Planning for a Resilient Rockaways:
A Strategic Planning Framework for Arverne East

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ROCKAWAY WATERFRONT ALLIANCE

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EXECUTIVE SUMMARY

Arverne East, a waterfront community on the Eastern end of the Far Rockaways, Queens contains one of the last remaining large expanses of vacant land in New York City. Arverne East embodies a rich history of coastal seaside communities, the lingering legacy of urban renewal, and the challenges and rewards of being situated on a barrier island, with miles of picturesque waterfront. The Arverne East site also represents the urhban challenges of spurring impactful economic development and bringing necessary public services to disadvantaged communities.

The Rockaway Waterfront Alliance (RWA), a community-based organization dedicated to fostering understanding and engagement between local community members and the waterfront, commissioned this study in the fall of 2012 to re-initiate conversations around the needs and possibilities within Arverne East. The following document provides a strategic planning framework based on qualitative and quantitative analysis, data gathering and public outreach. Part one provides a profile of the history, land use, zoning, local and regional demographics, market trends, housing, transportation, socioeconomic conditions and natural ecology of Arverne East and the Rockaways. Part two explores key local stakeholders and results from public outreach efforts. Part three addresses key coastal risks and hazards, particularly in light of climate change impacts and the October 2012 storm, Superstorm Sandy, which devastated coastal communities like the Rockaways and dramatically shifted conversations about the relationship between people, places and the environment. Part four explores a vision for a environmental, economic and social resilience through recommendations and actionable next steps.
Arverne East presents an opportunity to build in a thoughtful, contextual way, by

leveraging local assets to foster a community-oriented wellness and recreation hub that serves as model for coastal environmental, economic and social resilience.

This vision for an enriching environment that provides community services, recreation, employment opportunities and environmental protections emerged from a process of stakeholder interviews, public outreach, site visits and research which strove to pinpoint appropriate responses to current community needs and assets. An intentional focus on environmental, environmental and social resilience can offer protections to current and future community members and visitors, while remaining flexible to accommodate future trends and changes.

Study Recommendations

Environmental Resilience
Goal: Promoting development that anticipate and adapt to short and long-term environmental changes.

Objective I: Incorporating risk and vulnerability assessments into broad decision-making and planning mechanisms.

Recommendations:

- Guiding growth away from high-risk locations and locating critical facilities in less vulnerable areas.
- Incentivizing the (re)introduction and protection of natural systems and buffers.
- Retrofitting existing buildings and facilities that cannot be relocated.
- Monitoring and updating programs and plans on regular basis
- Participating in New York City's Local Waterfront Revitalization Program (LWRP) planning processes and updates to the New York City Comprehensive Waterfront Plan: Vision 2020.
- Enforcing the Coastal Zone Management Act, which manages coastal resources and balances economic development objectives with environmental conservation.

Objective II : Integrate complementary soft and hard infrastructure interventions to fortify existing and future structures and functions.

Recommendations:

- Replenish the coastline with a vegetated double dune system to protect against storm surges.
- Elevate site above Advisory Base Flood Elevation (ABFE) levels
- Exploring off-shore mechanisms tha leverage natural forces to provide protection against the storms and erosion.
- Consider multifunctional flood defense and stormwater management and retention mechanisms.
- Study feasible resilient building forms and locations, including mid-rise buildings with flood proof ground-floor uses and/or environmental buffers.
- Incorporate green infrastructure in existing and future developments.
- Retrofit and build new infrastructure to be storm-proof.
- Modernize energy transmission and distribution systems.

Objective III: Reduce the local carbon footprint by reducing energy demand and encouraging local renewable energy networks to lessen susceptibility to grid disruptions

Recommendations:

- Green building retrofits in existing structures and energy efficient building design for any new development can help increase energy efficiency and reduce energy demand.
- Improve/Adjust building codes to increase the sustainability of the buildings.
- Provide energy efficiency information and financing.

Economic Resilience
Goal: Bolstering the economic vitality of the area by creating opportunities and establishments that empower and serve the needs and aspirations of current and future residents.

Objective I: Developing mixed-use residential and retail that responds to existing and projected needs and markets.

Recommendations:

- Introduce medium density mixed-use housing, office and commercial retail, with elevation and ground-level adaptive green infrastructure for storm resilience
- Amend/modify current zoning to promote mixed-uses.

Objective II: Introduce innovative hotel and accommodations establishments to fill market gap, provide employment and capitalize upon local tourism and airport proximity.

Recommendations:

- Create a destination that can host day-trippers and weekend visitors.
- Establish a partnership with international airlines operating at JFK through guest room and meeting/conference space agreements.
- Provide event and conference space, as well as catering hall facilities to provide additional amenities to residents and visitors
- Incentivize community ownership/operation of facilities
- Serve as a model for urban ecotourism and utilize nearby recreation and environmentally sensitive regions in and around the peninsula

Objective III: Invest in new and existing community anchors as a way of creating local jobs and strengthening the local economy

Recommendations:

- Work closely with St. John's Episcopal Hospital throughout the Arverne East development process to create programmatic and economic linkages.
- Create a network of anchors connecting the Beach 59th Street Rockaway Institute for Sustainable Environment with a new a library located between P.S. 106 and the commercial corridor, encouraging residents to use spaces for social, cultural, recreational, and educational activities.
- Target a credit union to locate a new branch in Arverne East.

Goal: Create spaces and uses that promote positive, healthy interaction and exchange, and help build social capital and community identity

Objective I : Foster a health and wellness district that promotes active, healthy living environments through accessibility, connectivity and health-oriented recreation and commercial uses.

Recommendations:

- Establish a community health center to provide multiple, non-urgent primary health care services for all residents, in particular the low income, uninsured and underinsured members of the community.
- Initiate various activity programs to encourage healthy lifestyles to the community
- Establish a community garden site as an experiential and learning center for local residents, integrating its efforts with nutritional, obesity-reduction, and healthy medicine programs.
- Develop additional health-related facilities and programming to increase opportunities for local residents to stay active and be healthy.

Objective II: Promote social resilience through connectivity and open space interventions that foster connectivity, exchange, and collaboration.

Recommendations:

- Create a versatile public square as the centerpiece for a larger network of year-round recreational destinations for residents and visitors.
- Develop active recreation nodes near school areas (Beach 32nd and Beach 54th) to encourage outdoor street life throughout the day.
- Foster short-term uses such as public art installations by local and visiting artists or camping on vacant sites to foster local arts, discussion and visitors.
- Designate a nature preserve along the western portion of the site (Beach 44 - Beach 55) with walking paths and a nature education center promoting environmental education and ecotourism.
- Create dual-purpose water retention and active area (Beach 44 –Beach 40, behind retail/mixed use) containing active recreation through playgrounds for adults and children.
- Active recreational spaces respond to community needs for spaces and activities that can serve as a "third place" for all members during times of leisure.
- Build elevated recreational piers and walkovers (Beach 54th, 44th, 36th Streets) that provide north-south connections to the beach and destination viewing areas.
- Connect to broader parks network, including Jamaica Bay and the Gateway National Recreation Area.

