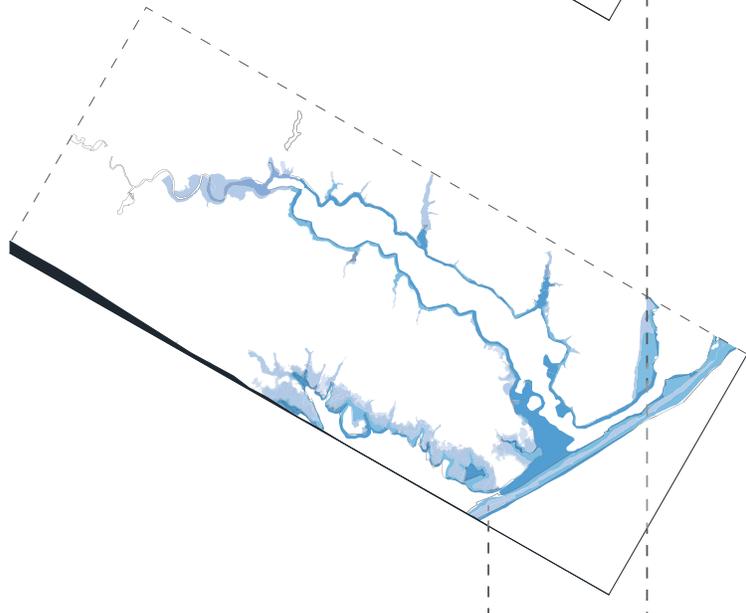
HISTORIC WETLANDS

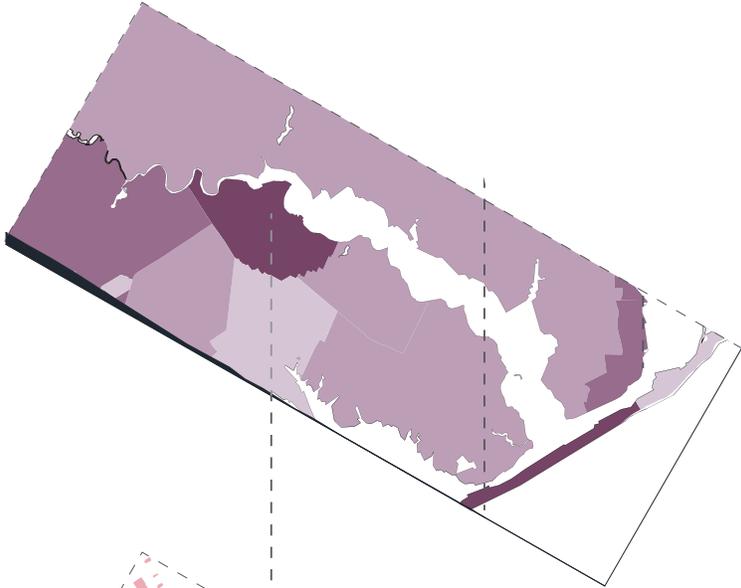
Most parts of both the Highlands and Sea Bright were historically wetlands.



FEMA FLOOD ZONES

According to FEMA, Sea Bright, Highlands and Rumson are in the high-risk flood zone while Red Bank is generally safe.





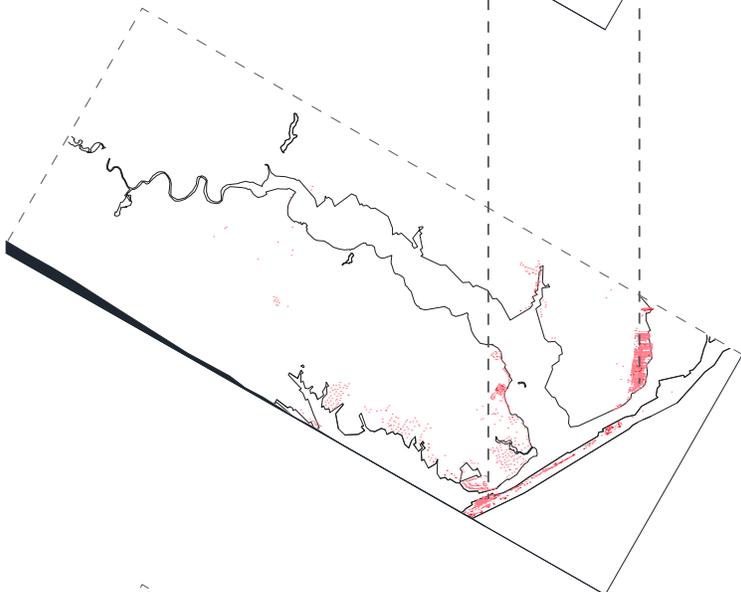
HOUSING TENURE

Sea Bright and Highlands areas have high concentration of renter-occupied housing units.



COMMERCIAL DISTRICTS

The commercial districts concentrated in Red Bank are generally at low risk while the districts in Sea Bright and Highlands are generally at high risk.

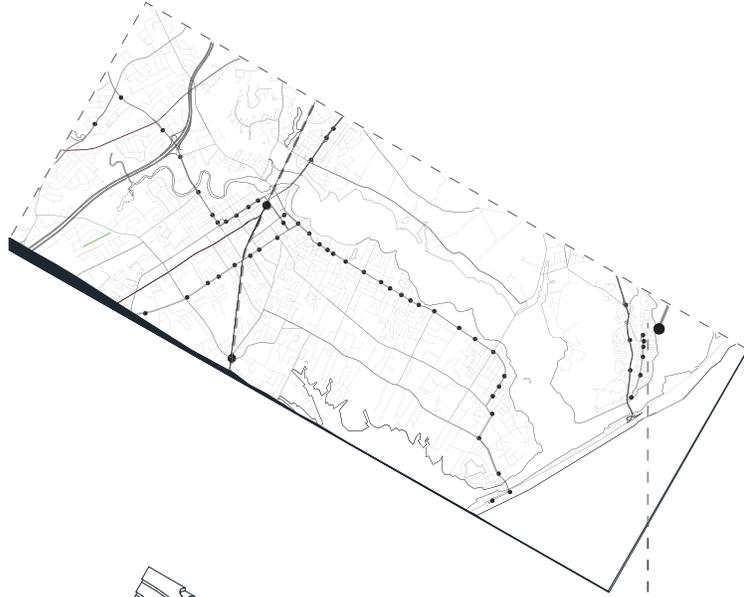


SANDY DAMAGE

From Sandy, buildings in Sea Bright and Highlands were damaged and/or inundated, due to their low elevation levels.

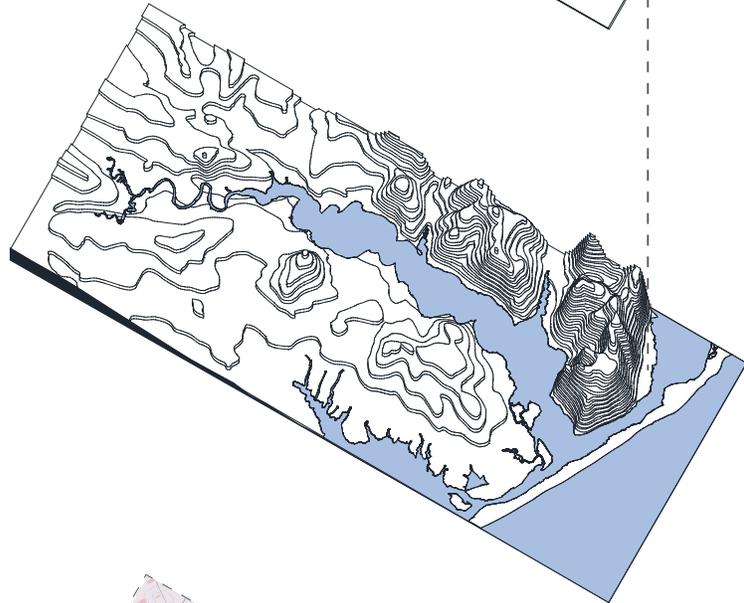
TRANSPORTATION

Public transit access is concentrated in Red Bank and Highlands, but there is no connection between the two.



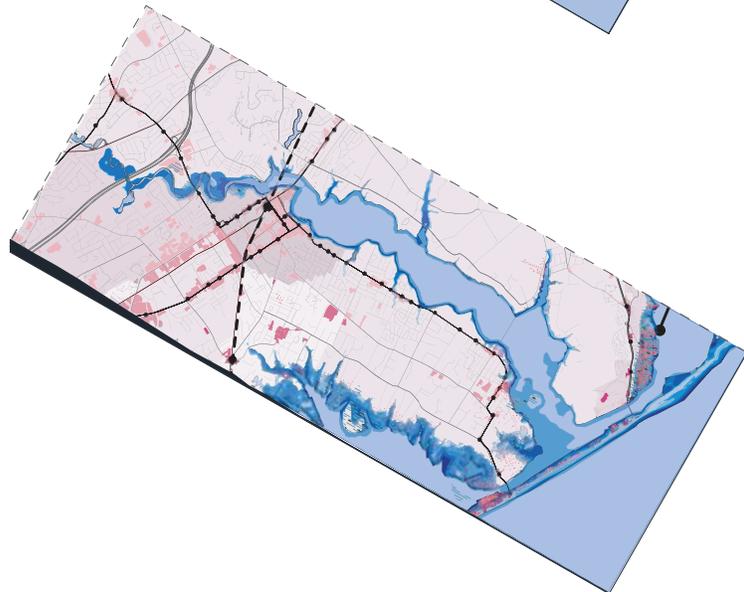
TOPOGRAPHY

The unique topography of the area creates pockets which are more at risk due to their low lying ground, while wealthier communities are found on higher ground.

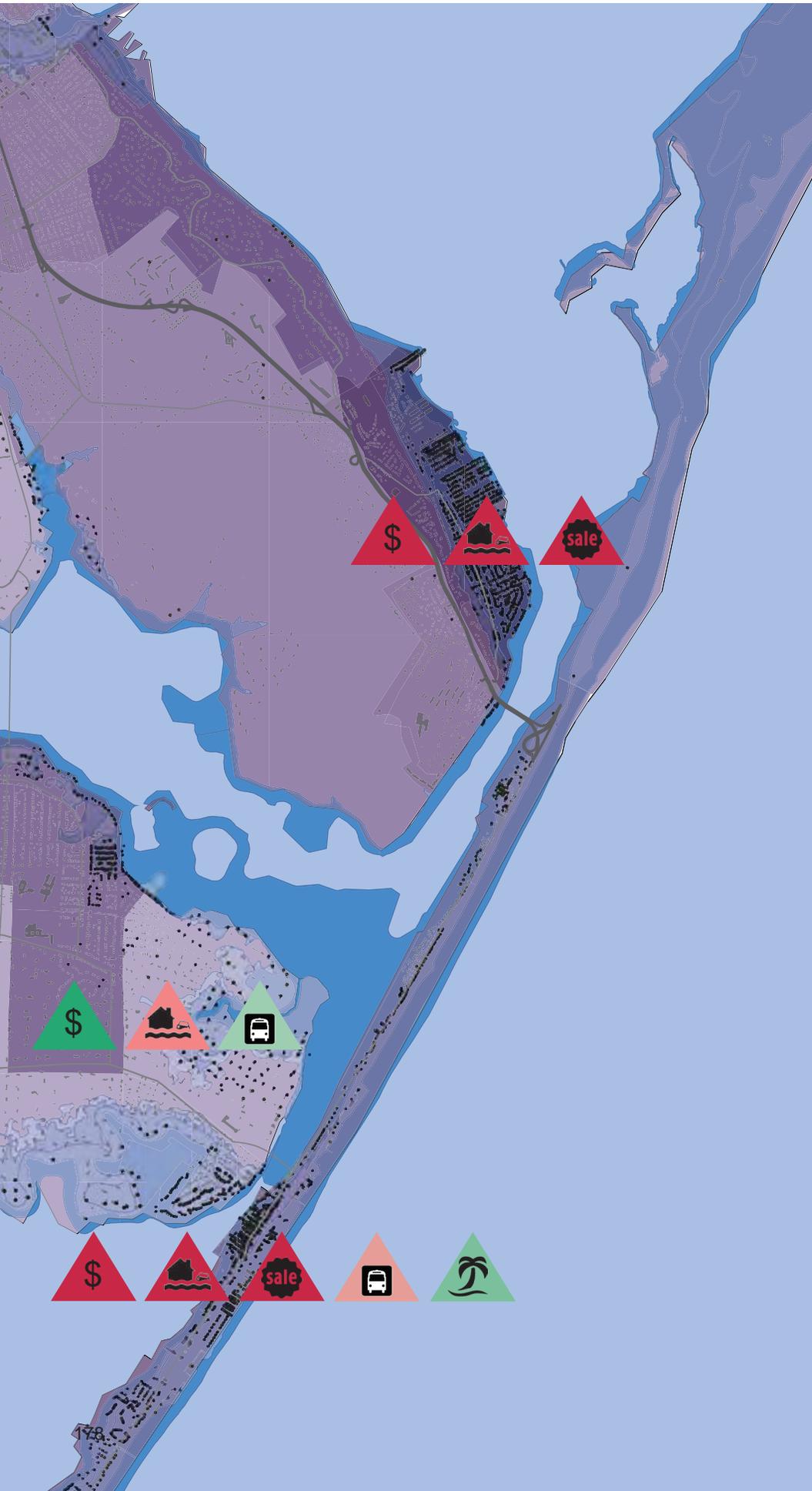


OVERLAY

Sea Bright, Highlands and Red Bank are the places of interests. However, they show different conditions; Red Bank has a stable commercial district, while Sea Bright and Highlands have very vulnerable commercial district.



Ways to Rebuild



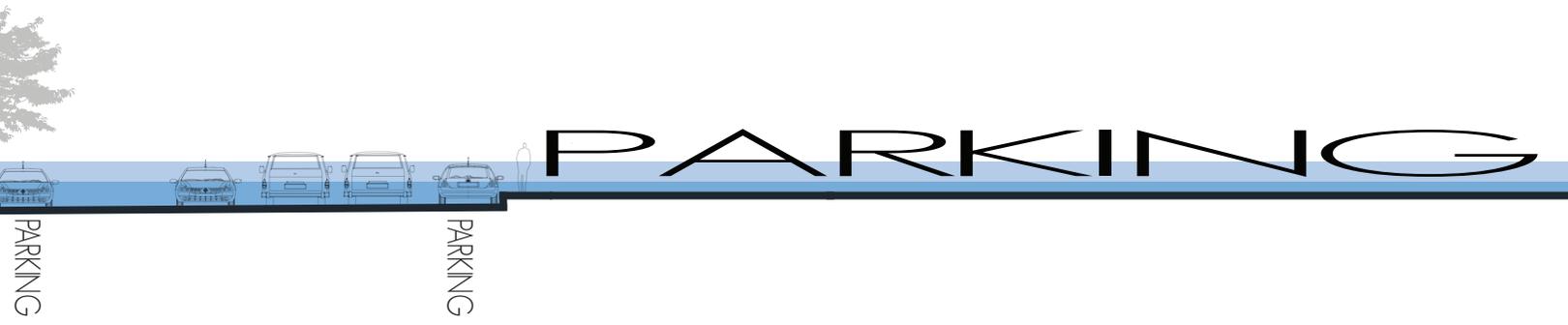
Goal to Build

Area Residents

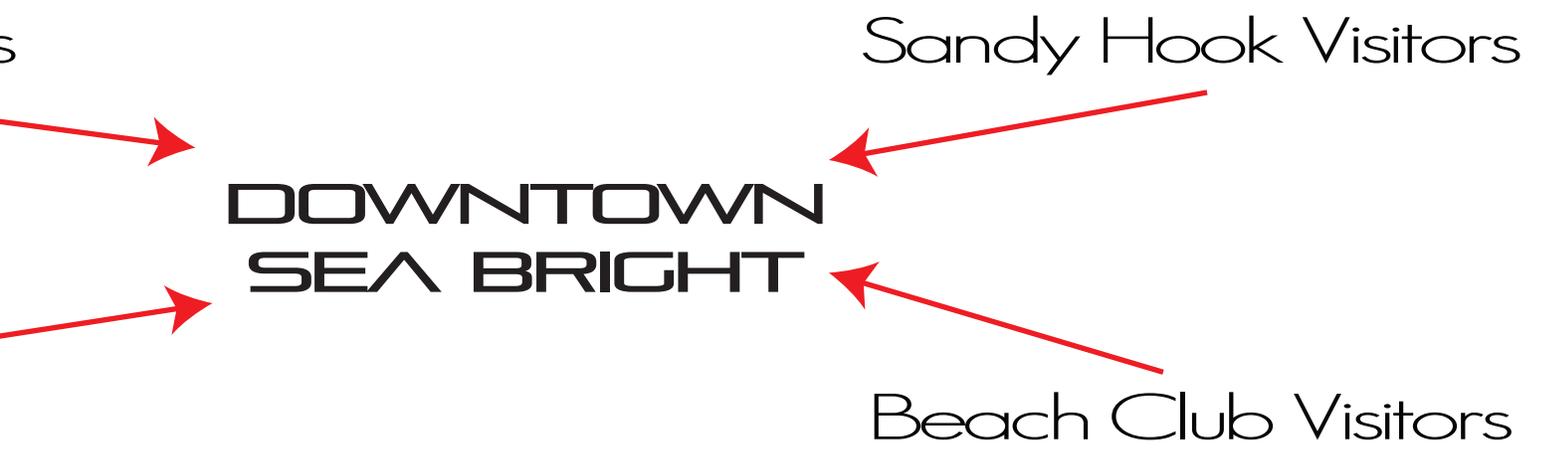
Day - Trippers

Protect





and Economic Resiliency







About Bay Head and Mantoloking

Context

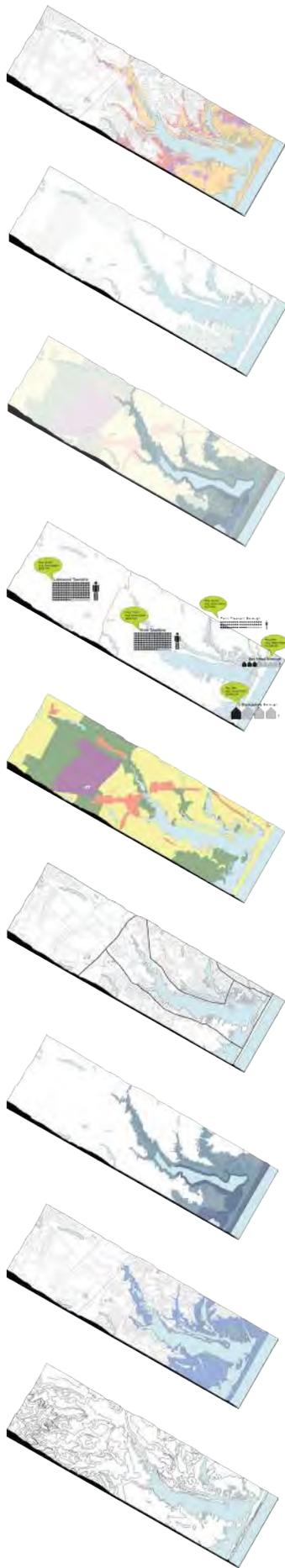
Situated along the northern coast of Ocean County in the center of the Jersey Shore, Bay Head and Mantoloking are two towns that developed at the turn of the 20th century. Their location at the junction between the barrier island and the mainland, as well as their position at the north half of Barnegat Bay, made this stretch of land very valuable for fisherman and recreational beach goers.