Objective III: Promote connectivity and enhanced multi-modal transportation network that enables people to access community spaces, assets, resources and each other.

Recommendations:

- Extend lateral beach road along south side of site to promote porousness and accessibility, and delineate between beach and development areas.
- Design complete streets to promote accessibility and circulation for people of different ages, backgrounds, physical and economic capability.
- Improve cycling environment and facilities through demarcated bike lane under the Rockaway Freeway train track, as well as bike rack facilities.
- Reinstitute ferry service between the Rockaways and Lower Manhattan.
- Re-align the road network near the intersections of Rockaway Freeway and Beach Channel Drive, between Beach 34th and Beach 35th Street.

- Expanded bus route and stops at the MTA Bus Depot from Howard Beach.

Next Steps

- Innovative storm surge and flooding protection measures from both the ocean and bay sides that mimic or work with natural processes and also do not exacerbate flooding in other parts of the peninsula.
- Programs that encourage community involvement in the entire process, from pre-development conceptualization to operations and to be included in the transformation and growth of the region.
- A thorough review of recent traffic and congestion around the site, potential impacts of these recommendations directly around the site, potential reconfiguration of the intersection of the Rockaway Freeway, Edgemere Avenue, Beach Channel Drive, Beach 35th Street, Beach 34th Street, and Seagirt Boulevard.
- Review of feasible near-term and long-term public transportation options and improvements, including bus rapid transit service throughout the peninsula as well as into Manhattan, additional ferry service, and bike-share programs with dedicated bike lanes.
- A thorough cost / benefit analysis of each recommendation option that includes the costs and benefits to the environment and to the community, as well as the benefits and costs of the linkages between each recommendation.
- Financing incentive programs that the Rockaways can take advantage of, particularly Sandy relief funds, and expansion of current empowerment zones and other city-level financing and zoning incentive programs to include the Rockaways.
- Appropriate building design and placement that works with the site and has minimal adverse impact to the site's natural resources.
- A rezoning study.
- Evacuation plans that incorporate the library, hotel, and convention center space as staging zones or evacuation centers during storms and transportation routes that efficiently move people to safer housing during storms. Additionally, an outreach plan in order to inform residents of staging zones and plans is a vital component of an effective evacuation plan.
- A plan to address the housing issue
- An in-depth market analysis to examine the true spending leakages, appropriate retailers as well as innovative incentives to attract these retailers to Arverne East, and the appropriate amount of square footage that could be supported in the region.
- Evaluation of redevelopment/repositioning strategies of complementary zones within the peninsula that could be redeveloped/repositioned in conjunction with Arverne East, such as downtown Far Rockaway.
- Marketing strategies that can change the perception issues in the Rockaways and re-position the region to increase the tourism industry.

INTRODUCTION:
RESEARCH AND ANALYSIS

1.1 PROJECT GOALS AND VISION

Figure 1. Site Boundary Map

Arverne East, a waterfront community on the Eastern end of the Far Rockaways, Queens contains one of the last remaining large expanses of vacant land in New York City. The Arverne East site embodies a rich history of coastal seaside communities, the lingering legacy of urban renewal, and the challenges and rewards of being situated on a barrier island, with miles of picturesque waterfront. The Arverne East site also represents the urban challenges of spurring impactful economic development and bringing necessary public services to disadvantaged communities.

The Rockaway Waterfront Alliance (RWA), a community-based organization dedicated to fostering understanding, engagement and respect between local community members and the waterfront, commissioned this study in the fall of 2012 to re-initiate conversations around the needs and possibilities within Arverne East. RWA cited the need to address historical natural hazard risks, outdated stormwater infrastructure and economic disparities as a key driver for initiating this study. The initial goal of the study was to identify opportunities and recommendations to strengthen economic development and environmental sustainability, whereby the conservation and restoration of natural habitats, the sustainable growth of the local economy, and the needs and aspirations of the Peninsula's residents were prioritized.

In October of 2012, near the beginning of this study, Superstorm Sandy struck the northeastern United States, bringing devastating tidal surges and waves that crippled infrastructure and service delivery in the Rockaways. The storm offered a glimpse into the volatile weather events waterfront communities must adapt to in the face of climate change and further highlighted the need for studies and strategic planning frameworks engaging community stakeholders, local leaders, decision makers and issue experts. On a broader level, the storm shifted conversations about the relationship between people, places and the natural environment.

A key opportunity to build a more environmentally and economically resilient Rockaways lies in planning for one of the last expanses of vacant, waterfront land in New York City. The Arverne East area of the Rockaway Peninsula, specifically Beach 32nd Street to Beach 54th Street, south of Rockaway Beach Boulevard, has been largely vacant for decades. In 2003, an Environ-

mental Impact Statement (EIS) was issued for the Arverne Urban Renewal Area (AURA), which encompasses Arverne East and some the surrounding land. The EIS outlined potential adverse impacts resulting from development on the site as well as mitigation measures against these impacts. The recommendations in this study incorporate certain recommendations and requirements from the EIS that may represent best possible options for the site. However, this report does not address each mitigation measure within the EIS, in an effort to avoid redundancy and explore additional innovative solutions in a post-Sandy environment.

Waterfront Solutions and the Rockaway Waterfront Alliance (RWA) are committed to creating a vision for Arverne East by means of a comprehensive approach, whereby the conservation and restoration of natural habitats, the sustainable growth of the local economy, and the needs and aspirations of the Peninsula's current residents are taken into account. Input from stakeholder meetings and a public community workshop heavily shaped the guiding vision and recommendations. Major goals include:

- Transforming Arverne East into a health and wellness hub
- Promoting near-term storm recovery, as well as long-term resilience. This includes equipping the site with the infrastructure necessary to protect the community from future extreme natural events.
- Creating an economic anchor for the Eastern Rockaway peninsula through much needed business development, commercial and retail access, as well as quality local employment opportunities. This includes commercial activity aiming to improve diversity of retail choice, reflect unique local character, and capture local retail spending.
- Developing a diverse housing community and complementary facilities to serve and attract a broad range of residents within the surrounding community and the broader peninsula. This includes mixed-income housing stock, along with hospitality facilities, entertainment and recreation, as well as quality public spaces.
- Promoting access to, from, and within the area by a multitude of transportation modes, including walking and cycling, to best accommodate the needs of a broad range of community members and visitors—including children, students, families, the elderly, and tourists.

1.1 LOCAL HISTORY AND CHARACTER

At the turn of the 20th century, the Rockaways served as a summer getaway for New Yorkers, who vacationed in the area's oceanfront bungalows and renowned hotels, including the celebrated Arverne Hotel and Colonial Hall. The area's vibrancy and popularity began to fade in the 1920s and 1930s, as automobiles made it possible for New Yorkers to access less populated beaches further east on Long Island. Additionally, the barrier island's vulnerability to harsh weather and erosion exposed the peninsula's homes and hotels, primarily of wood frame construction, to structural damage and devastating fires. The public's waning interest in the Rockaways as a summer destination enabled Robert Moses, head of the Mayor's Committee on Slum Clearance, to raze much of the waterfront structures throughout the 1940s and 1950s. Parking lots and public housing towers were created to accommodate the city's growing need for affordable housing options, especially for residents displaced from urban renewal projects throughout the city.

The legacy of this era is highly visible today. The politics of spatial inequity within the city have reinforced the area's high concentration of residents in need of social services and assistance. Of the 80 public housing communities in Queens, 21 are located in the Rockaways, exposing an already vulnerable population to the dangers of flooding, and distancing these communities from the economic, educational, technological, and cultural assets the city offers.

Today, small pockets of bungalow communities remain, but the historic, seaside character of the Rockaways has largely disappeared. Attempts have been made to revitalize and re-envision the area—most notably during the late 1980s, when Forest City won the city's RFP for multi-housing development—but have proven unsuccessful. Historic natural and economic barriers to development and revitalization persist. The area's transportation and commercial needs are largely unmet, reinforcing the community's isolation and compounding a legacy of disinvestment. Not only do peninsula residents have the longest average commute in the city at nearly an hour, residents also face a dearth of quality local job opportunities, limited access to retail and commercial services, and a scarcity of quality local public schools. On a broader level, fragmented interests among peninsula communities, prohibitive infrastructure costs, and a high concentration of public housing assistance recipients creates challenges to fostering the diverse mix of residences and businesses that is often the key to an economically viable, resilient and dynamic community.

In recent years, an active, growing surfing community, new housing and retail developments and interest in waterfront recreation opportunities have inspired a sense that change is yet again coming to the Rocka-

Woodframe beachfront hotels in Arverne

ways. The area has long been an attraction for surfers, particularly in the Beach 90's section, and in recent years has increasingly appealed to young adults from other parts of New York City who have helped to reinvigorate concession businesses along the boardwalk.

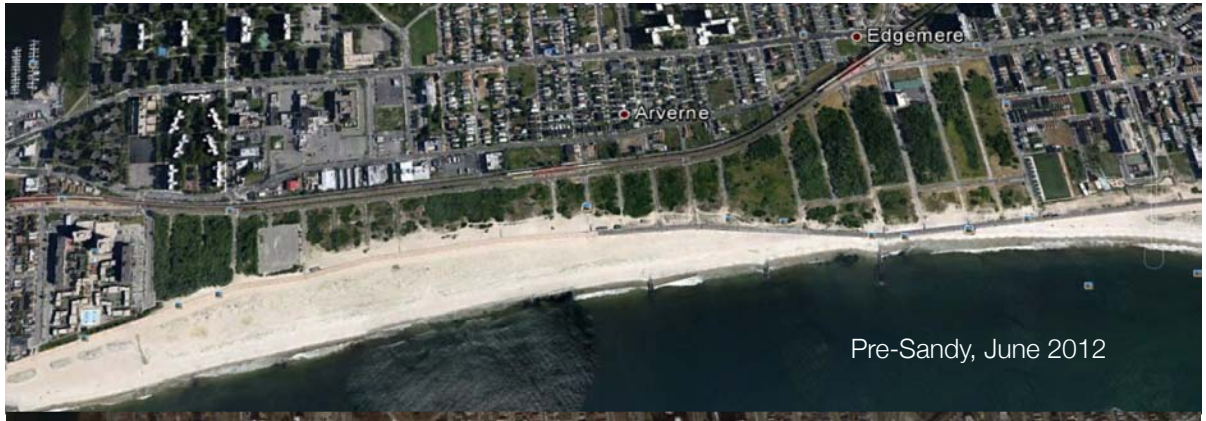
Changes within the Arverne Urban Renewal Area (AURA) —bounded by Beach 32nd Street, Beach 81st Street, Rockaway Freeway, and the Rockaway Boardwalk and consisting of 308 acres —also signal renewed interest and activity in the Rockaways. Established in 1968, the AURA remained vacant for over thirty years until 2002, when ground was broken in the western portion of the AURA for Arverne by the Sea. Arverne by the Sea consists of six communities, four of which have been completed and sold. At the time of research, the fifth community, also referred to as the Dunes and consisting of two-family market-rate homes ($559,000 to $995,000) was approximately 50 percent sold. The construction of luxury high-rise condominium buildings is planned upon completion of the Dunes. In 2006, the Eastern portion of the AURA, which closely aligns with this report's study area, was awarded to a group of three developers—L&M Development Partners, the Bluestone Organization, and Triangle Equities. Despite plans to complete the project in five years, the land remains vacant today. Initial delays resulted from a lack of construction and infrastructure financing, as well as the economic downturn of the late 2000's. In the aftermath of Superstorm Sandy, the developer and the city must review any development through the lens of increased flood and natural hazard threats. [2, 3, 4, 5]

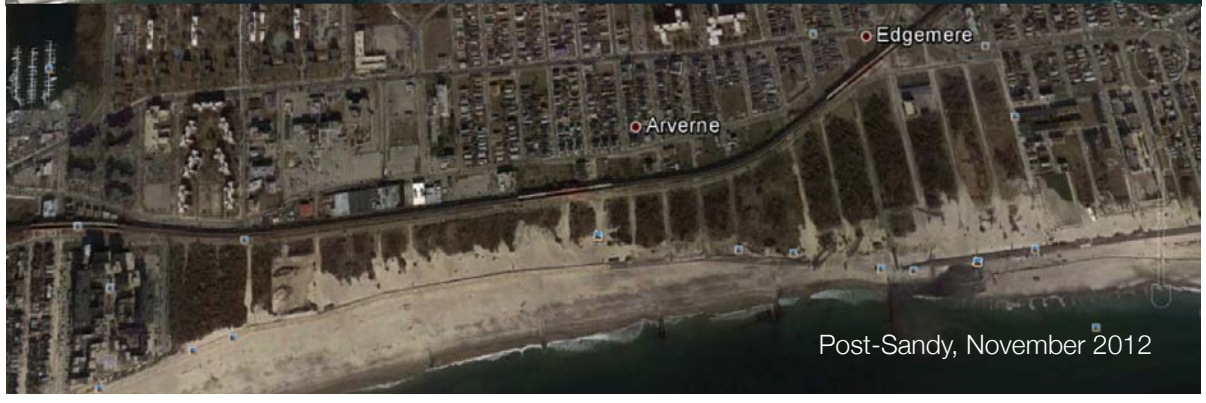
Typical bungalow block

1.3 THE EFFECTS OF SUPERSTORM SANDY AND LESSONS LEARNED

The 2012 weather event that has become known as Superstorm Sandy affected numerous countries as it traveled from the Caribbean Sea to the Great Lakes. What started as a tropical storm quickly grew in strength, and amassed Category 3 hurricane strength as it passed over Cuba on October 25. Sandy declined in intensity on its path north but continued to inflict damage on the eastern seaboard of the United States. When Sandy reached landfall over Brigantine, New Jersey on October 29, it was classified as a post-tropical cyclone with hurricane force winds.[6] Though not technically a hurricane, Sandy—due to a trajectory that swept the ocean in a counterclockwise fashion directly over the massive underwater Hudson Canyon—produced record-setting storm surges in and around New York Harbor. As this surge reached the New York harbor entrance, the waves reached a peak elevation 9.86 meters (32.3 feet), according to the National Oceanic and Atmospheric Administration's National Data Buoy Center.[7] The storm surge, coupled with flooding from Jamaica Bay, had devastating effects on the Rockaway Peninsula.