Risk + Need

Bay Head and Mantoloking are two similar towns with very different geographical formations. Bay Head connects to the mainland and contains many non-water front properties, while Mantoloking sits on the narrowest portion of the northern Ocean County barrier island. Most of its property is either ocean or bay front. To the north, south and west of these towns sit popular tourist destinations, middle class communities, and seasonal vacation rental havens. All of these towns sustained significant flood and surge damage from Sandy. Mantoloking, being the epicenter in terms of physical damage, saw three new inlets carved through the width of the entire island destroying homes and infrastructure. Much of this damage can be attributed to private property owner resistance to building federally funded dunes greatly diminishing the amount of public beach area and access.

Design Opportunity

In particular, Mantoloking does a good job of keeping outsiders off of its beaches. The Mantoloking Bridge connects neighboring Brick Township to the island, but beach access and parking can only be found to the north and south of Mantoloking's borders. The federally funded dune project is underway and will provide large beaches and protective infrastructure, but beach access will still be limited. The solution is to implement change on a regional scale with the introduction of a bike share system and network of bike lanes throughout the northern Ocean County barrier island communities. The bike share network will provide more beach access for people living in the neighboring communities to areas that have restricted parking.



Layers

FEMA FLOOD ELEVATIONS

FEMA rezoned many areas ultimately including more homes than before in “V” and “A” zones. Bay Head and Mantoloking are completely under flood risk, as well as much of Point Pleasant Borough and all portions of coastal Brick along the bay and rivers.



WETLANDS

At one time, the area was made up of mostly wetlands along the bodies of water. Much of this land sits at low elevation and is prone to flooding.



LAND OWNERSHIP

The primary area of flood risk is comprised of residential use. The barrier island acts as a buffer, protecting the bay from rising during a storm surge, is controlled by private land owners.





MUNICIPALITIES

The towns nearest to the ocean are also the smallest in terms of land area and population. Bay Head and Mantoloking also happen to be the wealthiest boroughs.



LANDUSE

The area is primarily made up of single family homes. Some major retail corridors and light industrial areas are situated near the center of the slice.

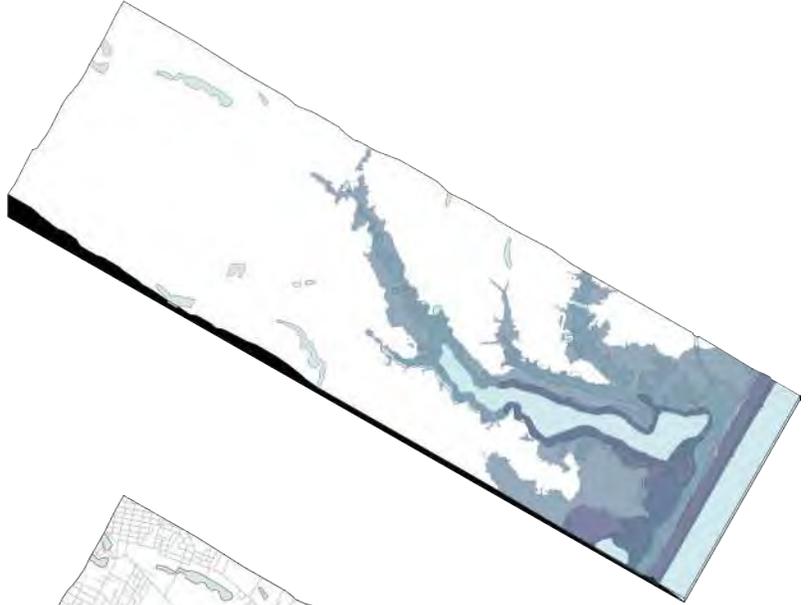


TRANSPORTATION

Three interchanges along the Garden State Parkway are the main access points to and from the region. Route 35 and the Mantoloking Bridge are the two main evacuation routes to and from the island.

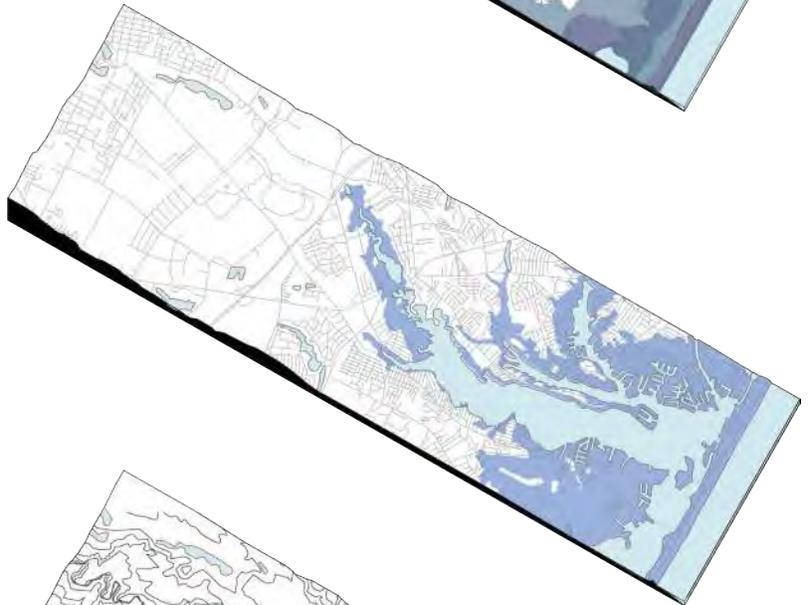
SEA LEVEL RISE

Projecting future sea rise of 2'-0" and +4'-0" and +6'-0" shows that a significant part of the most densely populated areas will be underwater in future storms.



SANDY FLOODING

The areas shown here in blue were submerged during Hurricane Sandy's storm surge at high tide. The overlay with the transportation network shows how much of the effected land is developed and used for residential use.

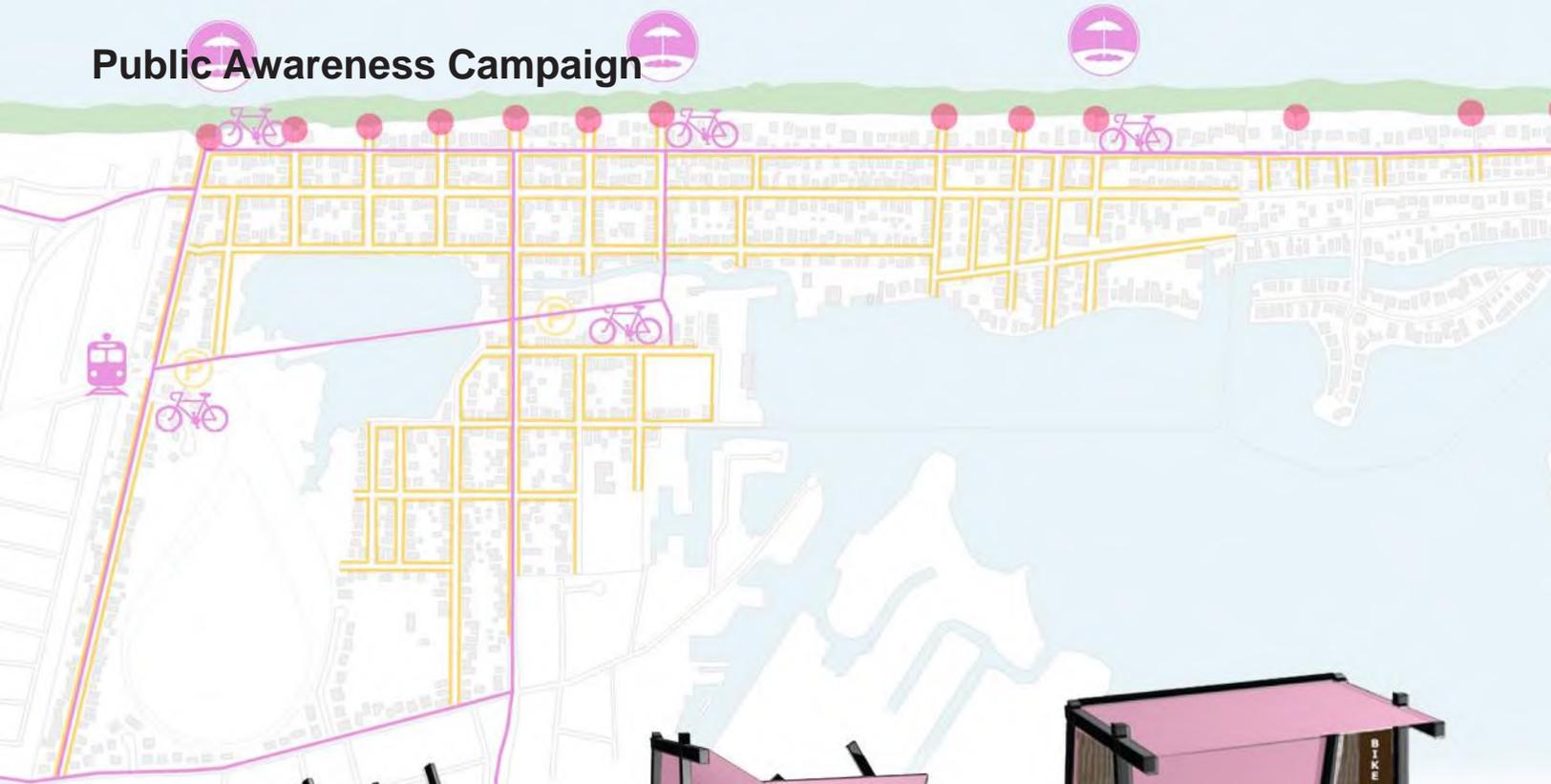


TOPOGRAPHY

The region near the coast is very low lying and this slice is made up of a very high percentage of water and wetlands.

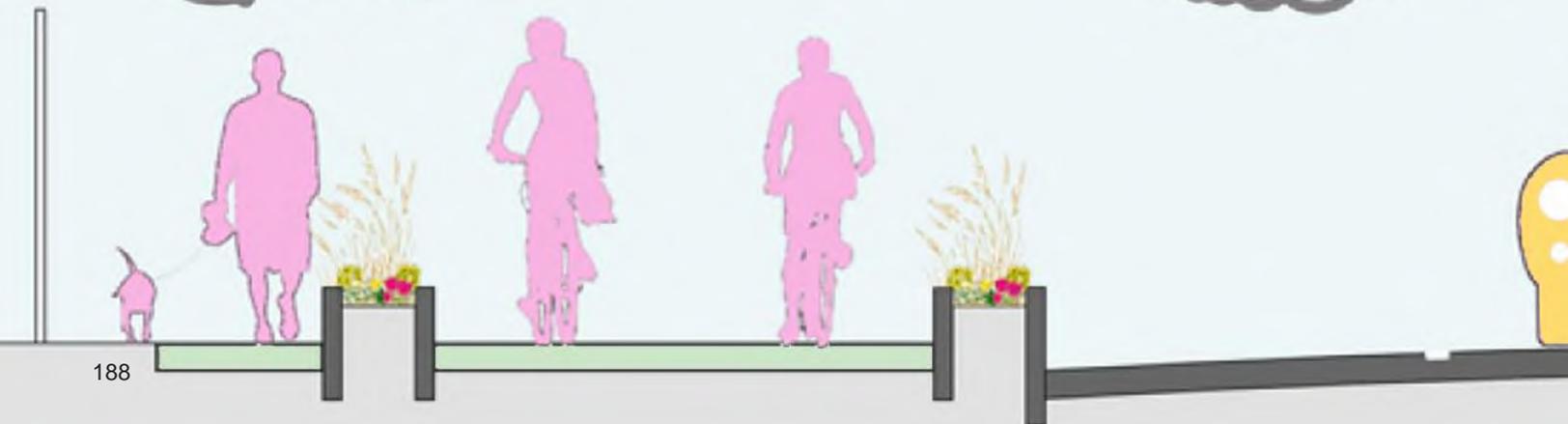


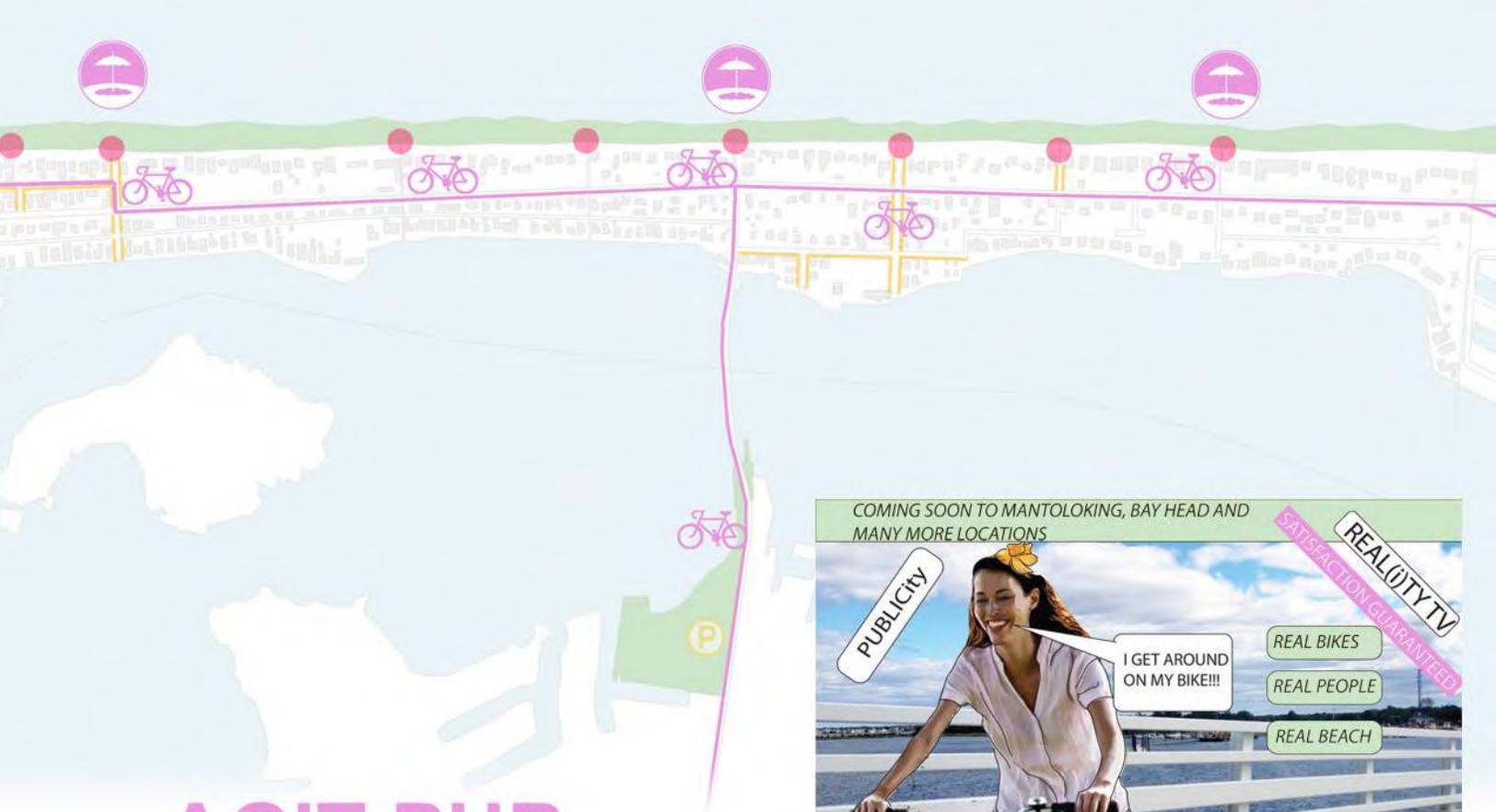
Public Awareness Campaign



How many flowers can I grow on the road?

How fast can I ride my bike on this divided lane?





=

AGIT-PUB TOOLS

COMING SOON TO MANTOLOKING, BAY HEAD AND
MANY MORE LOCATIONS

PUBLICITY

I GET AROUND
ON MY BIKE!!!