In the days following the storm, it became apparent that the road to recovery would be long. A vast number of houses on the peninsula were severely damaged, flooded (between three and six feet of water in the neighborhood just north of the study area), or





destroyed altogether; the elevated boardwalk was completely dismantled along certain stretches; and at least seven Rockaway residents had died. Authorities were simultaneously working to restore power, plow sand out of the roads, remove downed trees, and, most importantly, maintain public safety.[8] The Breezy Point community, on the western tip of the peninsula, experienced one of "the worst residential fires in New York City's history," resulting in 126 destroyed homes and an addition 22 damaged residences.[9]

Much of the study area is undeveloped and uninhabited, but the impacts of Sandy were clear. By serving their structural purpose and protecting much of what could have been damaged, the sand dunes were essentially flattened, covering acres of vegetated land with dispersed sand. The dunes and concrete construction may have also played a role in protecting the boardwalk, which remained intact through most of the study area, with the exception of a breach spanning Beach 35th Street to Beach 40th Street.

Throughout the surrounding communities, dunes—most created by the Army Corps—have proven effective natural barriers: during Sandy, they buffered Westhampton Beach on Long Island, Plumb Beach in Brooklyn, and Bradley Beach in Monmouth County, N.J., by blunting the attack of surging waves and tides, as well as nearby Point Lookout, Lido Beach, and Atlantic Beach. In contrast, Long Beach, New York, which had voted 5 to 0 against taking part in an Army Corps dune construction project implemented six years ago, suffered at least $200 million in property and infrastructure losses, according to preliminary estimates.[10]

Federal Response

On January 28, Congress passed a $50.5 billion Sandy aid bill, and President Obama signed the bill into law on January 29. Of the $50.5 billion, $51 billion was allocated to New York State, and $1.77 billion went to New York City.

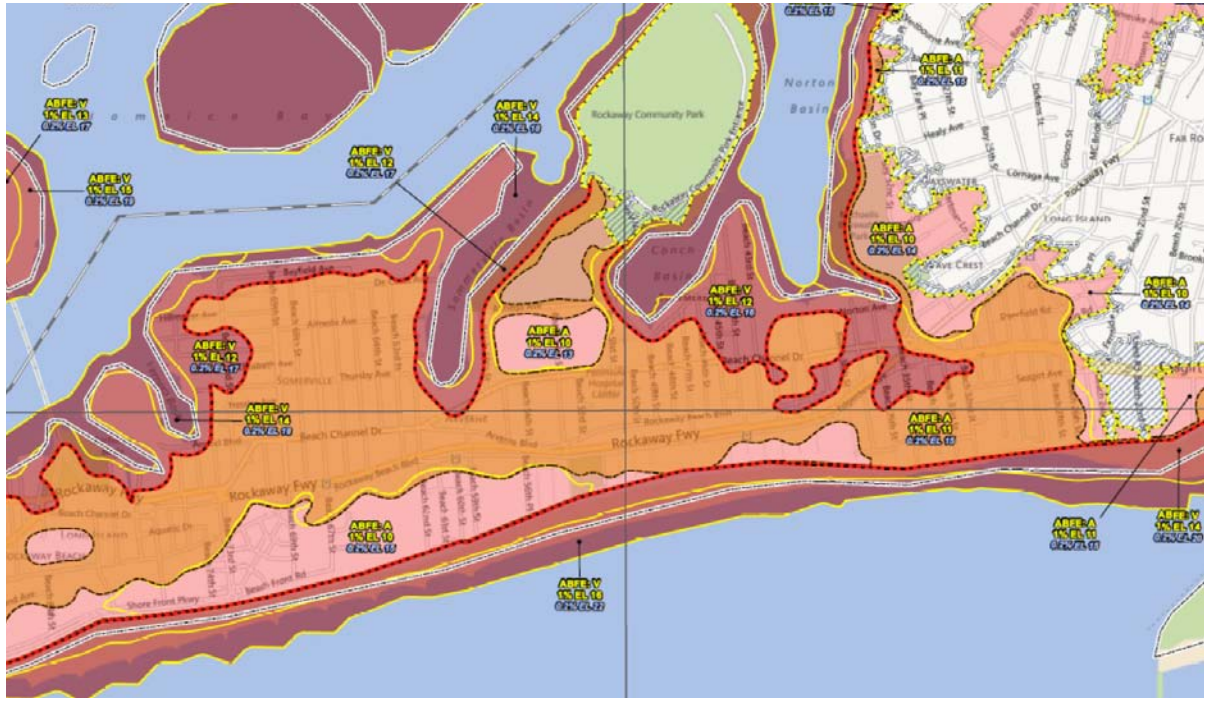
Meanwhile, FEMA's latest Advisory Base Flood Elevations (ABFE) Map was released in January of 2013 (Figure 2), altering the buildable boundaries of the region. The map has designated the study area as ABFE Zone V, representing areas subject to high velocity wave action during "1% annual chance coastal floods" and stringent building requirements. The rest of the peninsula has been designated ABFE Zone A, indicating high risk of storm surge flooding in a "1% annual chance coastal flood" event. Stringent building requirements, high financing costs, and overall risk further challenge much needed hard infrastructure upgrades or investments in the Rockaways.

State Response

In February of 2013, Governor Cuomo proposed a plan to allocate $400 million of the $51 billion in federal funding to buying out homeowners located within flood zones and returning these areas to their natural state for use as preserves, parks, and coastal buffers. Relocation incentives will be offered to entire blocks and to vulnerable areas, even to homeowners whose homes did not sustain severe damage.[11] Despite likely resistance by homeowners, the government seems committed to removing existing development from the area, since the funding requirements that will be needed for storm management and disaster relief could prove unsustainable in the future. Several communities in Staten Island are currently eligible for this program. While the Rockaways have not been listed, the state's consideration of managed retreat in the face of natural hazards may be an important consideration for developers and future residents.

Hazard mitigation and managed retreat is consistent with the state's Climate Action Plan, which aims to reduce greenhouse gas emissions 80 percent below 1990 levels by 2050. Given that the built environment is responsible for a substantial portion of emissions, the state has formulated adaptive building codes and siting guidelines that enforce energy efficiency and structure placement away from designated flood zones. Additionally, the plan calls for infrastructure investments in areas that are not vulnerable to flooding.

Figure 2. FEMA Advisory Base Flood Elevation Map



The New York State 2100 Commission

Perhaps the most far-reaching state response to Sandy came in the form of the New York State 2100 Commission, convened by Governor Andrew Cuomo, which sought to evaluate the state's critical infrastructure systems and issued a framework to ensure the viability and safety of the City into the next century.

The 2100 Commission cites five characteristics of resiliency: "spare capacity (e.g. establishing backup systems, such as alternative transportation routes), flexibility (favoring "soft" solutions that can be modified over time, like improved hazard maps and evacuation plans), limited failure (designing infrastructure networks, especially power grids, to shut down in small portions), rapid rebounds (initiating preemptive response strategies, like creating fleets of portable generators), and constantly learning."[12]

The Commission's Land Use recommendations focus on immediate actions and strategies the state can implement concerning its hard infrastructure on or near coastal lands:

- Protect Coastal and Great Lakes Communities: Repair and protect hard infra

structure along the coast, wastewater infrastructure, and important public recreational areas; dredge inlets and address beach breaches on Long Island and the Great Lakes; develop a comprehensive resilience strategy, including a restoration plan and storm surge barrier assessment, for New York Harbor.

- Reduce Inland Vulnerability to Extreme Weather Events: Manage at-risk drinking water supplies; strengthen dams and levees to protect the public from inland flooding; and protect and secure petroleum, chemical, and hazardous waste tanks located on waterways.
- Strengthen Wastewater Infrastructure: Require installation of disinfection systems; update design standards for wastewater systems; and improve long-term maintenance and planning.
- Develop Probabilistic Hazards Mapping and Risk Mapping that would identify problems and solutions for current methods of hazard and risk assessment.
- Strengthen Land Use Programs, Standards, Policies, Guidelines, and Procedures: Develop regional resilience strategies; update the State Environmental Quality Review Act (SEQRA) to incorporate resilience; and establish new land use policies to account for climate change effects.[13]

In addition to the actions and strategies that the New York State 2100 Commission outlined concerning the state's hard infrastructure, the document's Land Use recommendations also paid particular attention to soft forms of infrastructure, with suggestions that complement steps being taken on the Rockaway Peninsula and surrounding coastal communities, such as: restoring dunes, beaches, barrier islands, and coastal wetlands; protecting and restoring statewide freshwater wetlands; expanding wetlands protection in flood prone areas; creating a wetlands and natural systems mitigation banking program to offset damage or loss; protecting minor streams across the state; and expanding green infrastructure and urban forests. While ongoing maintenance costs will be a crucial consideration, soft forms of infrastructure will inevitably be part of the mix of mitigation efforts.

The 2100 Commission recognizes that "New York can only become more resilient to natural threats by re-integrating environmental functions into the built landscape, enhancing natural protections at the water's edge, and deploying sophisticated engineering to mimic environmental functions to the greatest degree possible. Environment and land use improvements are New York's first line of resilience to climate change over the coming years and decades."[14]

Local Response

On January 31, 2013, in response to FEMA's latest ABFE Map, Mayor Michael Bloomberg announced an executive order to suspend height restrictions to allow for safer building and renovation activity along vulnerable coastlines. A new rule increasing minimum flood proofing elevations was also adopted to mitigate future risk and storm-related damage.[15]

On February 6, 2013, Bloomberg revealed that, of the $1.77 billion in federal grants to be spent on Hurricane Sandy recovery within city limits, $720 million will be allocated towards housing recovery, $185 will be aimed at assisting and spurring local business, and $140 million will go towards improving infrastructure.[16]

Photo credit: Matthew David Powell (Flickr)

Destruction in the Rockaways

1.4 POPULATION, HOUSING AND SOCIO-ECONOMIC PROFILE

The Arverne East study area cannot be understood in isolation from the broader Rockaway peninsula. As of 2010, approximately 112,518 residents lived in the Rockaways, an eight percent increase from 2000 (Table 1). Approximately 40 percent of the peninsula's population is black or African American, followed by 34 percent white, 21 percent Hispanic, 2 percent Asian, and 3 percent other races (Table 2).

Between 2000 and 2010, racial composition has shifted throughout parts of the peninsula (Figures 3 and 4). While the western neighborhoods remain predominantly white, the composition of the predominantly black and Latino/Hispanic residents in the eastern portion of the Rockaways remains in flux. For example, Latinos/Hispanics (denoted in green) have shifted from southern Far Rockaway and into central Far Rockaway. Bayswater on the other hand experienced a strong shift from a predominantly black population in 2000 to a predominantly white population in 2010. There has been little change in racial composition immediately surrounding the study area, which remains primarily black, although that concentration has decreased slightly to the west of the study area.

Almost 27 percent of the Rockaway Peninsula is aged 18 years old or under, and an additional 13.4 percent of residents are 65 years old or over. According to the American Community Survey (ACS), the median household income varied greatly from west to east of Rockaway peninsula, as shown in Figure 5. In 2011, the western half of the peninsula had a median household income of over $60,000 per year, while the median household income for the eastern communities was below $40,000 per year; in one Eastern Rockaway community, annual median household incomes were $18,370.

Table 1. Change in Total Population, 2000-2010

	Total Population		Population Change, 2000 - 2010	
	2000	2010	Number	Percent
Study Area	8,924	10,142	1,218	14
Peninsula	104,070	112,518	8,448	8

Source: U.S. Census Bureau

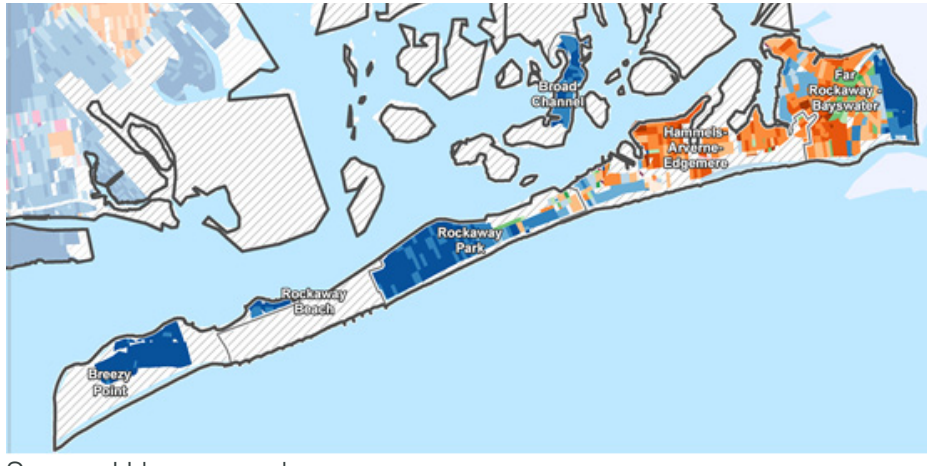
Table 2. Change in Total Population, 2000-2010

	Total Population	Non-Hispanic by Race					Hispanic Origin (of any race)
		Single Race				Two or More Races	
		White	Black/ African	Asian	Other		
Study Area	10,142	7.6%	63.6%	1.8%	0.9%	2.7%	23.4%
Rockaway	114,961	35.2%	38.9%	2.2%	1.1%	1.7%	21.0%

Source: U.S. Census Bureau

Figure 3. Racial Composition in the Rockaways in 2000

Figure 4. Racial Composition in the Rockaways in 2010



Source: Urbanresearchmaps.org

The Arverne East study area falls largely within three census tracts: 972.02, 972.04 and 992 (Figure 6). As of 2010, approximately 10,142 residents lived within or directly adjacent to the study area, a 14 percent increase from 2000. Arverne East's population has a higher percentage of minorities and children, compared to the makeup of the broader peninsula; African Americans account for approximately 63.6 percent of the population, followed by Hispanics (23.4 percent), Whites (7.6 percent), Asian (1.8 percent) and Other (3.6 percent).