REAL BIKES

REAL PEOPLE

REAL BEACH

SATISFACTION GUARANTEED

REAL(ITY)TV

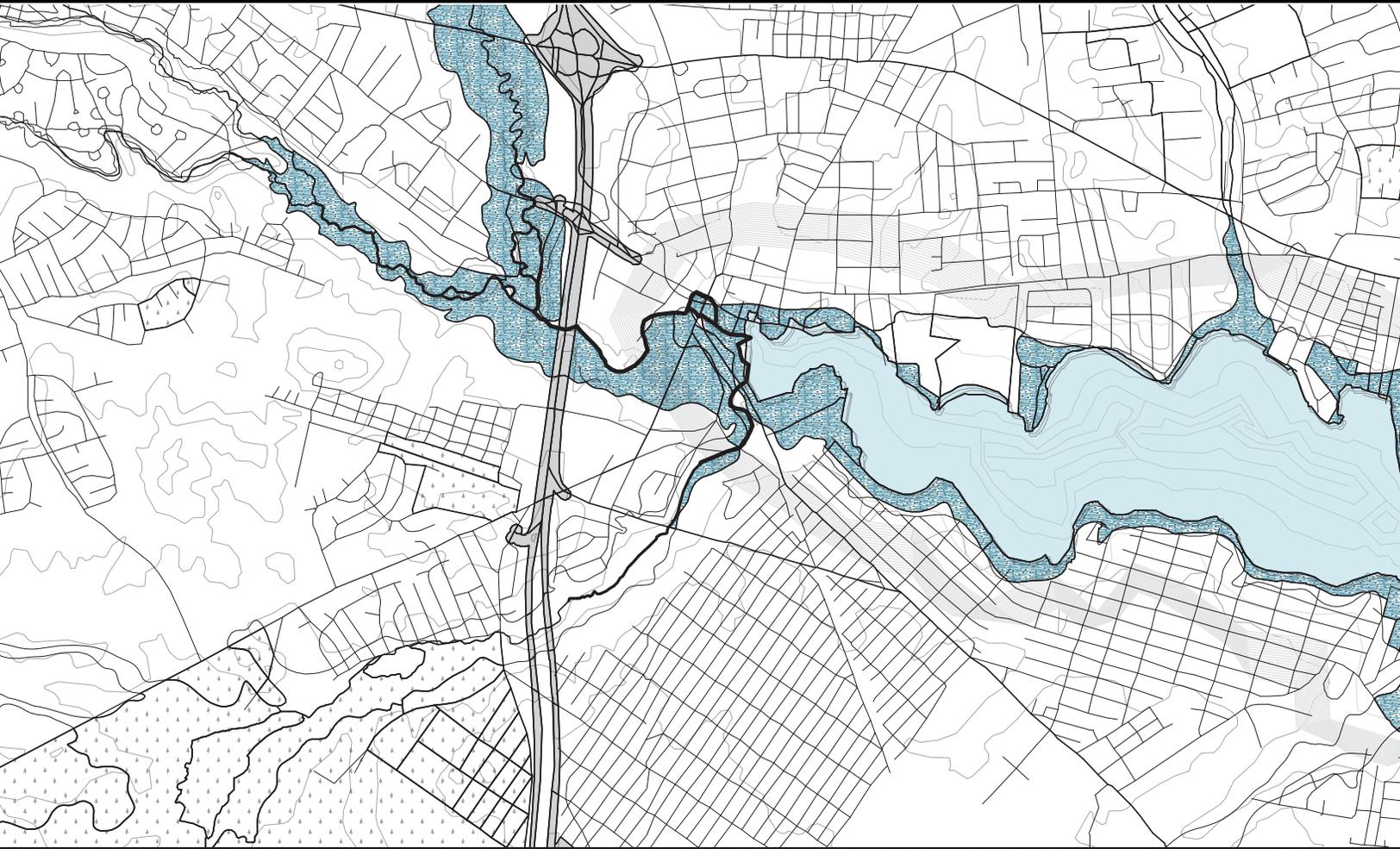
BROUGHT TO YOU
BY BIKETOPIA

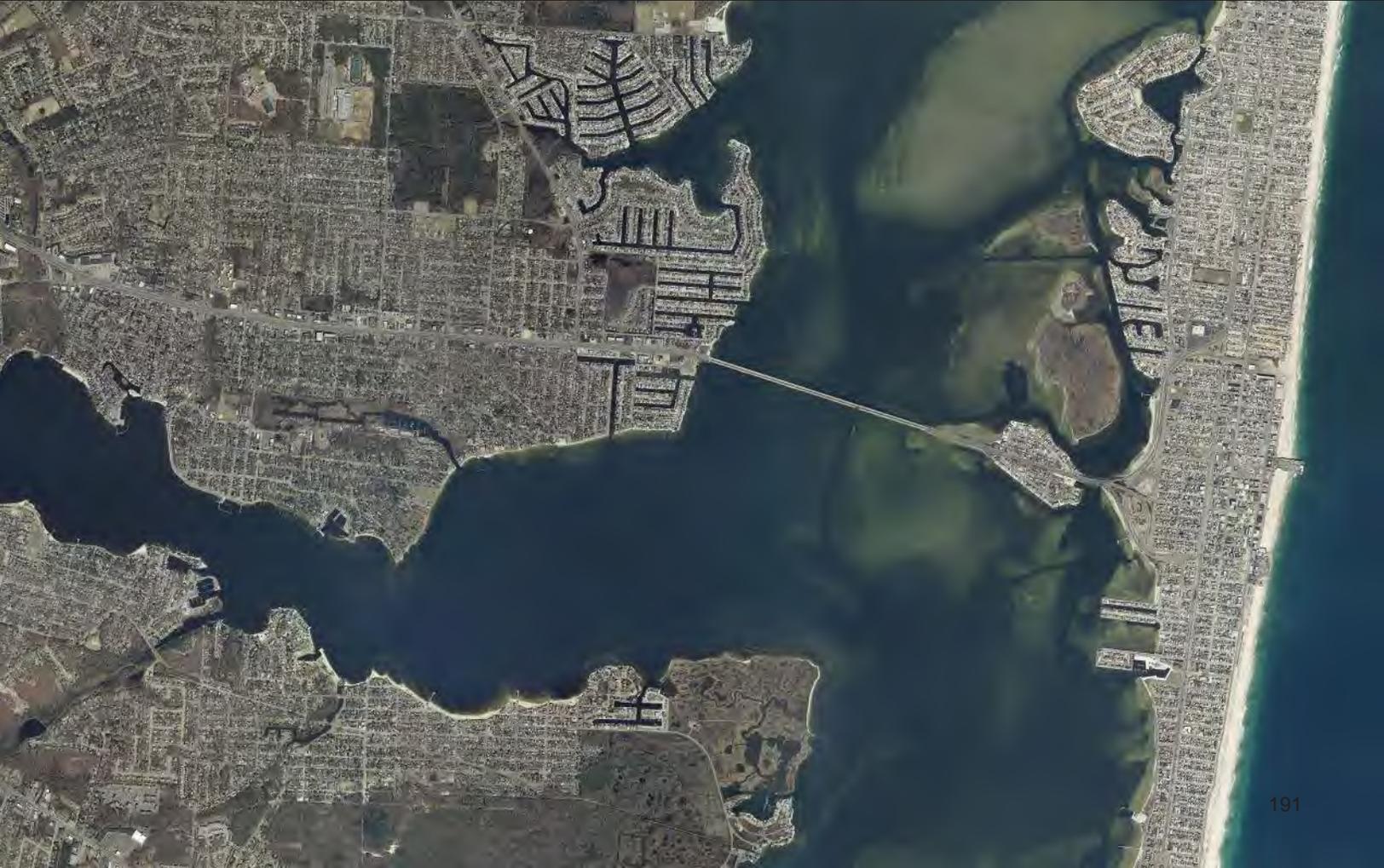
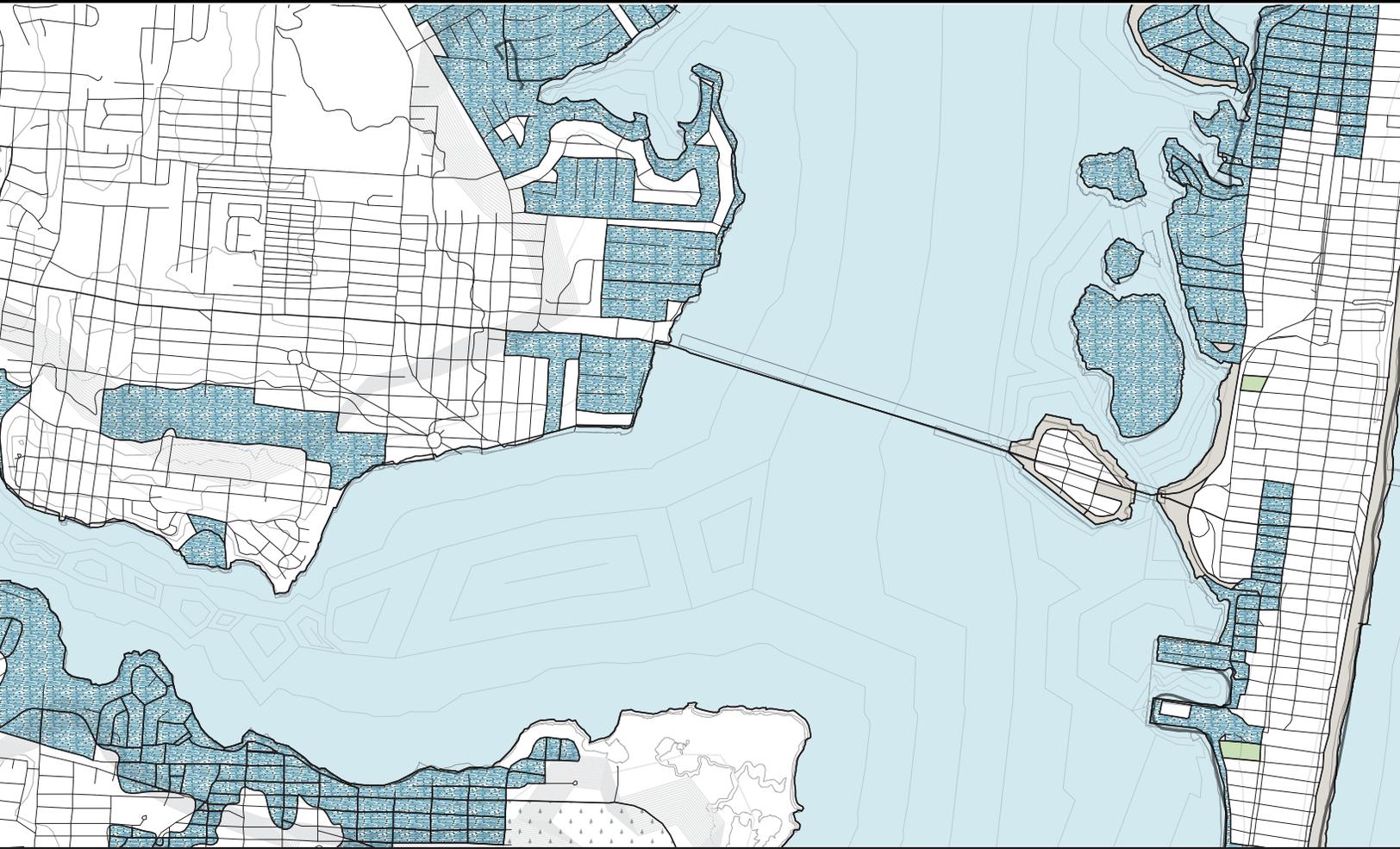
I ♥ BIKE

How many
hours can
I spend
on
the
beach?

How many comfort
stations do you need
to create a public
beach?







About the Barrier Island to Toms River

Context

Located east of the Garden State Parkway and surrounded by a bay and ocean, Toms River and the barrier island of Seaside Heights consist primarily of suburban, seasonal properties. Toms River began as a region of maritime industry in the 1700s and has evolved into a mixed suburban and metropolitan township. Route 37, which runs through Toms River, connects mainland counties to barrier island municipalities, most notably, Seaside Heights. Seaside is primarily a tourist destination that connects to Ortley Beach.

Risk + Need

Much of the damage from Hurricane Sandy occurred along the shore of the mainland and along the entire coast barrier island. The damaged properties on the mainland are owned by residents who typically can afford to rebuild their homes. The overall income of property owners in Seaside Heights is too low to rebuild their homes effectively in preparation for future storms. Along with the need to provide an effective housing strategy for Seaside Heights, the recent fire which caused extensive damage to boardwalk, demonstrates the weakness in retail infrastructure, particularly in response to natural disasters.

Design Opportunity

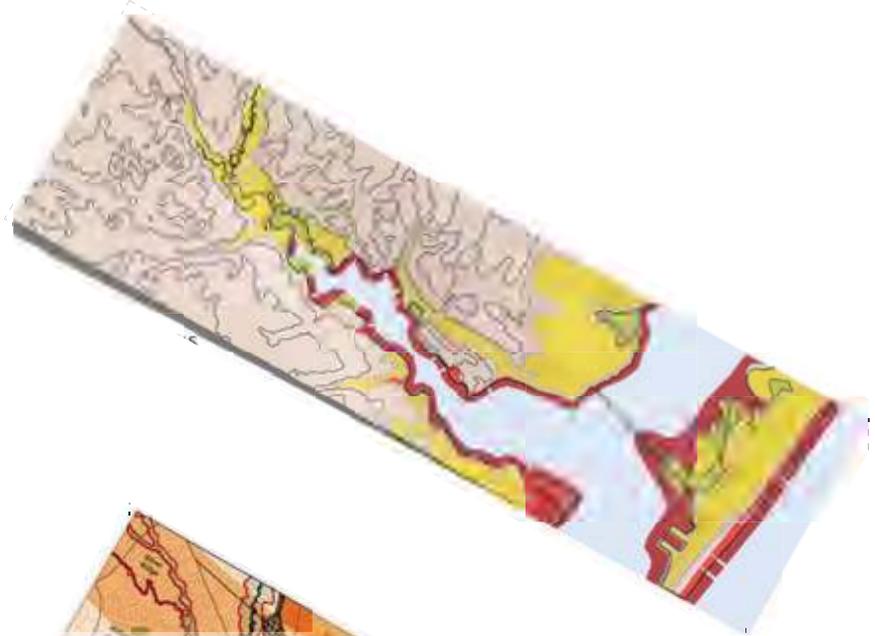
The low income housing along Seaside acts as a catalyst in focusing on building and design efforts throughout the Barrier Island. The cleared land from Seaside's boardwalk fire is a starting point for redesigning a dense, resilient community that responds to future natural change with adaptive qualities. Along with the area destroyed by the fire, homes and properties still left untouched from Sandy's damage provide an opportunity to begin redesigning a new community. Areas along the barrier Island that are the most elevated allow for the densification of an area where flood risk is low.



Layers

FEMA FLOOD ELEVATIONS

After Sandy, FEMA rezoned many new homes throughout the Barrier Island and Toms River. Seaside Heights and Ortley Beach experienced the most damage from Sandy along with some bayside properties in Toms River because of flooding in the bay area.



POPULATION FLOOD RISK

The darkest regions represent area of densest full time residence. There are still patches of dense population located near flood risk boundaries (red).



MEDIAN AGE

Shifts in tan represent median age from 30-35 (dark tan) to 35-60 (light tan). Since median age is evenly spread throughout the slice, one can conclude that many people reside in Toms River for an average of at least 20-30 years.





OWNER OCCUPIED HOMES

The areas in blue show housing occupied by full time residents (dark blue most dense to light tan least dense). The barrier island has very few full time residents and is comprised of mostly seasonal housing.



SOIL TYPES

Ultisols (in green) make up the majority of the soil typology. Buildup (brown) occurs mostly along the bayside of Toms River and the Barrier Island.

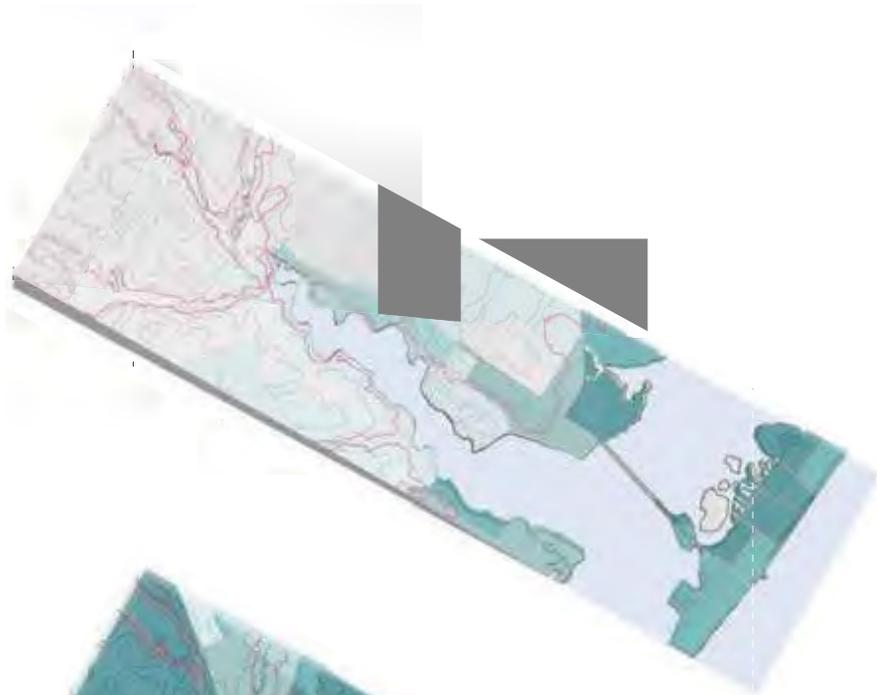


TRANSPORTATION

Running parallel to the Garden State Parkway, Route 35 serves as the main road throughout Seaside Heights. Route 37 is the only connection from the mainland to Seaside Heights.

SANDY DAMAGE

The darkest shades represent the areas most damaged by Sandy. The barrier islands and areas along the bay in Toms River were most affected by the storm.



INCOME

The darkest shades show the areas of lowest income households. Vulnerable areas are concentrated along the barrier island and west of the Parkway. Wealthier households exist along the shoreline of Toms River and the mainland shoreline.



OVERLAY

The darkest shade along the barrier island shows the area of greatest vulnerability. While the mainland was affected by Sandy, the property owners can afford to rebuild their damaged homes. Seaside is extremely low income and cannot afford to rebuild a new resilient design on their own, allowing for potential design opportunity for Rebuild By Design.



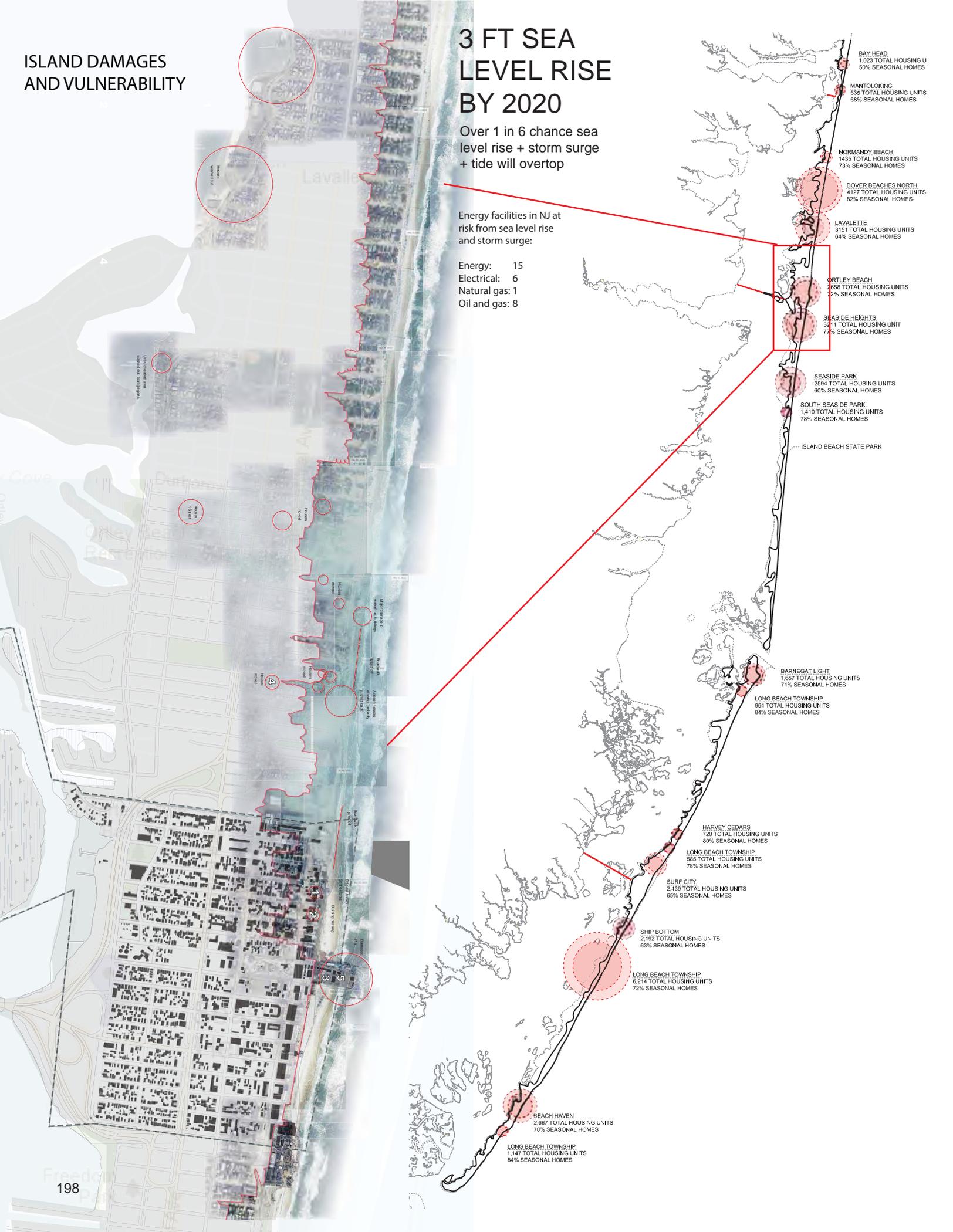
ISLAND DAMAGES AND VULNERABILITY

3 FT SEA LEVEL RISE BY 2020

Over 1 in 6 chance sea level rise + storm surge + tide will overtop

Energy facilities in NJ at risk from sea level rise and storm surge:

- Energy: 15
- Electrical: 6
- Natural gas: 1
- Oil and gas: 8



BAY HEAD
1,023 TOTAL HOUSING U
50% SEASONAL HOMES

MANTOLOKING
535 TOTAL HOUSING UNITS
68% SEASONAL HOMES

NORMANDY BEACH
1,435 TOTAL HOUSING UNITS
73% SEASONAL HOMES

DOVER BEACHES NORTH
4,127 TOTAL HOUSING UNITS
82% SEASONAL HOMES

LAVALLETTE
3,151 TOTAL HOUSING UNITS
64% SEASONAL HOMES

ORTLEY BEACH
2,656 TOTAL HOUSING UNITS
72% SEASONAL HOMES

SEASIDE HEIGHTS
3,211 TOTAL HOUSING UNIT
77% SEASONAL HOMES

SEASIDE PARK
2,594 TOTAL HOUSING UNITS
60% SEASONAL HOMES

SOUTH SEASIDE PARK
1,410 TOTAL HOUSING UNITS
78% SEASONAL HOMES

ISLAND BEACH STATE PARK

BARNEGAT LIGHT
1,657 TOTAL HOUSING UNITS
71% SEASONAL HOMES

LONG BEACH TOWNSHIP
964 TOTAL HOUSING UNITS
84% SEASONAL HOMES

HARVEY CEDARS
720 TOTAL HOUSING UNITS
80% SEASONAL HOMES

LONG BEACH TOWNSHIP
585 TOTAL HOUSING UNITS
78% SEASONAL HOMES

SURF CITY
2,439 TOTAL HOUSING UNITS
65% SEASONAL HOMES

SHIP BOTTOM
2,192 TOTAL HOUSING UNITS
63% SEASONAL HOMES

LONG BEACH TOWNSHIP
6,214 TOTAL HOUSING UNITS
72% SEASONAL HOMES

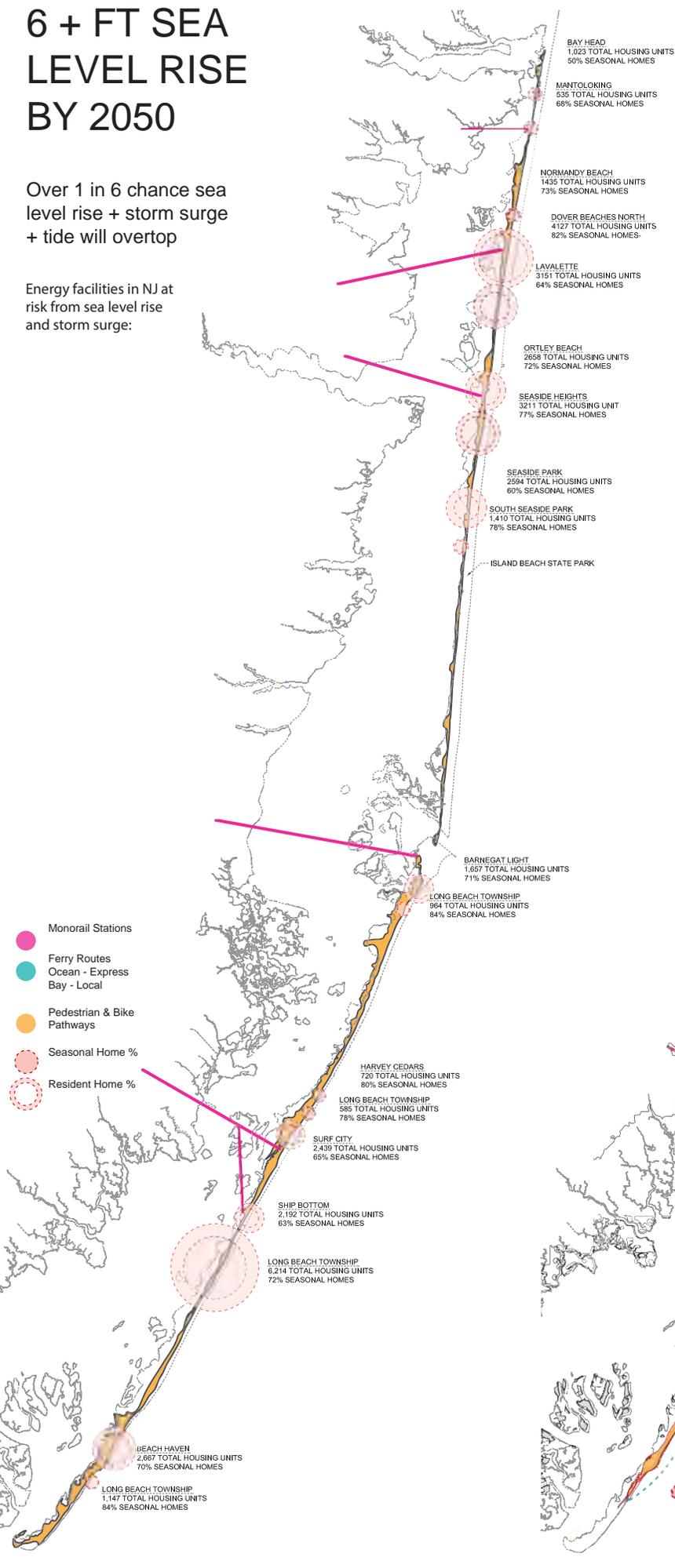
BEACH HAVEN
2,667 TOTAL HOUSING UNITS
70% SEASONAL HOMES

LONG BEACH TOWNSHIP
1,147 TOTAL HOUSING UNITS
84% SEASONAL HOMES

6 + FT SEA LEVEL RISE BY 2050

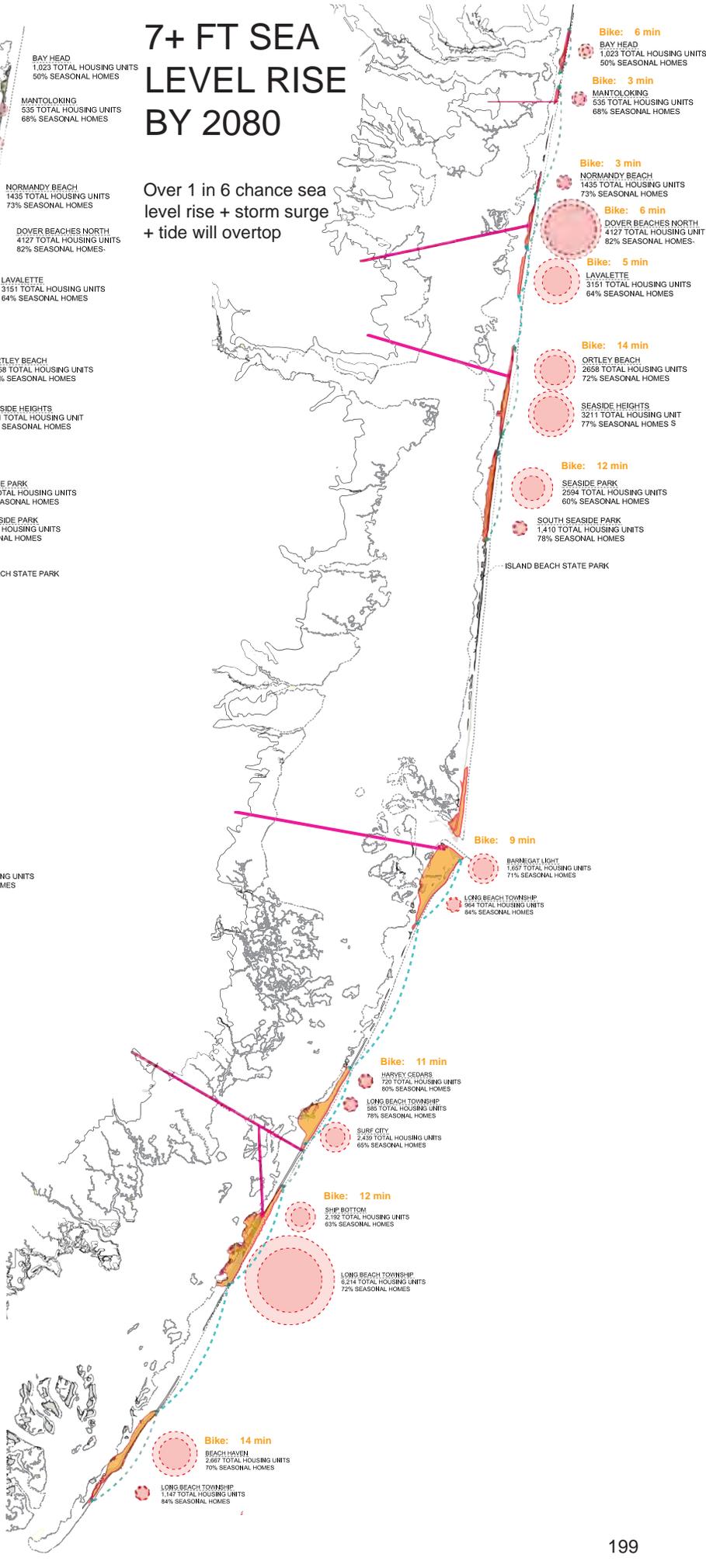
Over 1 in 6 chance sea level rise + storm surge + tide will overtop

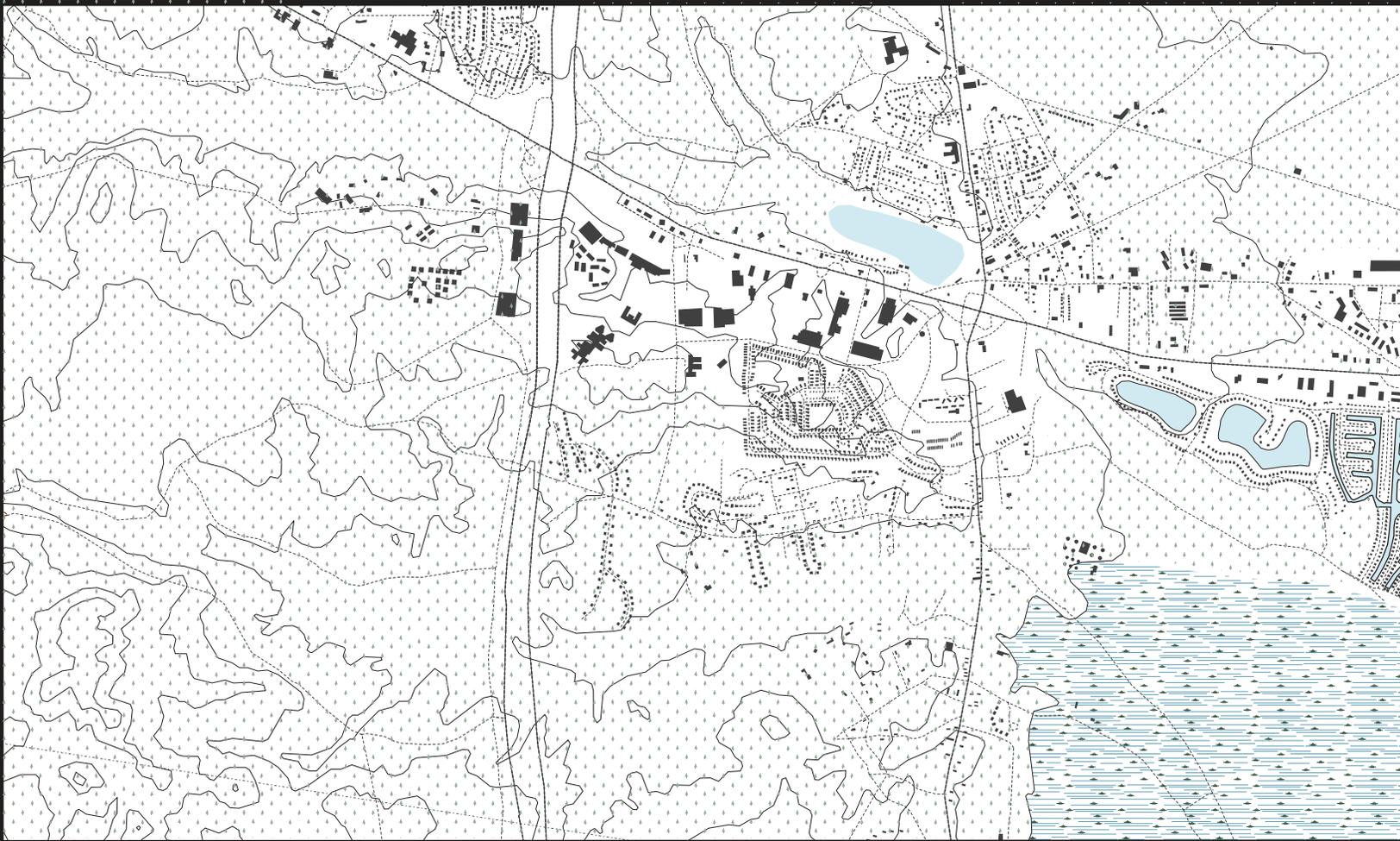
Energy facilities in NJ at risk from sea level rise and storm surge:

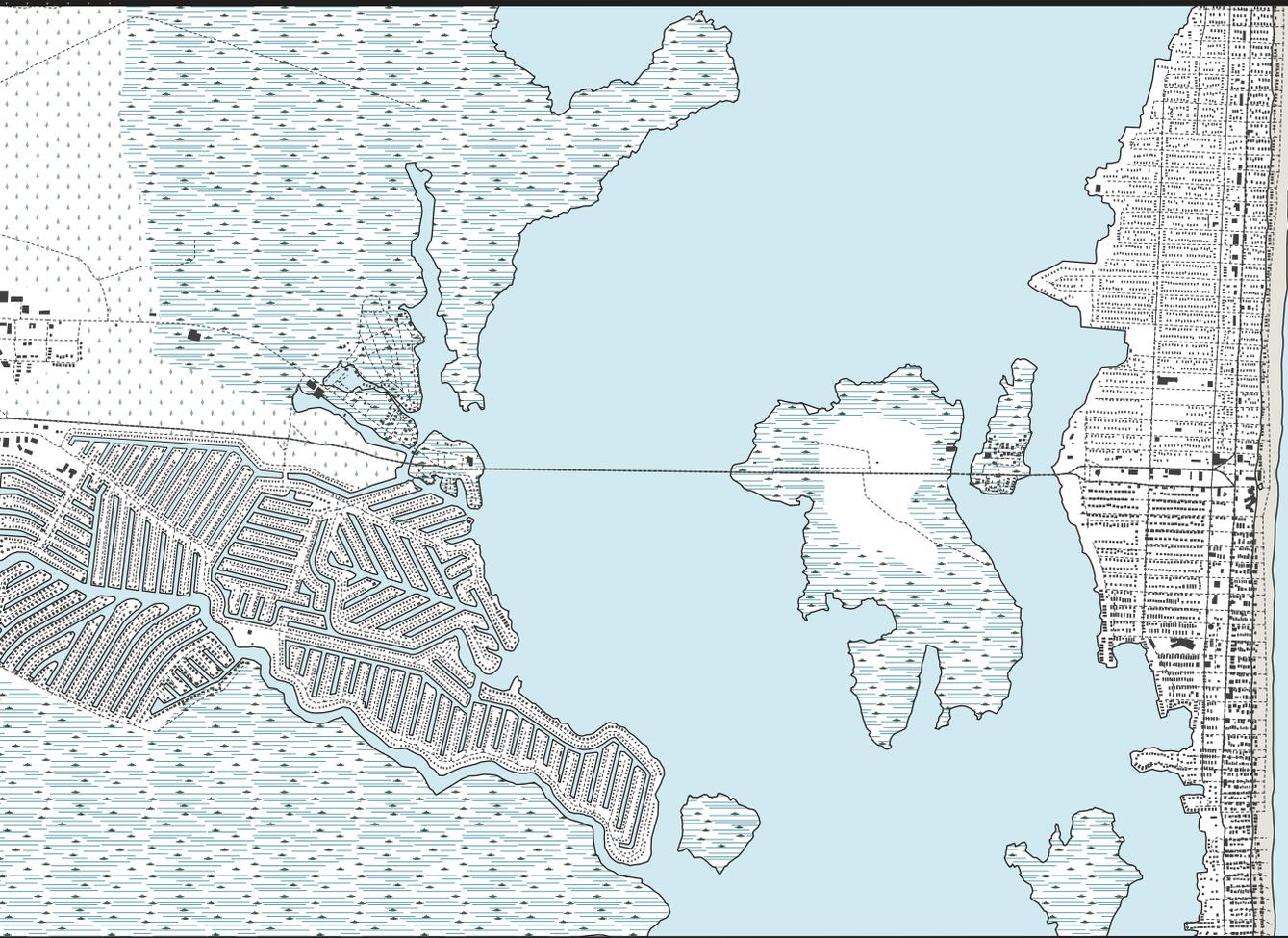


7+ FT SEA LEVEL RISE BY 2080

Over 1 in 6 chance sea level rise + storm surge + tide will overtop







About Long Beach Island to the Pinelands

Context

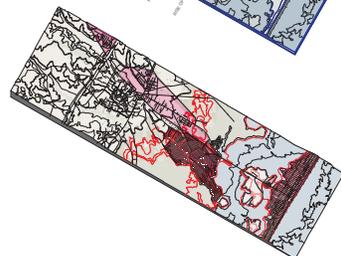
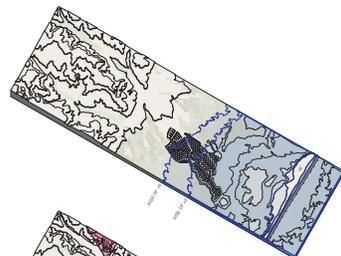
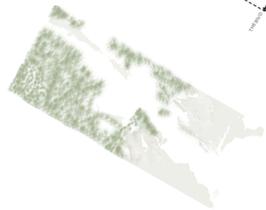
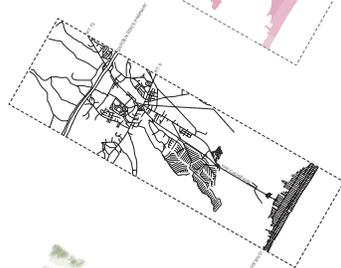
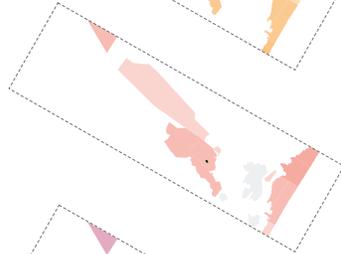
Situated along the southern coast of Ocean County, New Jersey, Long Beach Island serves as popular summer destination for many in the tri-state area, of NY, NJ and PA. Originally a small working class community sustained by its fishing economy, LBI has experienced a dramatic increase in the amount of residential development over the last 35 years. Separated from the town of Manahawkin by the Barnegat Bay, LBI experienced extensive damage and flooding in the aftermath of Superstorm Sandy. As a barrier island, potential in mitigating future risk lies not only in ocean side protection but also in protection communities located in areas prone to flooding on the Barnegat Bay.