Nearly a third (31 percent) of the population is under the age of 18 and an additional 10.5 percent of the population is aged 65 or older. This demographic makeup has important implications for the area's education and caregiving service needs, as well as its tax revenue base. Residents have lower levels of educational attainment compared to the broader peninsula; 73.9 percent of residents have high school diplomas or higher and 11.5 percent received bachelor's degrees or higher, as compared to 79.2 percent and 26.2 percent for the Rockaway Peninsula, comparatively. In addition, the annual median household income for Arverne East study area is lower than the New York City's median household income of $56,000+ and ranges from approximately $16,000 to $44,000.

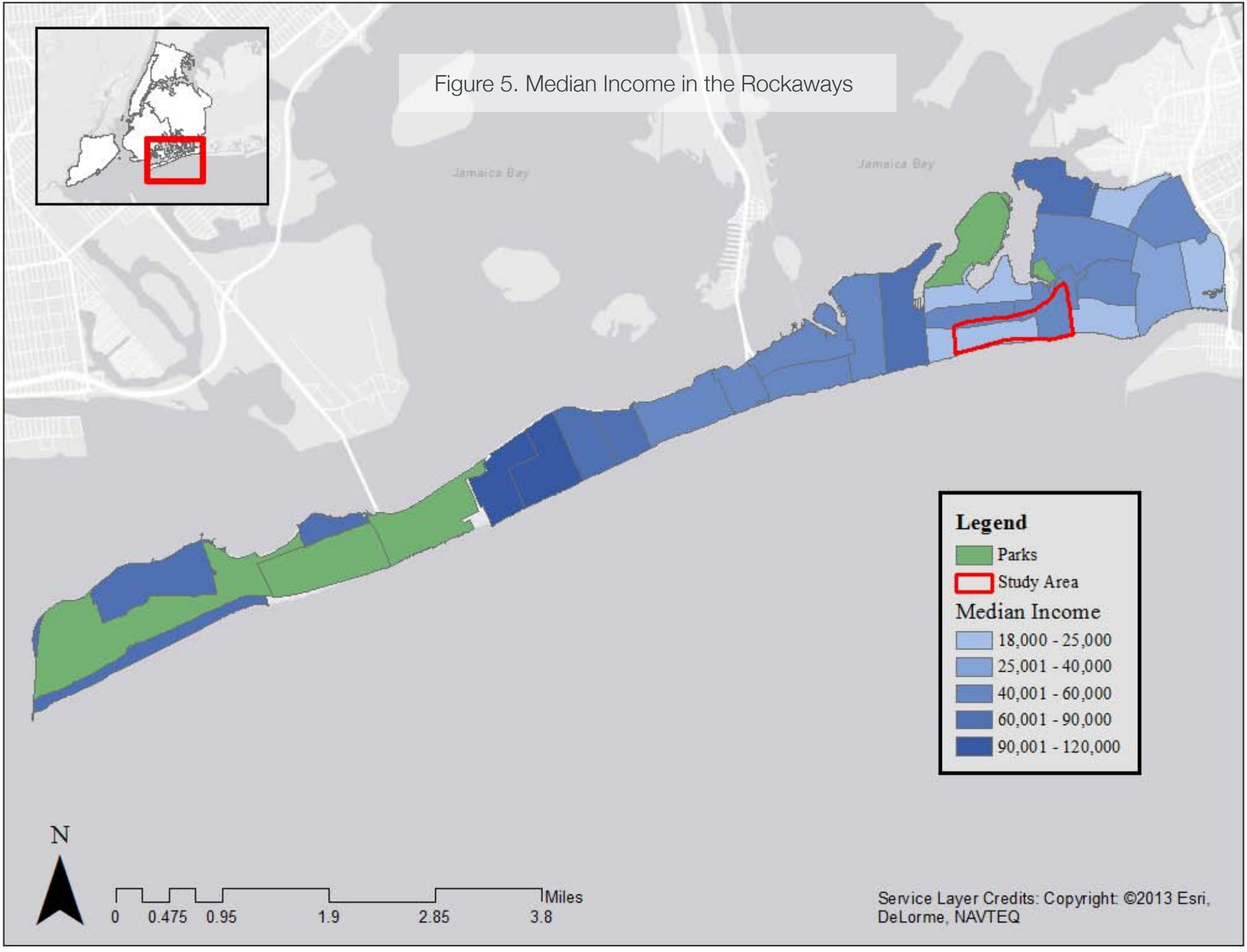


Figure 5. Median Income in the Rockaways
Jamaica Bay
Jamaica Bay
Legend
Parks
Study Area
Median Income
18,000 - 25,000
25,001 - 40,000
40,001 - 60,000
60,001 - 90,000
90,001 - 120,000
N
0
0.475
0.95
1.9
2.85
3.8
Miles
Service Layer Credits: Copyright: ©2013 Esri, DeLorme, NAVTEQ

Employment

According to the 2011 ACS, the Arverne East unemployment rate was 13.4 percent, as compared to the Rockaway Peninsula's unemployment rate of 10.2 percent. Employment rates vary widely based on gender, race and age. Male unemployment in Arverne East was significantly higher than female unemployment, at 17.6 percent as compared to 10.4 percent. In addition, 21.7 percent of Asians and 14.4 percent of blacks were unemployed, compared to 1.6 percent of whites. Most notably, there was an extremely high youth unemployment rate; nearly one in three 16 to 19 year olds and over one in five 20 to 24 year olds were unemployed. Approximately 41 percent of employed residents work in the service sector and another 20 percent work in management, business, science and/or the arts. Of the 580 business establishments in Far Rockaway and Arverne (zip codes 11691 and 11692), over one-fourth fall within the health care and social assistance category; one-fifth are retail trade establishments; and nearly half fall into accommodation and food services, real estate and rental and leasing services, or services categorized as "other."