Risk + Need

Overlaying key layers of information mapped at the scale of our specific slice, both potential areas of risk and need can be identified. The “canal community” of Beach Haven West is simultaneously the densest area our slice and the community most vulnerable to flooding.

Design Opportunity

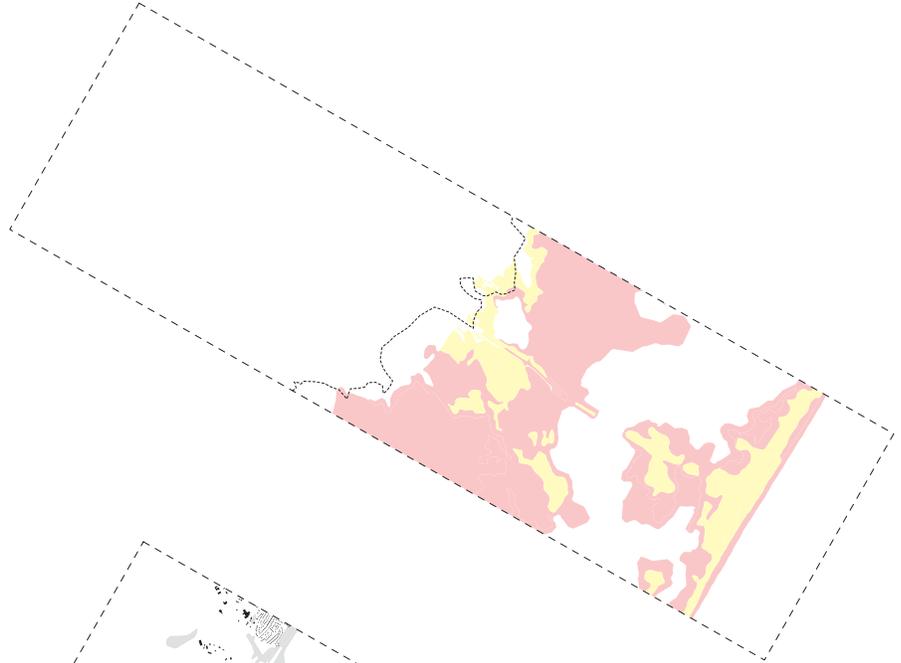
Overlaying key layers of information mapped at the scale of our specific slice, both potential areas of risk and need can be identified. The “canal community” of Beach Haven West is simultaneously the densest area our slice and the community most vulnerable to flooding. The bay side properties of Ship Bottom and Surf City are also at risk due to a lack of efficacious infrastructure to prevent surging water. Current efforts to maintain and protect LBI land mass are generally focused on beach side replenishment, namely “beach nourishment,” neglecting to focus on bay side risk. Working with the natural ecological process of “island migration” our proposal reevaluates existing restoration efforts and proposes a new public bay edge.



Layers

FEMA FLOOD ELEVATIONS

FEMA rezoned many areas ultimately including more homes than before in "V" and "A" zones. Beach Haven West and bay-side properties in Ship Bottom were most affected due to flooding and high velocity water movement.



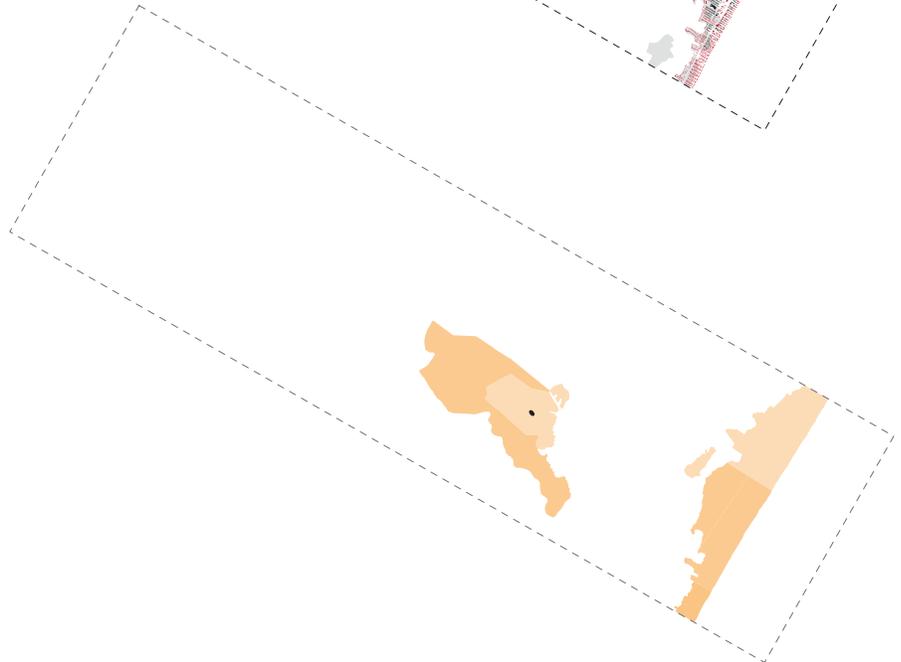
SANDY DAMAGE

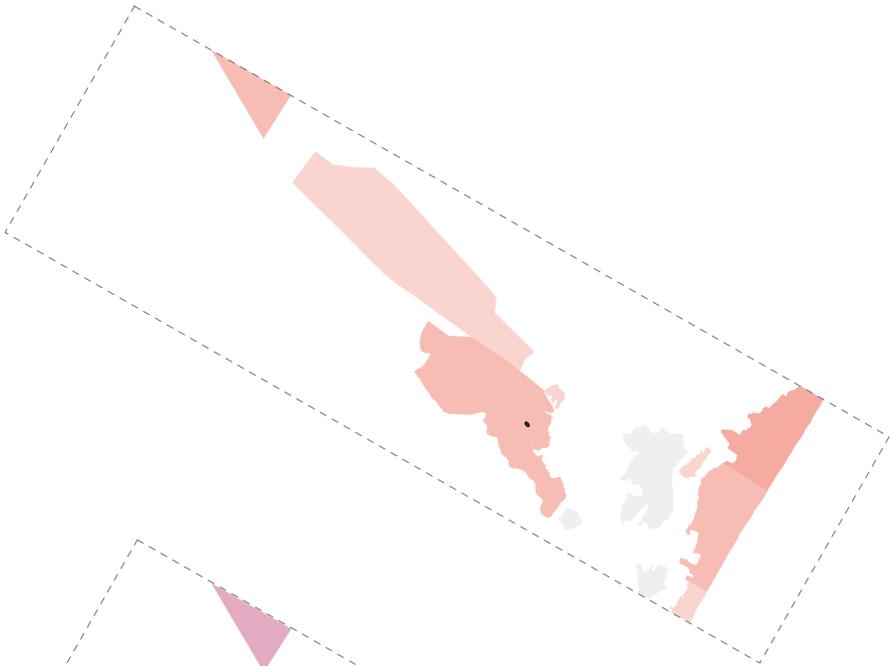
Overlaying damage caused by Sandy (red), areas of infill (grey) and building footprint data shows that the most damage occurred in areas that are both close to water bodies and built on infill land.



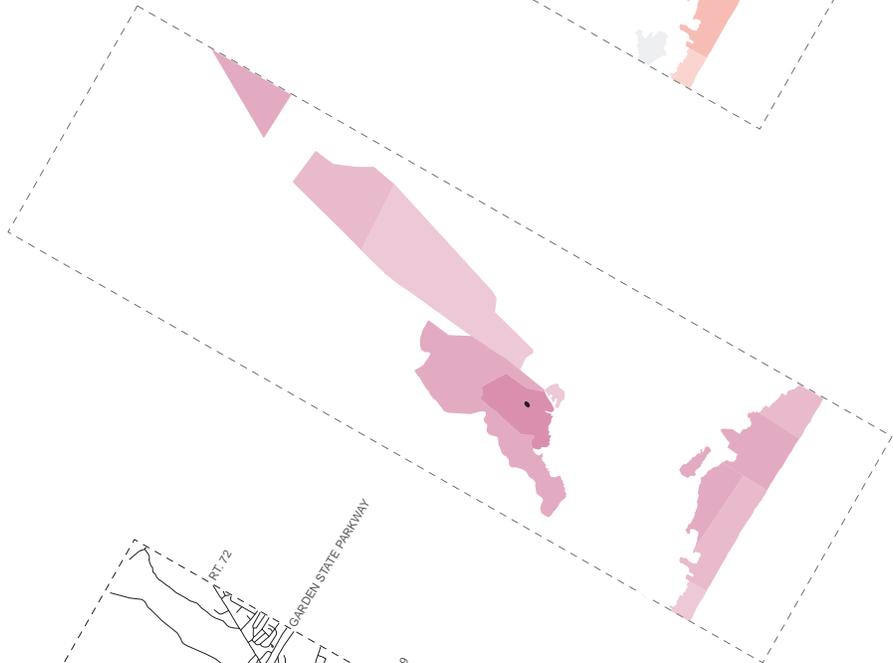
SEASONAL HOUSING

Homes in both Beach Haven West and Ship Bottom represent the towns with the second largest pool of second homes.

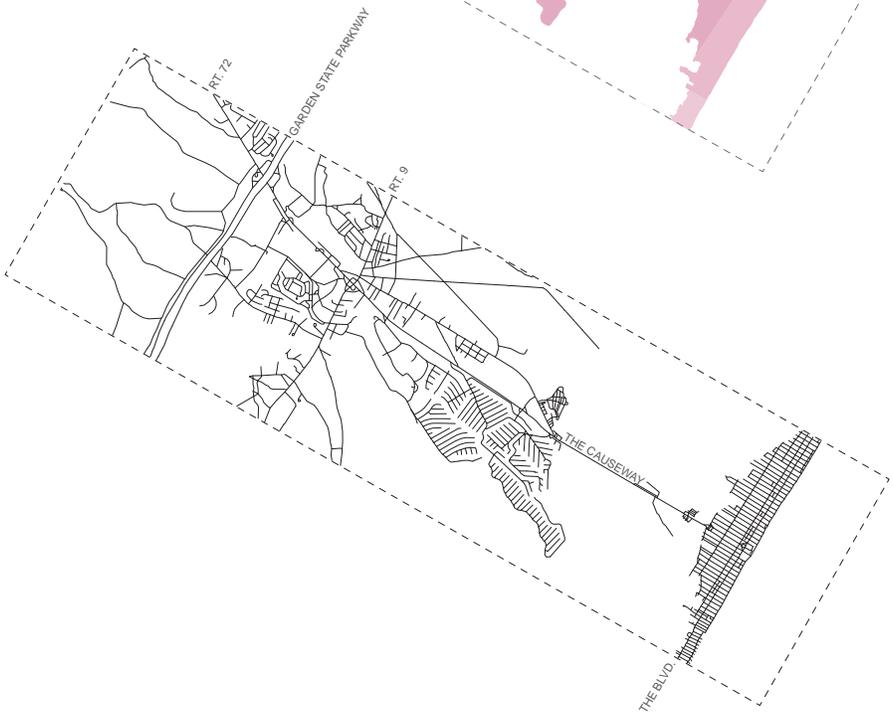




YEAR ROUND POPULATION
 The area with the highest year round population is located in Beach Haven West nearest to the Manahawkin Bay, the second most dense areas are located along the bay on the island.



HOUSING UNIT DENSITY
 The homes in Surf City are the most densely packed, followed by Beach Haven West and Ship Bottom.



TRANSPORTATION
 Running east to west and parallel to the Garden State Parkway, Route 72 serves as the main (and only) road on and off of Long Beach Island. The Parkway leads to the New York area and Route 72 connects to Philadelphia.

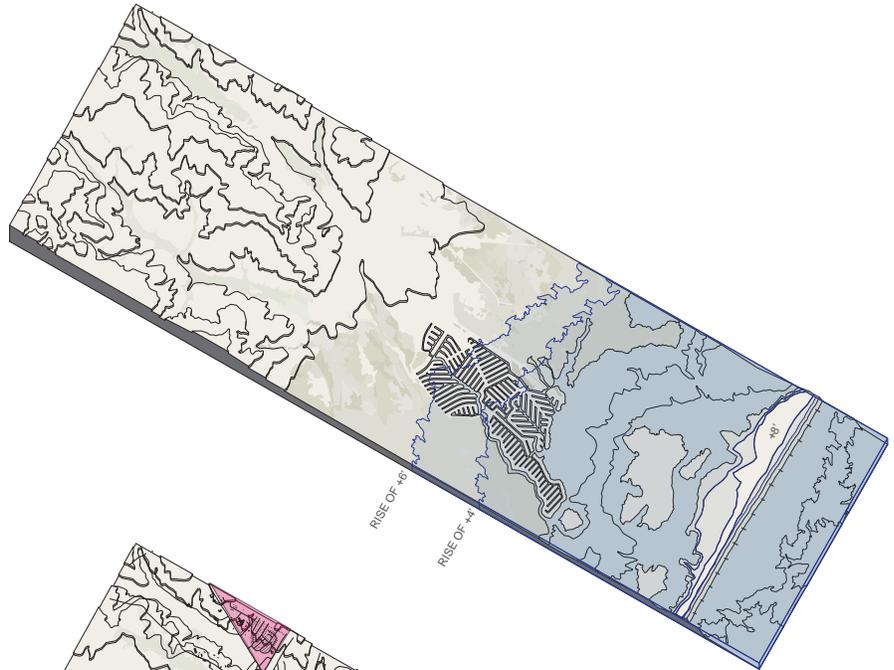
FEMA FLOOD ELEVATIONS

FEMA rezoned many areas ultimately including more homes than before in "V" and "A" zones. Beach Haven West and bay-side properties in Ship Bottom were most affected due to flooding and high velocity water movement.



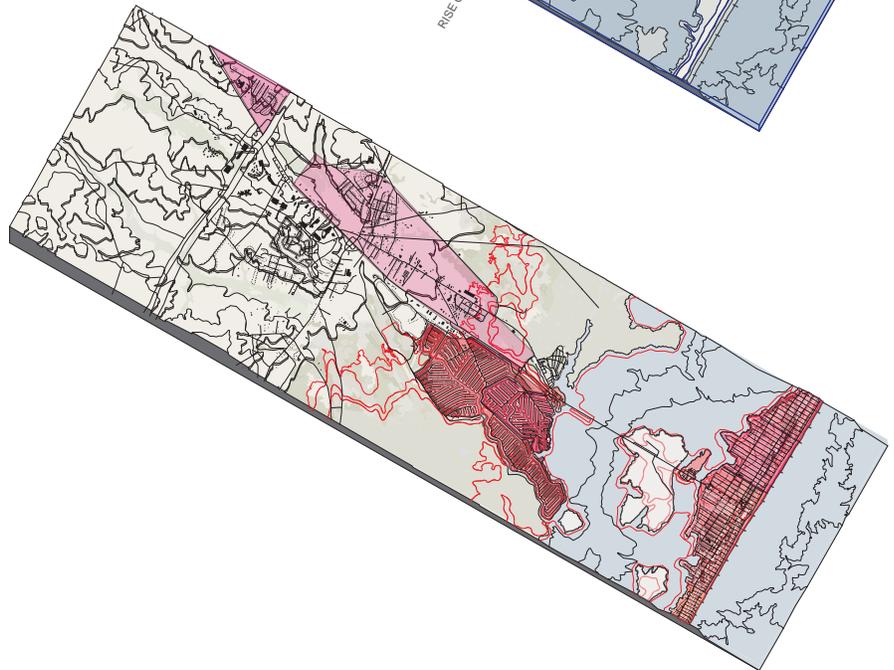
SANDY DAMAGE

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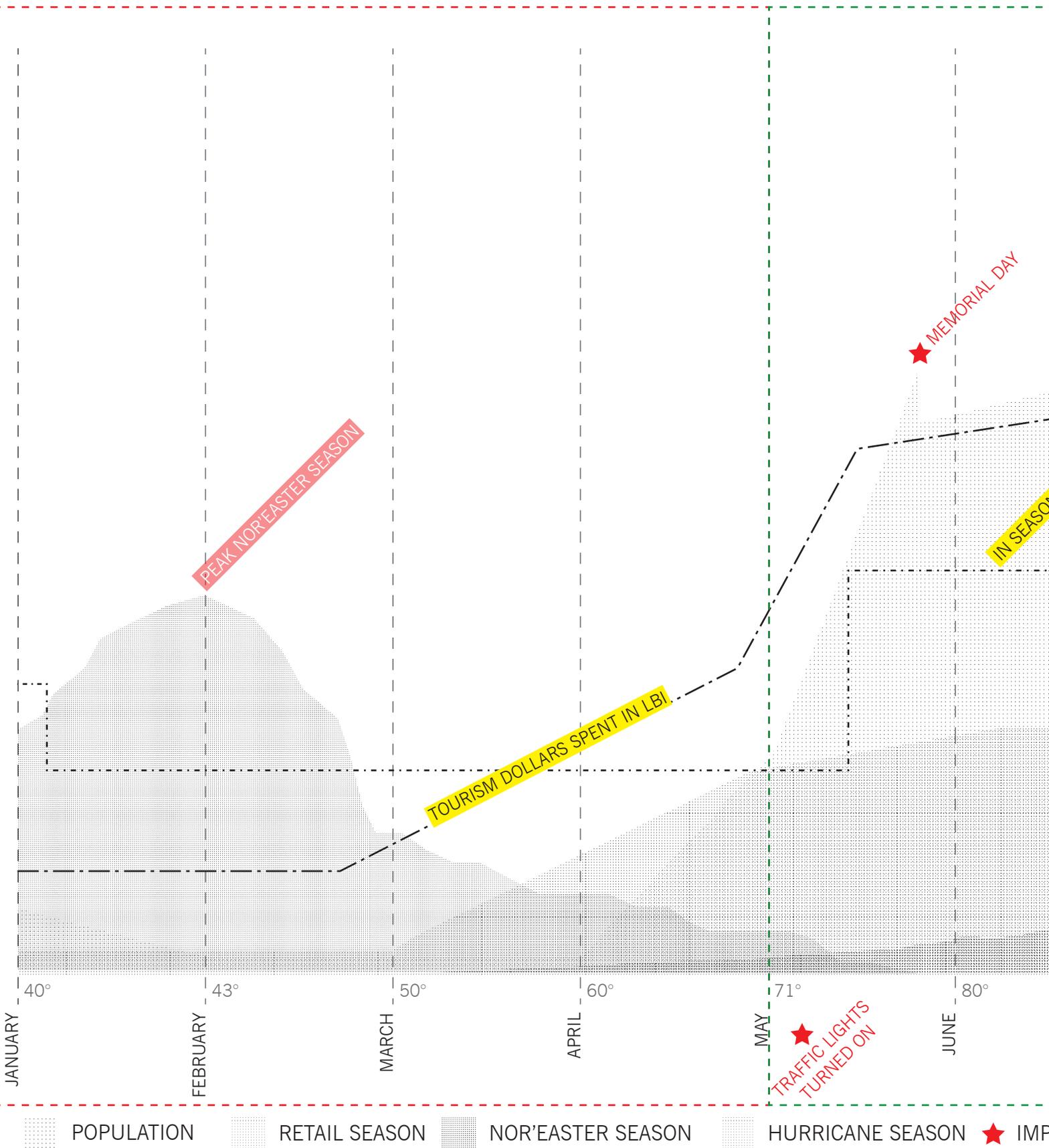
SEASONAL HOUSING

Homes in both Beach Haven West and Ship Bottom represent the towns with the second largest pool of second homes.



Seasonal Economy and Storm Risk

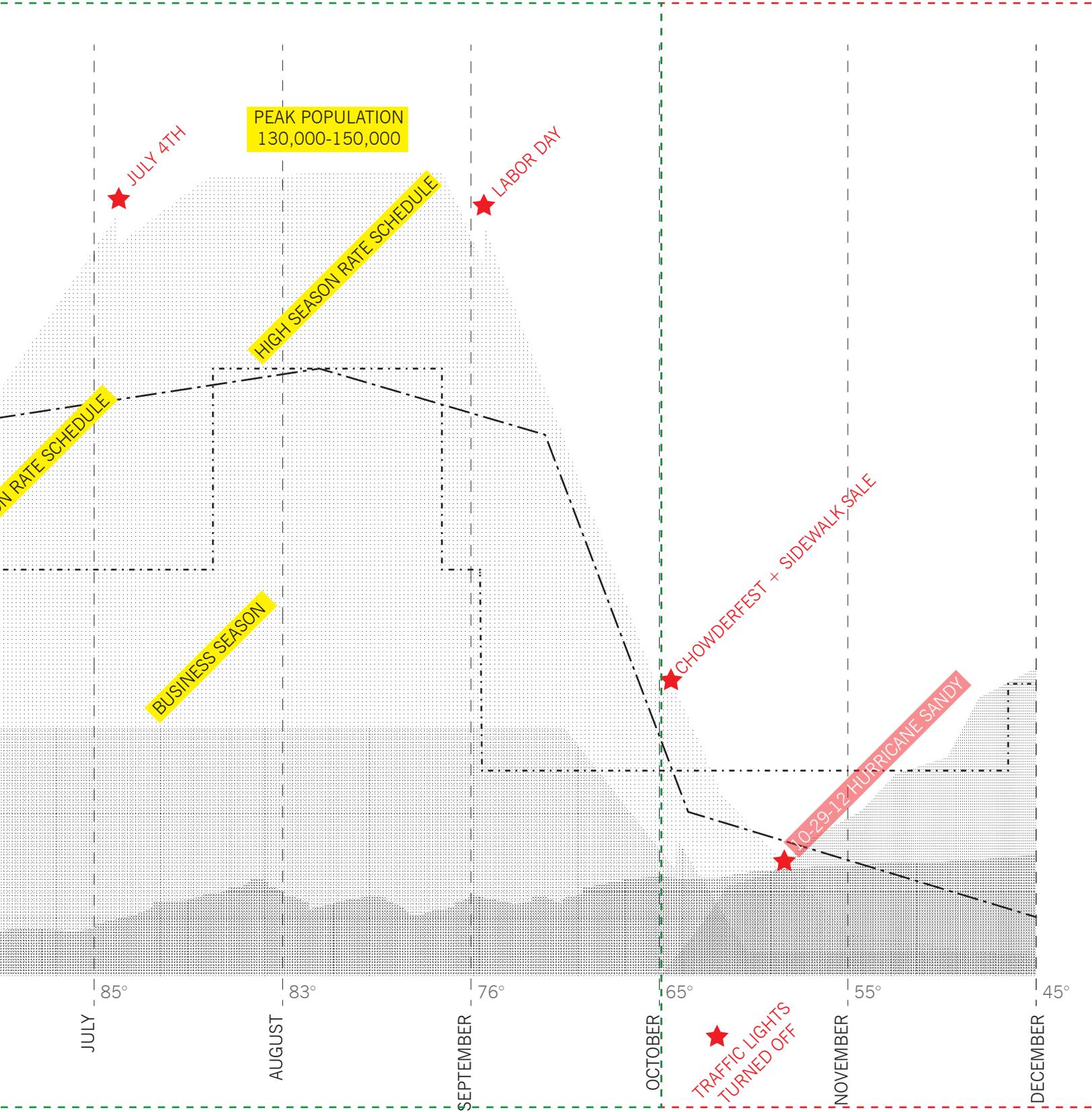
GREATEST STORM RISK



POPULATION
 RETAIL SEASON
 NOR'EASTER SEASON
 HURRICANE SEASON
 ★ IMP

TOURISM SEASON

GREATEST STORM RISK



IMPORTANT DATES

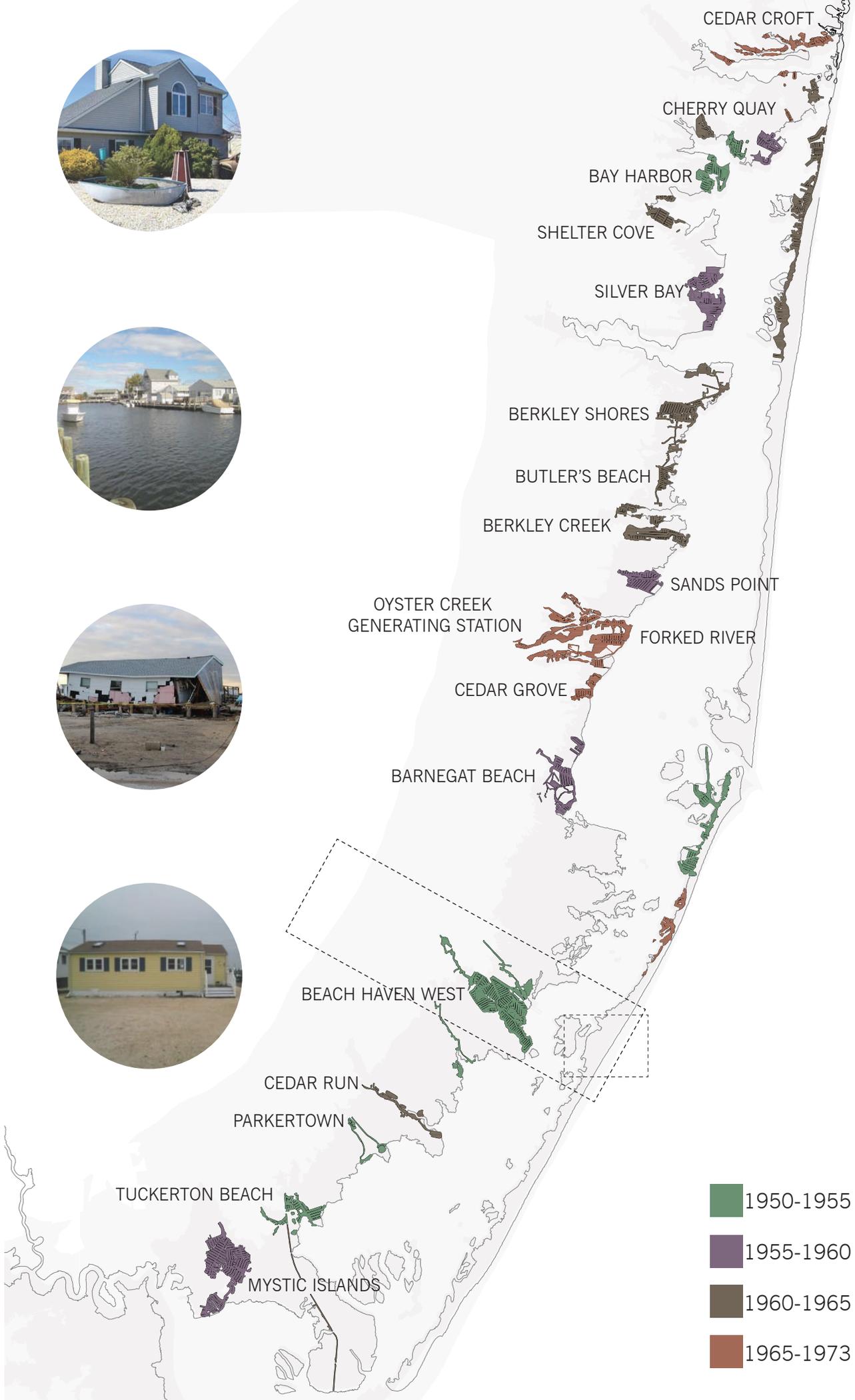
Canal Communities

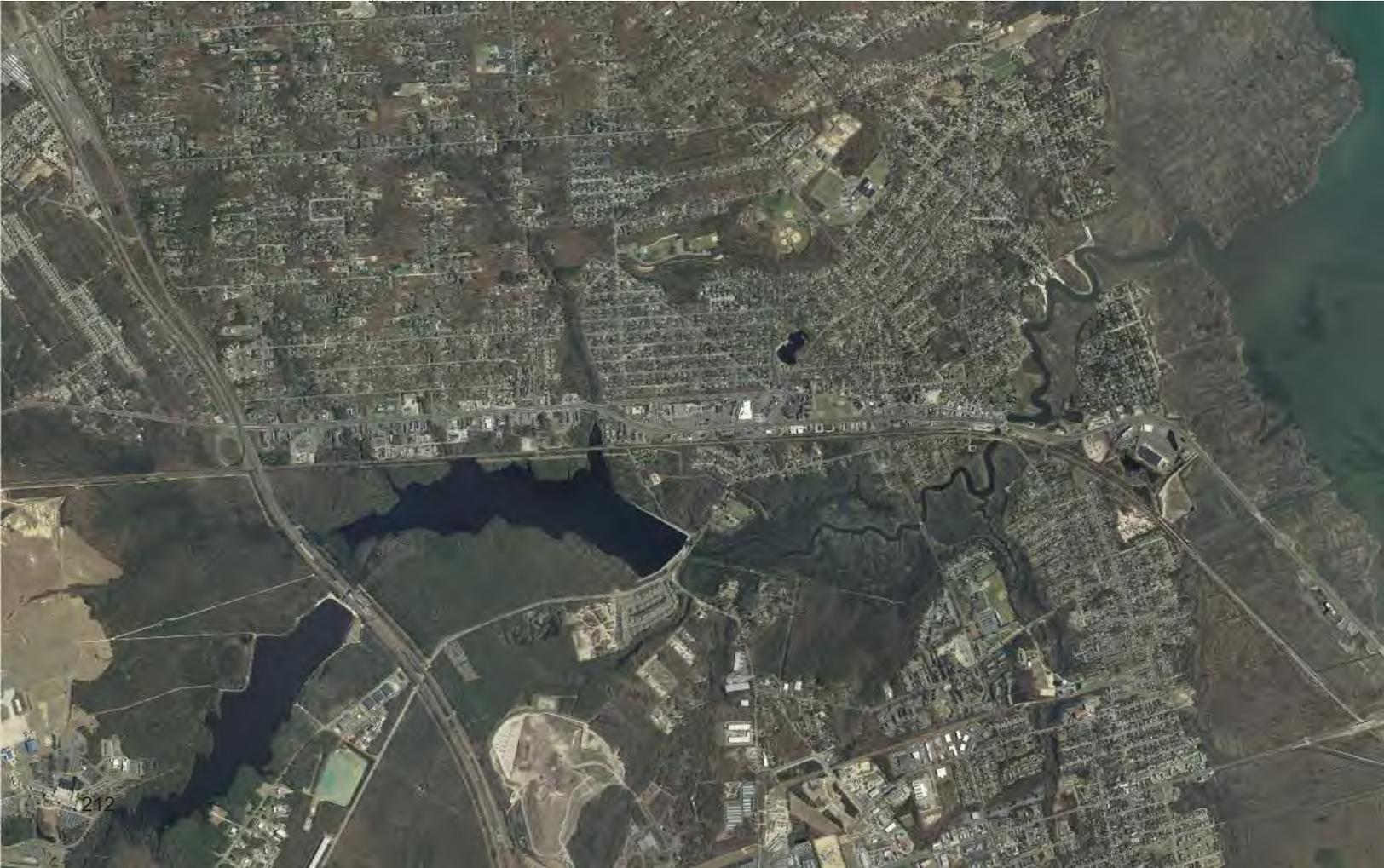
Over development in at risk wetlands.

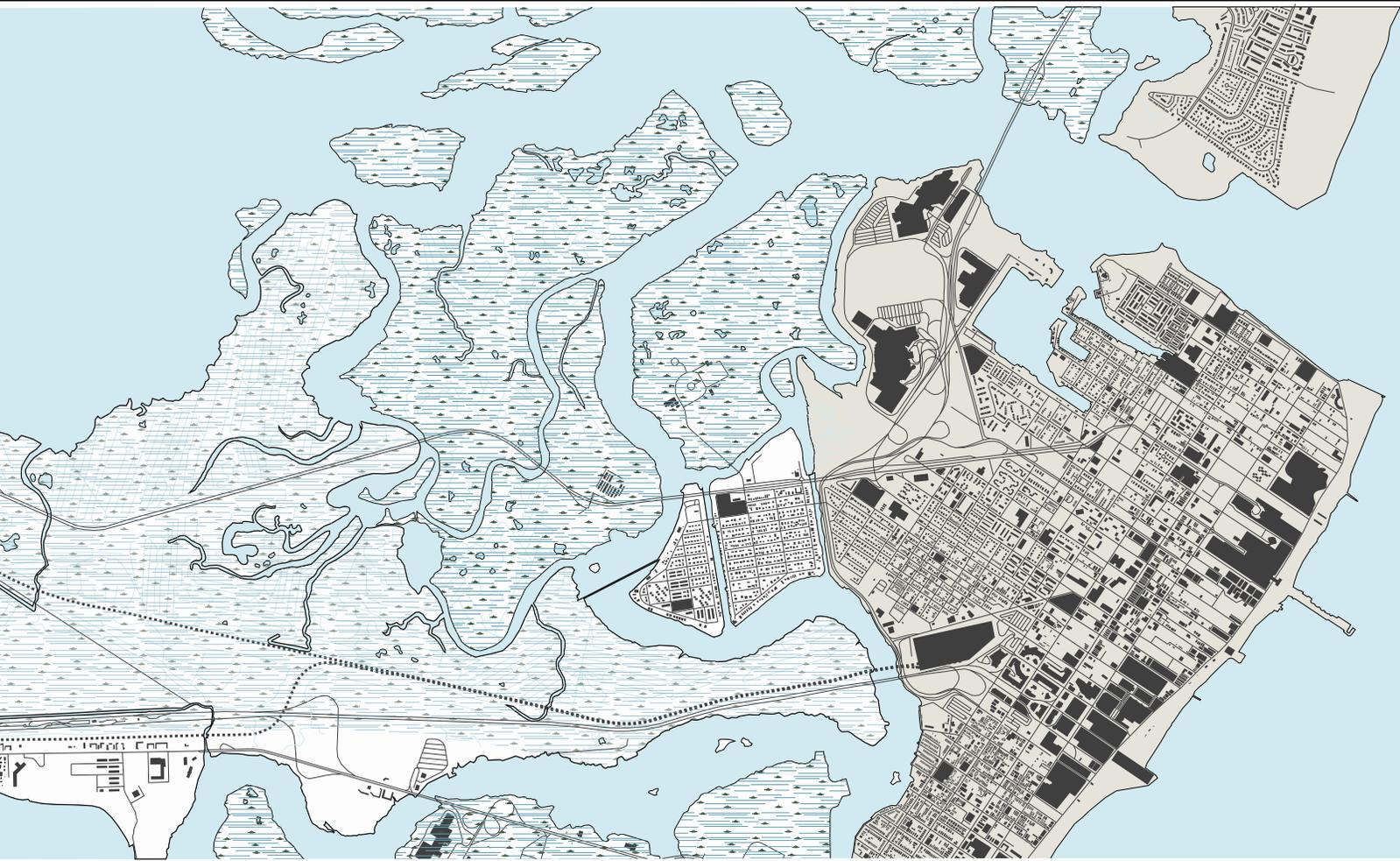
A large number of communities developed on the mainland side of the back bays during the mid 20th century . These communities destroyed extensive amounts of wetlands that provide protection to the mainland as well as maintain ecologies unique to the Mid Atlantic region.

These development patterns were halted in the 1960's with the enforcement of wetlands protections and other development agencies.

The communities are at risk for flooding from cyclical storms as well as major hurricane events, and sea level rise.







About Atlantic City

Context

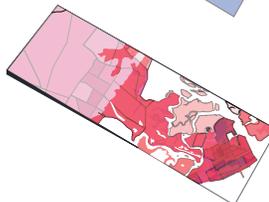
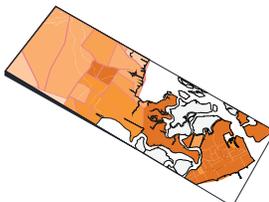
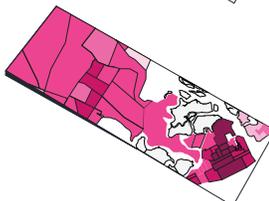
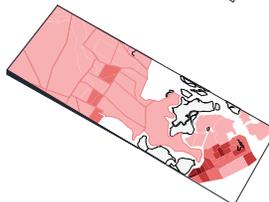
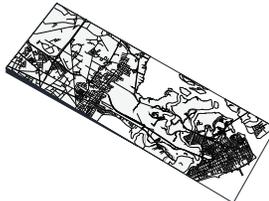
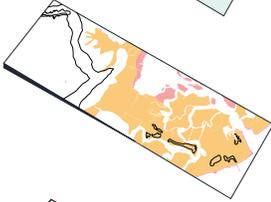
Along the southern coast of Atlantic County, New Jersey, Atlantic City is a popular destination for millions of visitors in the tri-state area. Mostly known for its casinos, boardwalk and beaches, Atlantic City attracts the most visitors from all parts of New Jersey.

Risk + Need

Superstorm Sandy affected Atlantic City and inflicted damage to its housing and commercial areas. Due to the demographics, high flood risks, and low income, Atlantic City is shown to be a very high risk and vulnerable area. More employment for residents, resilient buildings and a more cohesive city will be critical components to address in terms of the survival of Atlantic City as a major income generator for the state of New Jersey.

Design Opportunity

Overlaying information such as income, density and potential flood areas shows center Atlantic City as being the most vulnerable. Atlantic City casinos generated 3 billion dollars in revenue, and the state of New Jersey collected 295.6 million in taxes, but the medium household income of residents was only \$28,000. In Atlantic City 30% of the residents live below the poverty line despite the busy tourism area that surrounds residential neighborhoods. There is a distinct separation between the residents and the casinos of Atlantic City creating, in a sense, two separate cities. Our proposal involves merging these two cities while building up land with the anticipation that both cities can benefit from the tourism industry and at the same time be protected from the rising flood from storms.