Figure 6. Census Tracts Surrounding Study Area

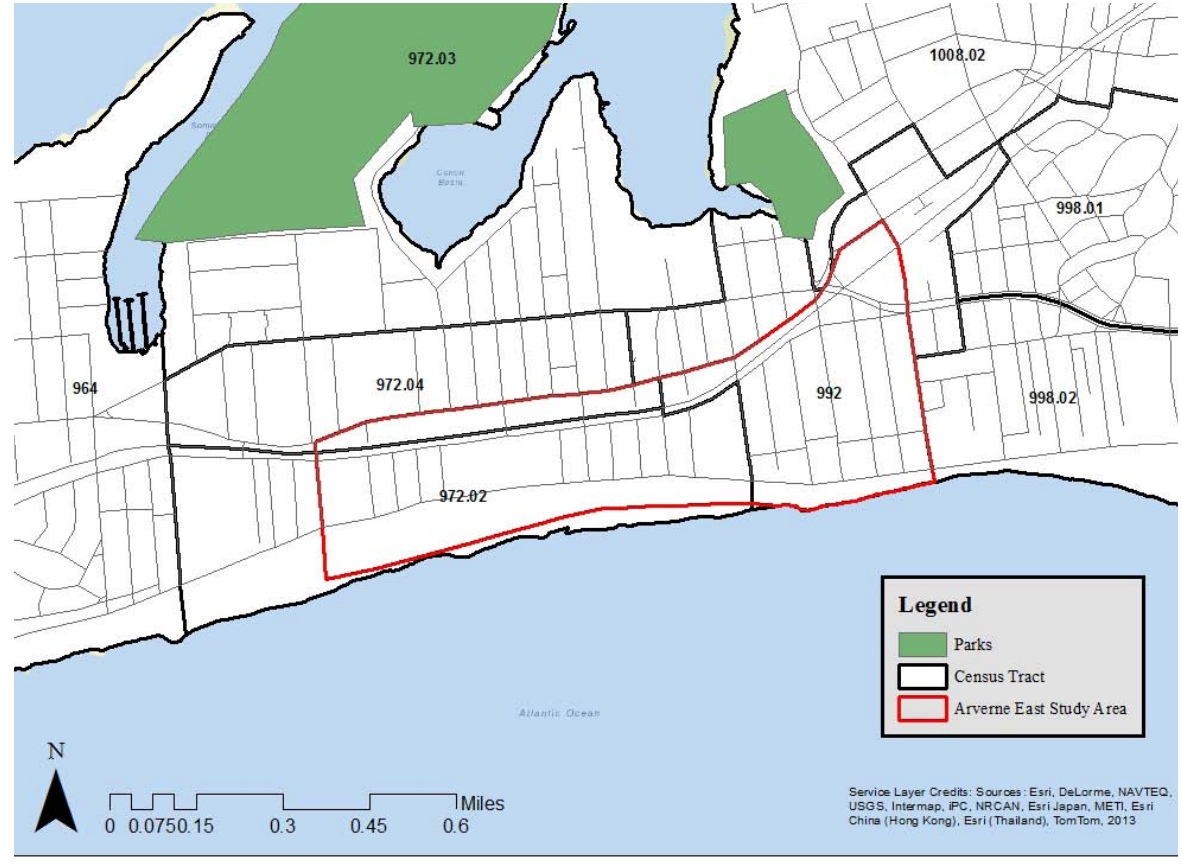
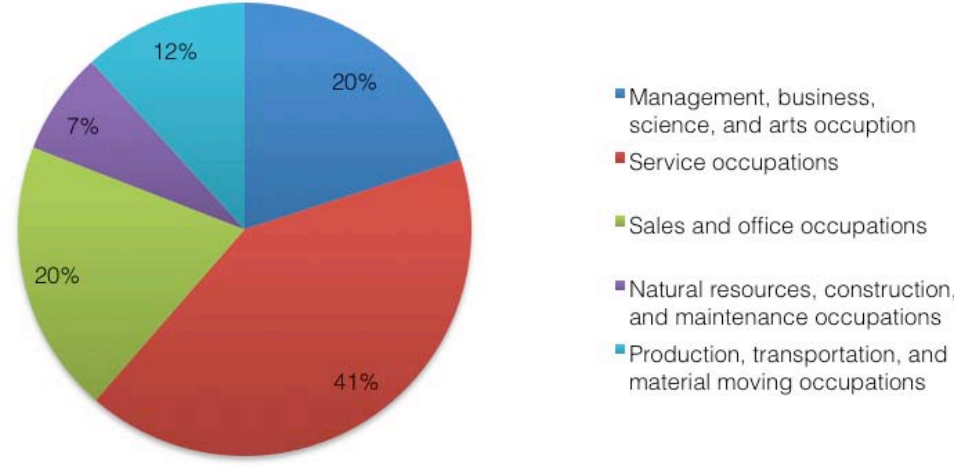


Figure 7. Occupation in Study Area



Public Health

According to the 2010 New York City Community Health Survey, obesity levels on the Rockaway peninsula are comparable to citywide levels; however, comparatively high asthma and diabetes rates suggest public health issues. Approximately 15 percent of Rockaway residents reported having asthma at some point in their lives, compared to 10.8 percent citywide. In addition, nearly 12 percent of Rockaway residents reported having diabetes, compared to 9.3 percent citywide.

Immigration

In 2011, a majority of Arverne East residents were born in the United States (71.1 percent), but over one-fourth (28.9 percent) of all residents were born in foreign countries. Over half of the foreign-born population (53.5 percent did not have U.S. citizenship), however nearly 70 percent had resided in Arverne East for over a decade. A majority of the foreign-born population was born in Latin America (68.3 percent), and additional 12.4 percent was born in Africa.

Housing

In 2011, there were 44,325 housing units in the Rockaway peninsula; 87.1 percent of which were occupied. A majority of these units (62.0 percent) were renter-occupied. Arverne East contains 3,652 units, with a slightly lower occupancy rate of 86.3 percent. Rates of rental occupation in Arverne East (75.7 percent) are higher than that of the broader peninsula. As of 2009, vacancies among rental properties ranged between 5.0 and 6.2 percent for the peninsula. In 2008, rental rates for market-rate units averaged between $1,053 and $1,338 in the Rockaways.

The high concentration of high-rise public housing in the Rockaways is reflected in fact that 41.7 percent of buildings contained more than 20 units. In Arverne East, this figure is even higher, with 55 percent of buildings containing 20 or more units (Figure 8). Arverne East housing units tend to be smaller than the Rockaway average, with 71.7 percent of units having two or fewer bedrooms, as compared to the 61.2 percent in the Rockaways (Table 3).

Homeownership rates vary by race and are highest among whites (54.6 to 67.2 percent), followed by African-Americans (29.9 and 39.5 percent), and then Latinos (18.8 and 27.9 percent).

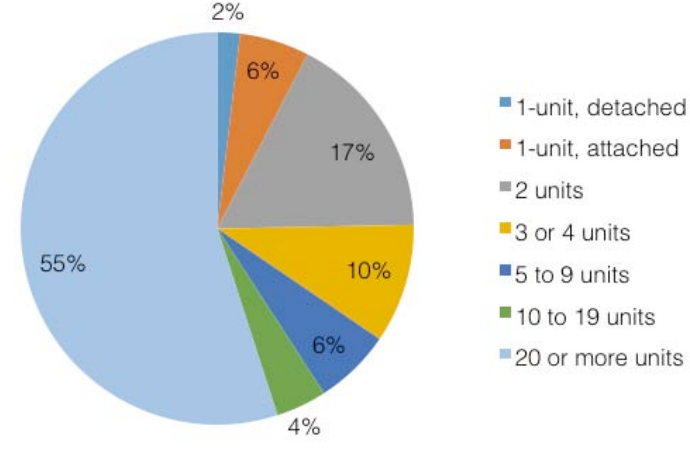
Many renters and over half of homeowners with mortgages in the Rockaways are cost burdened, meaning that they spend over 30 percent of their monthly household income on housing costs. In Arverne East, there is a large gap in housing affordability between homeowners and renters; 60 percent of renter households are cost burdened, as compared to 40 percent of homeowners (Figure 9).