Layers

TOPOGRAPHY

The topography of the area is mainly flat with highest points inland at 50'-0" above sea level.



FEMA FLOOD ZONES

FEMA rezoned many areas ultimately including more homes than before in "V" and "A" zones. Atlantic City was most affected due to flooding and high velocity water movement.



SANDY DAMAGE

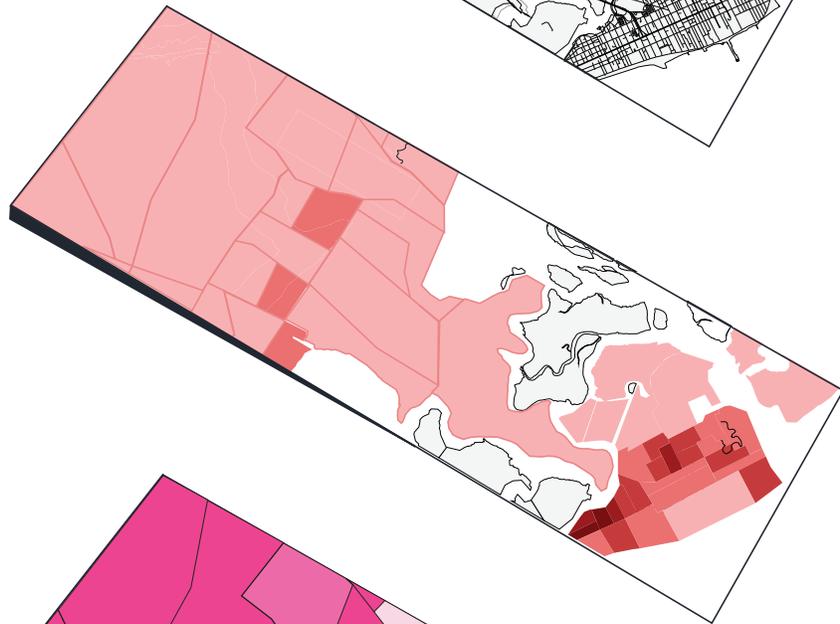
Areas damaged by Hurricane Sandy were mostly in the Atlantic City region.





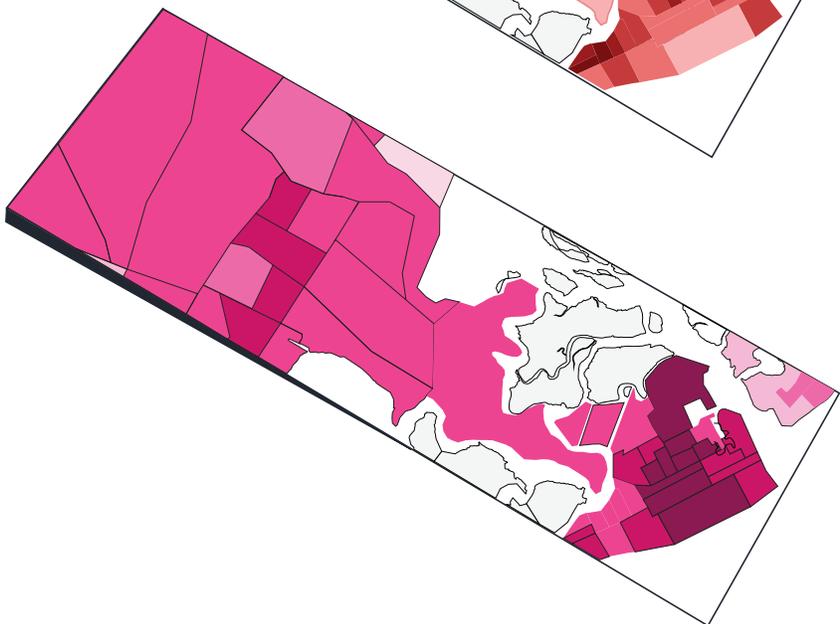
TRANSPORTATION

There are three major highways into the Atlantic City: Route 30, the Black horse pike and the Atlantic City expressway. These major highways are also the evacuation routes connecting with Atlantic Avenue which runs through the city.



POPULATION DENSITY

The area with the highest density population is located in Atlantic City.

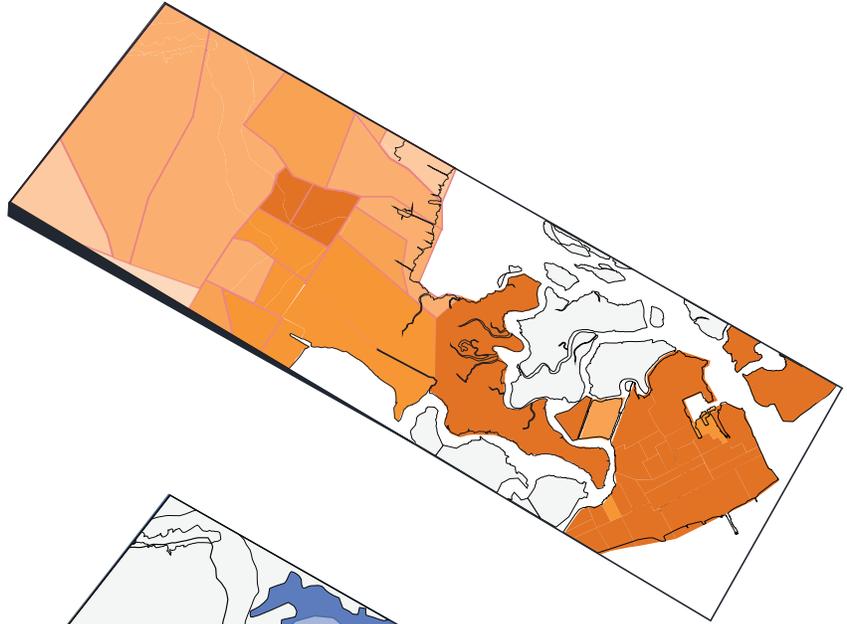


INCOME

The areas with casinos have a much higher revenue and income compared to the full time residents of Atlantic City. The percentage of residents in Atlantic City below the poverty line is much higher than in any other areas of the region.

RENTER OCCUPANCY

Homes in Atlantic City are mostly renter occupied with. Further inland away from Atlantic City percentage of owner occupied homes increases.



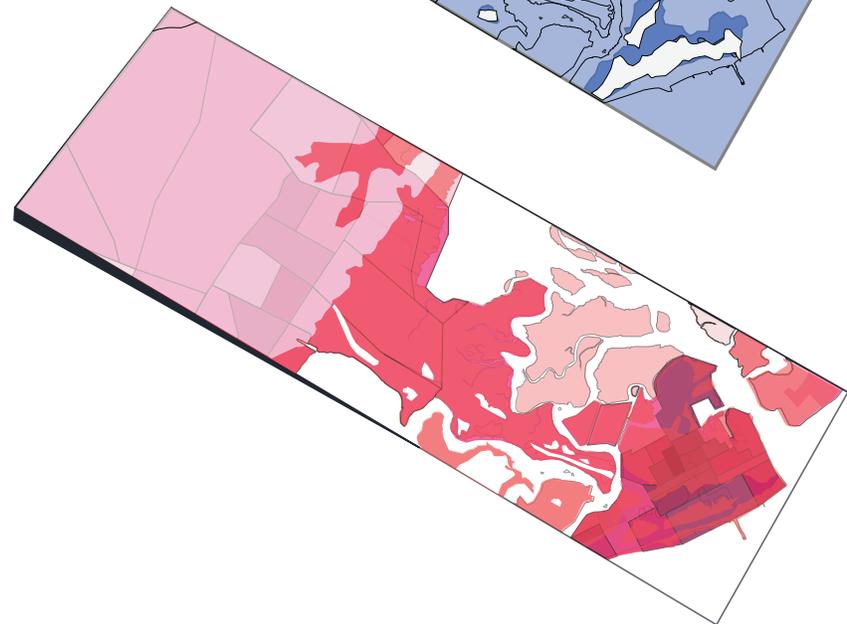
SEA LEVEL RISE

Projecting future sea rise of 20" and +4'-0" and +6'-0" shows that many of the most developed areas are at major risk to future flooding.



OVERLAY

Overlaying Sandy Hit areas, income and density shows that the most vulnerable areas are also the densest, poorest and historically most affected by flooding. The most vulnerable areas are within the center of Atlantic City.



Appendix B:

Analysis of Jersey Shore Target Regions

**Vulnerability, Opportunity, and
Outstanding Housing Obligations.**

Analysis of Jersey Shore Target Regions

Vulnerability, Opportunity, and Outstanding Housing Obligations.

The primary perspective of this analysis is that the greatest threat to Jersey Shore communities is not periodic Sandy Superstorm-type events but rising sea level. According to Dr. Faust Jacob of Columbia University's Earth Institute, the sea level will rise by close to six feet by 2100 "with a 90% confidence factor." Using the projections of the federal National Oceanic and Atmospheric Administration, we have charted the percentage of year-round housing units that would suffer major/severe damage at six feet and ten feet above current sea level (the latter adds storm events).

Finally, we have tabulated the degree to which nearby high-and-dry mainland communities have unfulfilled obligations to build affordable housing units under the Mount Laurel doctrine. These could help support relocation of low-income households under a policy of "managed retreat" – managed retreat at least affecting year-round residences. Clearly, other uses could continue in the face of rising sea levels and periodic hurricanes and storms, such as recreational enjoyment of the beach areas, seasonal residences (without publicly-aided flood insurance), temporary seasonal housing (RVs, tents, etc.) and commercial businesses that can be moved in advance of major weather events.

Our analysis has covered all municipalities in Cape May, Atlantic, Ocean, and Monmouth Counties. They have been characterized by geographic location: barrier island and oceanfront towns, inlet/bay back-up towns, and high-and-dry towns. All have also been categorized under Building One New Jersey's Municipal Opportunity Index as maximum-, high-, medium-, low-, and minimum-opportunity towns (based on relative job opportunity, school opportunity, quality of municipal services, and local socioeconomic profile).

Absecon Island Target Region

Maximum jeopardy: Being north of Cape May County, the five Absecon Island towns (Longport, Margate City, Ventnor City, Atlantic City, and Brigantine) all suffered appreciable major/severe storm damage (20-35%) from Sandy. All five would suffer catastrophic major/severe damage from a six-foot sea level increase (70-90%) and would, in effect, be inundated at the ten-foot level (sea level increase plus high surf/storm surge (97-100%). Whereas one can envision Atlantic City's casinos literally "riding out the storm," residential populations to the boardwalk's north where most of Atlantic City's garden apartment-style, public housing projects are located would suffer greatly. (Atlantic City's year-round residential properties suffered 24.5% major/severe damage during Sandy.)

Back-up towns: Whereas several inlet/bay backup towns would incur considerable damage from a six-foot sea level increase (e.g. Corbin City 22%, Somers Point 26%), most of the inlet/bay towns are on higher land, and there is a considerable high-and-dry hinterland throughout the rest of Atlantic County (e.g. Hamilton township, Hammonton town, etc.).

Relocation potential: A policy of managed retreat of year-round residents of Absecon Island would be a very major undertaking. The five Absecon Island towns had 28,650 year-round housing units (including 15,504 in Atlantic City). By contrast with other barrier islands, year-round residences on Absecon Island outnumber seasonal residences by a 3:2 ratio, reflecting the area's status as a year-round destination resort rather than as just a summertime beach community. However, the 18 mainland towns had an unmet Mount Laurel obligation of 4,386 affordable units. This could represent a substantial inventory of new homes for Atlantic City's low-income population while still maintaining their access to job opportunities in Atlantic City's tourism and entertainment economy.

municipalities (south to north) (numbers keyed to Wikipedia map)	total households (year-round) 1-M	total seasonal housing units 1-N	% households with major/ severe damage from Sandy 1-AS	municipal opportunity index (MOI) classification	50% chance of Sandy-type damage (decade)	50% chance of Sandy-type damage (feet above current sea level)	6 foot sea level by 2100 (damage %)	50% chance of 10 ft level (current sea level plus surge (damage %)		
ABSECON ISLAND										
4-Longport borough	1.104	1.337	20,0%	minimum-opportunity	2020	3	84%	100%		
6-Margate City city	3.156	3.958	25,4%	maximum-opportunity	2020	3	90%	100%		
8-Ventnor City city	4.592	3.237	34,9%	low-opportunity	2020	4	70%	100%		
10-Atlantic City city	15.504	4.509	24,5%	central city	2020	3	75%	100%		
12-Brigantine city	4.294	4.928	28,5%	medium-opportunity	2020	2	68%	97%		
	% households with major/ severe damage from Sandy 1- AS	6 foot sea level by 2100 (damage %)	50% chance of 10 ft level (current sea level plus surge (damage %)	municipal opportunity index (MOI) classification	total year- round households (housing stock) 1-M	past affordable housing production	past affordable housing production as % of current housing stock	potential new affordable housing under goal A	goal A as % of current housing stock	
inlet/bay backup towns										
1-Estell Manor city (tract 116)	2,0%	1%	3%	medium-opportunity	619	0	0,0%	39	6%	
2-Corbin City city (tract 116)	0,0%	22%	48%	medium-opportunity	185	0	0,0%	17	9%	
21-Egg Harbor township	0,7%	nf	nf	maximum-opportunity	14.917	0	0,0%	1.502	10%	
3-Somers Point city	1,7%	26%	50%	medium-opportunity	4.655	9	0,2%	118	3%	
5-Linwood city	0,9%	11%	27%	maximum-opportunity	3.219	3	0,1%	173	5%	
7-Northfield city	0,0%	2%	4%	maximum-opportunity	3.152	0	0,0%	246	8%	
9-Pleasantville city	5,9%	5%	11%	low-opportunity	6.898	0	0,0%	83	1%	
11-Absecon city	1,0%	4%	16%	high-opportunity	3.179	0	0,0%	230	7%	
22-Galloway township	0,2%	nf	nf	high-opportunity	13.482	0	0,0%	649	5%	
high-and-dry towns										
19-Weymouth township (tract 116)	0,0%			minimum-opportunity	1.153	0	0,0%	38	3%	
20-Hamilton township	0,4%	nf	nf	high-opportunity	9.490	36	0,4%	682	7%	
13-Port Republic city	0,0%	12%	41%	high-opportunity	3.189	0	0,0%	28	1%	
14-Egg Harbor City city	0,0%	0%	0%	minimum-opportunity	1.593	0	0,0%	65	4%	
23-Mullica township	4,0%	nf	nf	low-opportunity	2.154	0	0,0%	89	4%	
18-Buena Vista township	0,0%	nf	nf	low-opportunity	2.786	0	0,0%	57	2%	
17-Buena borough	0,0%	nf	nf	minimum-opportunity	1.723	75	4,4%	(18)	na	
16-Folsom borough	0,0%	nf	nf	low-opportunity	688	0	0,0%	32	5%	
15-Hammonton town	0,0%	0%	0%	high-opportunity	5.408	128	2,4%	276	5%	

Long Beach Island Target Region

Maximum jeopardy: Long Beach Island (particularly its southern half) is one of New Jersey's most vulnerable barrier islands. Divided up into six municipalities (including Long Beach township that is broken into five segments, the island as a whole suffered 31% major/severe damage during Sandy. The island's southern end would be substantially damaged by a six-foot sea level increase (North Beach Haven CDP 64%, Beach Haven 70%, Ship Bottom 52%) while the northern end sits on somewhat higher ground (Surf City 17%, Harvey Cedars 27%, and Barnegat Light 32%). However, the island would be inundated by a sea level/storm event that raised water levels to ten feet (90-100%).

Back-up towns: Several communities fronting the bay behind the barrier island suffered major damage during Sandy: the bayside area of Little Egg Harbor township (census tract 7361.05 – 90%), the bayside area of Stafford township (tract 7351.03 – 68%), and bayside Tuckerton borough (28%). All these areas should be eligible for managed retreat, but the townships themselves have considerable higher ground in which 80% or more of their populations currently reside. Wedged into the southern end of Ocean County, these townships are flanked by rural townships in eastern Burlington County that represent the high-and-dry alternatives.

Relocation potential: Long Beach Island contains 7,066 year-round residences (as compared to 29,101 seasonal housing units). Adding the three bay front areas discussed above raises the target for managed retreat to 12,276 residences. However, there is only modest potential for relocation into new Mount Laurel affordable housing units. The Ocean County towns (1,281 units) and the Burlington county towns (55 units) combined have unmet Mount Laurel obligations of 1,336. Many relocatees who desired to stay close to island-related employment would have to look to farther removed townships in Ocean County.

municipalities (south to north) (numbers keyed to Wikipedia map)	total households (year-round) I-M	total seasonal housing units I-N	% households with major/ severe damage from Sandy I-AS	municipal opportunity index (MOI) classification	50% chance of Sandy-type damage (decade)	50% chance of Sandy-type damage (feet above current sea level)	6 foot sea level by 2100 (damage %)	50% chance of 10 ft level (current sea level plus surge (damage %)		
LONG BEACH ISLAND										
Long Beach Island (all municipalities)	7.066	29.101	31,1%	<i>low-opportunity</i>	2020	4' = 37%	47%	99%		
32- Long Beach township	2.513	11.866	57,9%	low-opportunity	na	na	nf	nf		
North Beach Haven CDP	1.115	5.099	na	na	2020	4' = 39%	64%	99%		
2-Beach Haven borough	641	3.173	0,0%	high-opportunity	2020	4' = 43%	70%	100%		
3-Ship Bottom borough	1.177	3.455	52,0%	minimum-opportunity	2020	4' = 3%	52%	100%		
4-Surf City borough	1.177	3.455	0,0%	minimum-opportunity	2020	4' = 0%	17%	100%		
5-Harvey Cedars borough	169	1.045	0,0%	minimum-opportunity	2020	4' = 4%	27%	100%		
6-Barnegat Light borough	274	1.008	0,0%	minimum-opportunity	2020	4' = 15%	32%	90%		
	% households with major/ severe damage from Sandy I- AS	6 foot sea level by 2100 (damage %)	50% chance of 10 ft level (current sea level plus surge (damage %)	municipal opportunity index (MOI) classification	total year- round households (housing stock) I-M	past affordable housing production	past affordable housing production as % of current housing stock	potential new affordable housing under goal A	goal A as % of current housing stock	
inlet/bay backup towns										
33-Little Egg Harbor township (balance)	5,1%	nf	nf	minimum-opportunity	8.060	211	2,6%	207	2,6%	
census tract 7361.05	90,0%	na	na	na	1.735	na	na	na	na	
1-Tuckerton borough	28,3%	15%	63%	minimum-opportunity	1.396	0	0,0%	147	10,5%	
30-Stafford township (balance)	1,0%	nf	nf	high-opportunity	10.096	448	4,4%	441	4,4%	
census tract 7351.03	68,0%	na	na	na	2.079	na	na	na	na	
29-Barnegat township	1,1%	1%	5%	minimum-opportunity	8.128	1.085	13,3%	486	6,0%	
high-and-dry towns										
Bass River township (Burlington)	0,0%	nf	nf	medium-opportunity	501	0	0,0%	23	4,6%	
Woodland township (Burlington)	0,0%	nf	nf	medium-opportunity	439	0	0,0%	32	7,3%	

NOTE 1: Sandy damage to Beach Haven, Surf City, Harvey Cedars, and Barnegat Light boroughs was probably attributed to Long Beach township and Ship Bottom ZIP codes.

NOTE 2: Percentages of major/severe damages to Little Egg Harbor and Stafford townships are net of two shoreline census tracts.

Barnegat Peninsula Target Region

Maximum jeopardy: Like Long Beach Island, the seven towns on the Barnegat Peninsula were hard-hit by Sandy (45-85% major/severe damage) and face major threats from rising sea level and future storms. With a six-foot rise in sea level, major/severe damage would range from a low of 51% in northernmost Point Pleasant Beach to 84% in Lavallette borough. Any weather event producing 10-foot water levels would overwhelm the barrier island (83% to 99%).

Back-up towns: Because of the combined effect of surge in Barnegat Bay and the Toms River, mainland towns suffered major/severe damage to bay front and river front neighborhoods from Sandy. Hardest hit were Ocean Gate (87%), Brick township (tract 7143 – 96% and tract 7144 – 66%) and Toms River township (tract 7270.02 – 100%; tract 7225 – 80%; tract 7234 – 72%; and tract 7224.02 – 65%). Though there were other areas that suffered lesser damage in these two townships, excluding these hard-hit areas, the overall major/severe damage rate in the balance of Brick and Toms River townships was 6.0% and 5.8%, respectively.

Relocation potential: Both townships have been building Mount Laurel units (Brick 863 units and Toms River 857 units) that still represented less than 3% of their total housing stock. With significant new Mount Laurel obligations triggered by projected housing growth (Brick 812 units and Toms River 3,097 units), the two townships should be able to provide sufficient affordable housing units for their own low-income households moving away from the water's edge within their townships. Moreover, the total amount of Mount Laurel obligations among all back-up and high-and-dry towns (10,610 affordable units) compares very favorably with the total number of households (11,742) of all income levels that could be relocated from both the barrier island and threatened bay shore and river front communities.

municipalities (south to north) (numbers keyed to Wikipedia map)	total households (year-round) 1-M	total seasonal housing units 1-N	% households with major/ severe damage from Sandy 1-AS	municipal opportunity index (MOI) classification	50% chance of Sandy-type damage (decade)	50% chance of Sandy-type damage (feet above current sea level)	6 foot sea level by 2100 (damage %)	50% chance of 10 ft level (current sea level plus surge (damage %)		
barrier island										
7-Seaside Park borough (tract 2080 pt)	2,537	4,678	65%	minimum-opportunity	2070	5' =56%	70%	96%		
8-Seaside Heights borough (tract 2080 pt)	"	"	"	minimum-opportunity	2070	5' =48%	75%	99%		
14-Lavallette borough	933	2,218	85%	low-opportunity	2070	5' =74%	84%	94%		
15-Mantoloking borough (tract 7120 pt)	621	937	68%	medium-opportunity	2070	5' =60%	74%	88%		
16-Bay Head borough (tract 7120 pt)	"	"	"	high-opportunity	2050	5' = 63%	72%	93%		
17-Point Pleasant Beach borough	1,985	1,388	45%	medium-opportunity	2050	5' = 40%	51%	83%		
	% households with major/ severe damage from Sandy 1- AS	6 foot sea level by 2100 (damage %)	50% chance of 10 ft level (current sea level plus surge (damage %)	municipal opportunity index (MOI) classification	total year- round households (housing stock) 1-M	past affordable housing production	past affordable housing production as % of current housing stock	potential new affordable housing under goal A	goal A as % of current housing stock	
inlet/bay backup towns										
28-Ocean township	9,5%	nf	nf	minimum-opportunity	3,485	135	3,9%	193	5,5%	
27-Lacey township	7,2%	nf	nf	low-opportunity	11,591	306	2,6%	629	5,4%	
26-Berkeley township	4,1%	nf	nf	low-opportunity	22,560	469	2,1%	573	2,5%	
9-Ocean Gate borough	55,0%	87%	100%	minimum-opportunity	831	0	0,0%	13	1,6%	
10-Island Heights borough	5,0%	13%	21%	low-opportunity	683	0	0,0%	38	5,6%	
11-Pine Beach borough	1,0%	4%	15%	minimum-opportunity	818	5	0,6%	48	5,9%	
12-Beachwood borough	0,4%	1%	1%	minimum-opportunity	3,682	0	0,0%	165	4,5%	
13-South Toms River borough	11,0%	6%	9%	medium-opportunity	1,098	0	0,0%	80	7,3%	
24-Toms River township	14,6%	17%	23%	minimum-opportunity	35,705	857	2,4%	3,097	8,7%	
18-Point Pleasant borough	11,9%	17%	42%	medium-opportunity	7,273	4	0,1%	350	4,8%	
23-Brick township (balance)	6,0%	nf	nf	medium-opportunity	29,842	863	2,9%	812	2,7%	
census tract 7143	96,0%			na	332					
census tract 7144	66,0%			na	1,354					
high-and-dry towns										
25-Manchester township	0,0%	nf	nf	low-opportunity	22,854	179	0,8%	1203	5,3%	
19-Lakehurst borough	0,0%	nf	nf	minimum-opportunity	881	0	0,0%	86	9,8%	
22-Lakewood township	0,0%	nf	nf	minimum-opportunity	24,283	26	0,1%	897	3,7%	
21-Jackson township	0,0%	nf	nf	high-opportunity	20,448	199	1,0%	2225	10,9%	
20-Plumstead township	0,0%	nf	nf	low-opportunity	7,962	0	0,0%	201	2,5%	

Manasquan-Belmar Target Region

Medium jeopardy: Though Manasquan (37% major/severe damage) and Belmar (26%) suffered significantly from Sandy, as ocean front communities rather than barrier island communities, the five water's edge towns of southern Monmouth County appear to be in less long-term jeopardy from rising sea levels than barrier island neighbors in Ocean, Atlantic and Cape May counties. A six-foot sea level rise only generates major/severe damage in the 0% (Belmar) to 23% (Manasquan) range, while weather events raising water levels further to ten feet would generate 2% (Sea Girt) to "only" 58% (Manasquan) damage. This suggests that only Manasquan borough might be a suitable candidate for a policy of managed retreat.

Back-up towns: Both Spring Lake Heights and Lake Como, lying behind their ocean front neighbors, have little long-term jeopardy from rising sea level and major storms. The dozen "high-and-dry" boroughs and townships are literally that.

Relocation potential: The unmet Mount Laurel obligations of the inland towns totaled 3,905 affordable housing units with the great bulk of them being in three maximum-opportunity townships (Wall – 1,109 units; Freehold – 849 units; and Manalapan – 685 units) plus high-opportunity Howell township (616 units). They could readily accommodate low-income households relocating from Manasquan and Belmar boroughs.

municipalities (south to north) (numbers keyed to Wikipedia map)	total households (year-round) 1-M	total seasonal housing units 1-N	% households with major/ severe damage from Sandy 1-AS	municipal opportunity index (MOI) classification	50% chance of Sandy-type damage (decade)	50% chance of Sandy-type damage (feet above current sea level)	6 foot sea level by 2100 (damage %)	50% chance of 10 ft level (current sea level plus surge (damage %)		
barrier island/oceanfront										
1-Brielle borough	1.805	229	7,0%	high-opportunity	2020	3'	4%	21%		
2-Manasquan borough	2.374	1.126	36,5%	maximum-opportunity	2090	7'	23%	58%		
3-Sea Girt borough	823	468	4,0%	maximum-opportunity	2100	10'	1%	2%		
5-Spring Lake borough	1.253	795	6,0%	maximum-opportunity	2020	3'	14%	30%		
7-Belmar borough	2.692	1.236	26,1%	minimum-opportunity	2100	9'	0%	37%		
	% households with major/ severe damage from Sandy 1- AS	6 foot sea level by 2100 (damage %)	50% chance of 10 ft level (sea level plus surge (damage %)	municipal opportunity index (MOI) classification	total year- round households (housing stock) 1-M	past affordable housing production	past affordable housing production as % of current housing stock	potential new affordable housing under goal A	goal A as % of current housing stock	
inlet/bay backup towns										
4-Spring Lake Heights borough	1,0%	1%	5,0%	low-opportunity	2.316	0	0,0%	94	4,1%	
6-Lake Como borough	11,0%	0%	10,0%	low-opportunity	788	0	0,0%	31	3,9%	
high-and-dry towns										
44-Wall township	0,0%	nf	nf	maximum-opportunity	10.051	228	2,3%	1.109	11,0%	
43-Howell township	0,0%	nf	nf	high-opportunity	17.260	307	1,8%	616	3,6%	
34-Farmingdale borough	0,0%	nf	nf	low-opportunity	547	9	1,6%	12	2,2%	
35-Freehold borough	0,0%	nf	nf	minimum-opportunity	4.006	139	3,5%	76	1,9%	
42-Freehold township	0,0%	nf	nf	maximum-opportunity	12.577	431	3,4%	849	6,8%	
36-Englishtown borough	0,0%	nf	nf	medium-opportunity	621	7	1,1%	76	12,2%	
41-Manalapan township	0,0%	nf	nf	maximum-opportunity	12.909	327	2,5%	685	5,3%	
37-Roosevelt borough	0,0%	nf	nf	low-opportunity	1.612	20	1,2%	12	0,7%	
40-Millstone township	0,0%	nf	nf	high-opportunity	3.615	24	0,7%	155	4,3%	
38-Allentown borough	0,0%	nf	nf	high-opportunity	704	0	0,0%	35	5,0%	
39-Upper Freehold township	0,0%	nf	nf	medium-opportunity	2.363	2	0,1%	155	6,6%	

Asbury Park-Long Branch Target Region

Medium jeopardy: With the exceptions of Loch Arbor village (that reported no major/severe damage from Sandy) and Monmouth Beach (that suffered 42% major/severe damage), the other coastal communities from Avon-by-the-Sea to Long Branch appear to be on higher ground overall. Both Asbury Park and Long Branch are projected to suffer no damage from a six-foot rise in sea level and a 10-foot, storm-driven event would produce only a 7% major/severe damage in Asbury Park and only 1% in Long Branch.

Back-up towns: Though Interlaken reported 11% major/severe damage from Sandy, none of the six back-up towns touching bays and inlets and six high-and-dry towns appear threatened by rising sea level, only Shrewsbury borough (23%) and Interlaken (11%) would appear to be threatened by a 10-foot weather event.

Relocation potential: Only Monmouth Beach (1,494 residences) would appear to be a candidate for managed retreat. The dozen inland communities have an unmet Mount Laurel obligation of 2,239 affordable units that could easily accommodate low-income relocatees from Monmouth Beach. Neptune township stands out for having so fulfilled prior Mount Laurel obligations that its credits wipe out new obligations from projected housing growth and leave Neptune township with a future credit of 93 affordable units.

municipalities (south to north) (numbers keyed to Wikipedia map)	total households (year-round) 1-M	total seasonal housing units 1-N	% households with major/ severe damage from Sandy 1-AS	municipal opportunity index (MOI) classification	50% chance of Sandy-type damage (decade)	50% chance of Sandy-type damage (feet above current sea level)	6 foot sea level by 2100 (damage %)	50% chance of 10 ft level (current sea level plus surge (damage %)		
barrier island/oceanfront										
8-Avon-by-the-Sea borough	901	420	3,0%	low-opportunity	na	na	na	na		
10-Bradley Beach borough	2,098	1,082	3,0%	minimum-opportunity	>2100	8'	0%	15%		
#-Ocean Grove (CDP) (tract 8074)	1,948	1,184	3,0%	low-opportunity	na	na	na	na		
11-Asbury Park city	6,725	1,351	1,8%	minimum-opportunity	>2100	8'	0%	7%		
12-Loch Arbour village (tract 8124)	82	77	0,0%	low-opportunity	na	na	16%	74%		
14-Allenhurst borough (tract 8124)	217	148	0,0%	low-opportunity	na	na	0%	9%		
15-Deal borough (tract 8124)	333	593	2,0%	low-opportunity	>2100	10'	0%	2%		
16-Long Branch city	11,753	2,417	9,5%	minimum-opportunity	>2100	na	0%	1%		
17-Monmouth Beach borough	1,494	487	42,0%	high-opportunity	?	?	?	1%		
	% households with major/ severe damage from Sandy 1- AS	6 foot sea level by 2100 (damage %)	50% chance of 10 ft level (sea level plus surge (damage %)	municipal opportunity index (MOI) classification	total year-round households (housing stock) 1-M	past affordable housing production	past affordable housing production as % of current housing stock	potential new affordable housing under goal A	goal A as % of current housing stock	
inlet/bay backup towns										
9-Neptune City borough	2,0%	0%	4,0%	minimum-opportunity	2,133	0	0,0%	46	2,2%	
45-Neptune township	3,0%	na	na	low-opportunity	11,201	197	1,8%	(93)	-0,8%	
13-Interlaken borough (tract 8124)	0,0%	1%	11,0%	minimum-opportunity	361	0	0,0%	40	11,1%	
23-West Long Branch borough	0,3%	0%	0,0%	maximum-opportunity	2,384	0	0,0%	233	9,8%	
22-Oceanport borough	13,6%	0%	1,0%	maximum-opportunity	3,693	108	2,9%	58	1,6%	
21-Little Silver borough	9,0%	0%	0,0%	maximum-opportunity	2,146	0	0,0%	209	9,7%	
high-and-dry towns										
46-Ocean township	0,1%	na	na	medium-opportunity	10,611	0	0,0%	1034	9,7%	
27-Tinton Falls borough	0,0%	0%	0,0%	high-opportunity	8,357	641	7,7%	114	1,4%	
24-Eatontown borough	0,0%	0%	0,0%	low-opportunity	5,497	452	8,2%	108	2,0%	
47-Colts Neck township	0,0%	na	na	maximum-opportunity	3,277	88	2,7%	186	5,7%	
25-Shrewsbury borough (tract 8123)	0,0%	0%	0,0%	minimum-opportunity	1,261	0	0,0%	287	22,8%	
48-Shrewsbury township (tract 8123)	0,0%	na	na	minimum-opportunity	583	0	0,0%	14	2,4%	

Sea Bright-Union Beach Target Area

Maximum jeopardy: On its long barrier island south of the Sandy Hook peninsula, Sea Bright was devastated by Sandy (95% major/severe damage) where Sandy's water levels must have exceeded even the 10-foot event projected by the surging seas website (resulting in 13% major/severe damage). Also, though seemingly partially sheltered by federal- and state-owned Sandy Hook, Highlands (40%), Keansburg (34%) and Union Beach (67%) recorded major/severe damage from Sandy. Keansburg and Union Beach are projected to suffer from both a six-foot sea level rise (64% and 67%, respectively) and a ten-foot weather event (93% and 79%, respectively). Sea Bright, Keansburg and Union Beach are prime candidates for managed retreat.

Back-up towns: With substantial inland waterfront properties, maximum-opportunity Rumson borough suffered significant major/severe damage from Sandy (18%) and is the only inland community projected to be threatened by a six-foot rising sea level (5%) and a major ten-foot sea level/storm surge (23%). High-opportunity Middletown township's beachfront areas also suffered significant Sandy damage (tract 8005 – 42% and tract 8006 – 12%) but only one of eight township households are living in these areas.

Relocation potential: A total managed retreat from low-opportunity Sea Bright (813 households), minimum-opportunity Keansburg (3,805) and minimum-opportunity Union Beach (2,143) would involve 6,761 households of all income levels. Unmet Mount Laurel obligations of the inland towns total 4,415 with the largest shares being high-opportunity Middletown (1,262 affordable units), high-opportunity Hazlett township (457 units), and maximum-opportunity Holmdell and Marlboro townships (616 and 1,173 units, respectively). Though at a rate short of their past Mount Laurel obligations, Middletown (529 units), Holmdell (307 units) and Marlboro (207 units) all have a history of building affordable units.

municipalities (east to west) (numbers keyed to Wikipedia map)	total households (year-round) 1-M	total seasonal housing units 1-N	% households with major/ severe damage from Sandy 1-AS	municipal opportunity index (MOI) classification	50% chance of Sandy-type damage (decade)	50% chance of Sandy-type damage (feet above current sea level)	6 foot sea level by 2100 (damage %)	50% chance of 10 ft level (current sea level plus surge (damage %)		
barrier island/oceanfront										
18-Sea Bright borough	813	440	95%	low-opportunity	>2100	10'+	9%	13%		
# Sandy Hook	na	na	na	na	na	na	na	na		
28-Highlands borough	2,623	523	40%	minimum-opportunity	>2100	10'+	6%	21%		
29-Atlantic Highlands borough	1,870	132	3%	low-opportunity	>2100	10'	0%	3%		
30-Keansburg borough	3,805	513	34%	minimum-opportunity	2020	1'	64%	93%		
31-Union Beach	2,143	126	67%	minimum-opportunity	2070	6'	67%	79%		
32-Keyport borough	3,067	205	4%	minimum-opportunity	2020	4'	7%	12%		
	% households with major/ severe damage from Sandy 1- AS	6 foot sea level by 2100 (damage %)	50% chance of 10 ft level (sea level plus surge (damage %)	municipal opportunity index (MOI) classification	total year-round households (housing stock) 1-M	past affordable housing production	past affordable housing production as % of current housing stock	potential new affordable housing under goal A	goal A as % of current housing stock	
inlet/bay backup towns										
19-Rumson borough	18%	5%	23%	maximum-opportunity	2,344	0	0,0%	282	12%	
20-Fair Haven borough	0%	0%	0%	maximum-opportunity	1,970	0	0,0%	138	7%	
26-Red Bank borough	1%	0%	0%	low-opportunity	4,929	222	4,5%	226	5%	
52-Middletown township (net)	1%	na	na	high-opportunity	24,754	529	2,1%	1,262	5%	
Middletown township (tract 8005)	42%	na	na	na	1,482	na	na	na	na	
Middletown township (tract 8006.01)	12%	na	na	na	1,865	na	na	na	na	
53-Hazlett township	0%	na	na	high-opportunity	7,140	0	0,0%	457	6%	
33-Matawan borough	0%	0%	0%	low-opportunity	3,358	0	0,0%	32	1%	
high-and-dry towns										
51-Holmdell township	0%	na	na	maximum-opportunity	5,584	307	5,5%	616	11%	
50-Aberdeen township	1%	na	na	minimum-opportunity	6,876	20	0,3%	229	3%	
49-Marlboro township	0%	na	na	maximum-opportunity	13,001	207	1,6%	1,173	9%	

Summary:

Overall perspective:

New Jersey state government faces two key challenges: adopting a policy of managed retreat for rising sea level-threatened towns (particularly on barrier islands) and getting truly serious about enforcing court-ordered and COASH-ordered Mount Laurel affordable housing obligations.