Table 3. Bedroom Counts in Study Area and Rockaway

	Study Area		Rockaway	
Total housing units	3,652	100.0%	44,325	100.0%
No bedroom	161	4.4%	3,225	7.3%
1 bedroom	1,137	31.1%	10,633	24.0%
2 bedrooms	1,321	36.2%	13,285	30.0%
3 bedrooms	839	23.0%	11,532	26.0%
4 bedrooms	63	1.7%	3,470	7.8%
5 or more bedrooms	131	3.6%	2,180	4.9%

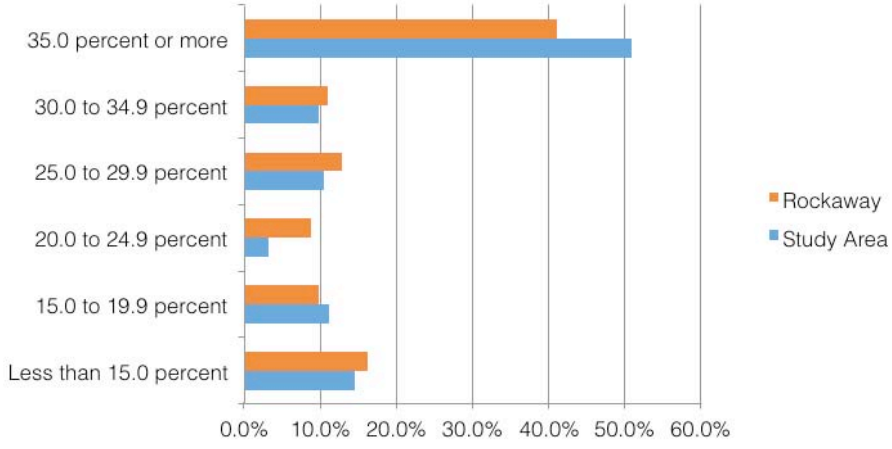
Source: American Census Bureau, ACS 2011

Figure 8. Units in Structure in Arverne East, 2011



Source: American Census Bureau, ACS 2011

Figure 9. Gross Rent as A Percentage of Household Income, 2011



Source: American Census Bureau, ACS 2011

As of 2010, foreclosure rates in the area surrounding the Arverne East study area were notably high. West of the study area, between 104.4 and 125.6 single-family homes out of 1,000 were in foreclosure. The picture was less severe to the north of the study area with 83.2 to 104.4 homes out of 1,000 in foreclosure. In 2010, the median peninsula home price was between $124,641 and $237,346 for two- to four-family homes. Mortgage originations for new home purchases in the peninsula between 18.2 and 28.4 per 1,000 properties in 2009; this range was comparable that of Manhattan during the same period.[17]

In November of 2012, nearly half (46 percent) of the 141 homes for sale in Arverne were in foreclosure, a majority of which were multi-family properties. Of the 40 homes that sold between August and October of 2012, the median sales price was $270,750, although no distinction was made between single-family and multi-family homes.[18]

Table 4: Housing Characteristics in Arverne East

Total Households	3246	
Family households	2323	71.6%
Married-couple family	755	23.3%
With related children under 18 years	420	12.9%
Female householder, no husband present	1371	42.2%
With related children under 18 years	898	27.7%
Male householder, no wife present	197	6.1%
With related children under 18 years	88	2.7%
Nonfamily households	923	28.4%
Households with one or more persons under 18 years	1612	49.7%
Households with one or more persons 65 years and over	522	16.1%
Total Housing Units	3625	
Occupied Housing Units	3246	89.5%
Renter occupied	2645	73.0%
Owner occupied	601	16.6%
Vacant housing units	379	10.5%
For rent	260	7.2%
Rented, not occupied	3	0.1%
For sale only	23	0.6%
Sold, not occupied	5	0.1%
For seasonal, recreational, or occasional use	7	0.2%
All other vacant	81	2.2%

Source: American Census Bureau, 2010 Census

Figure 10. Median Sales Price

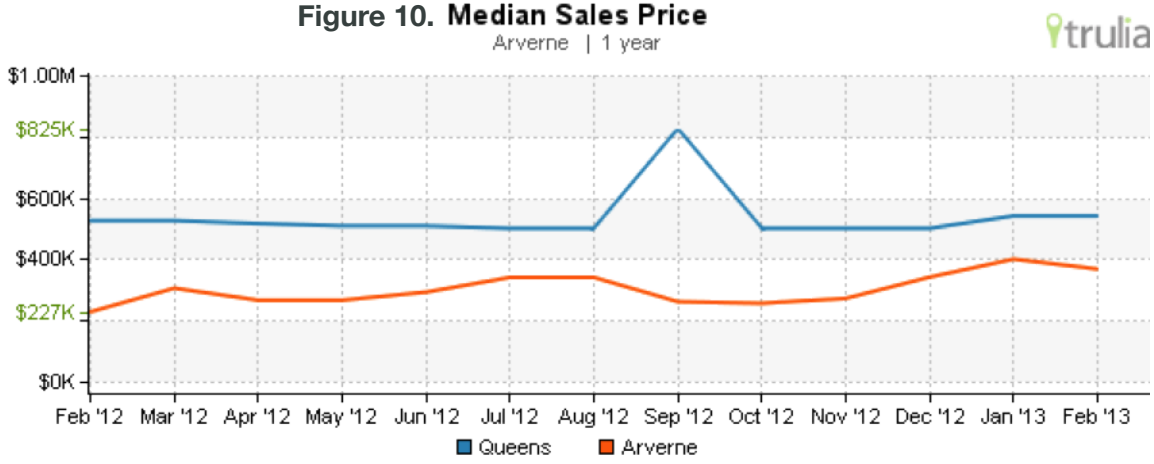
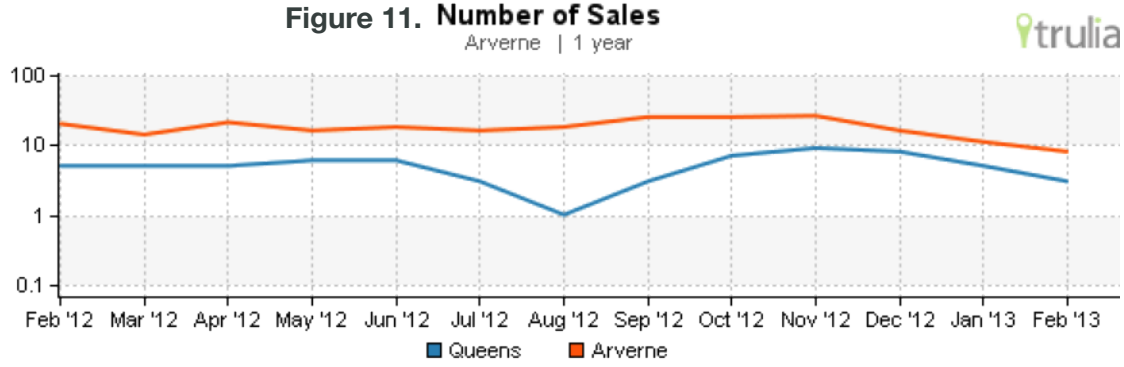


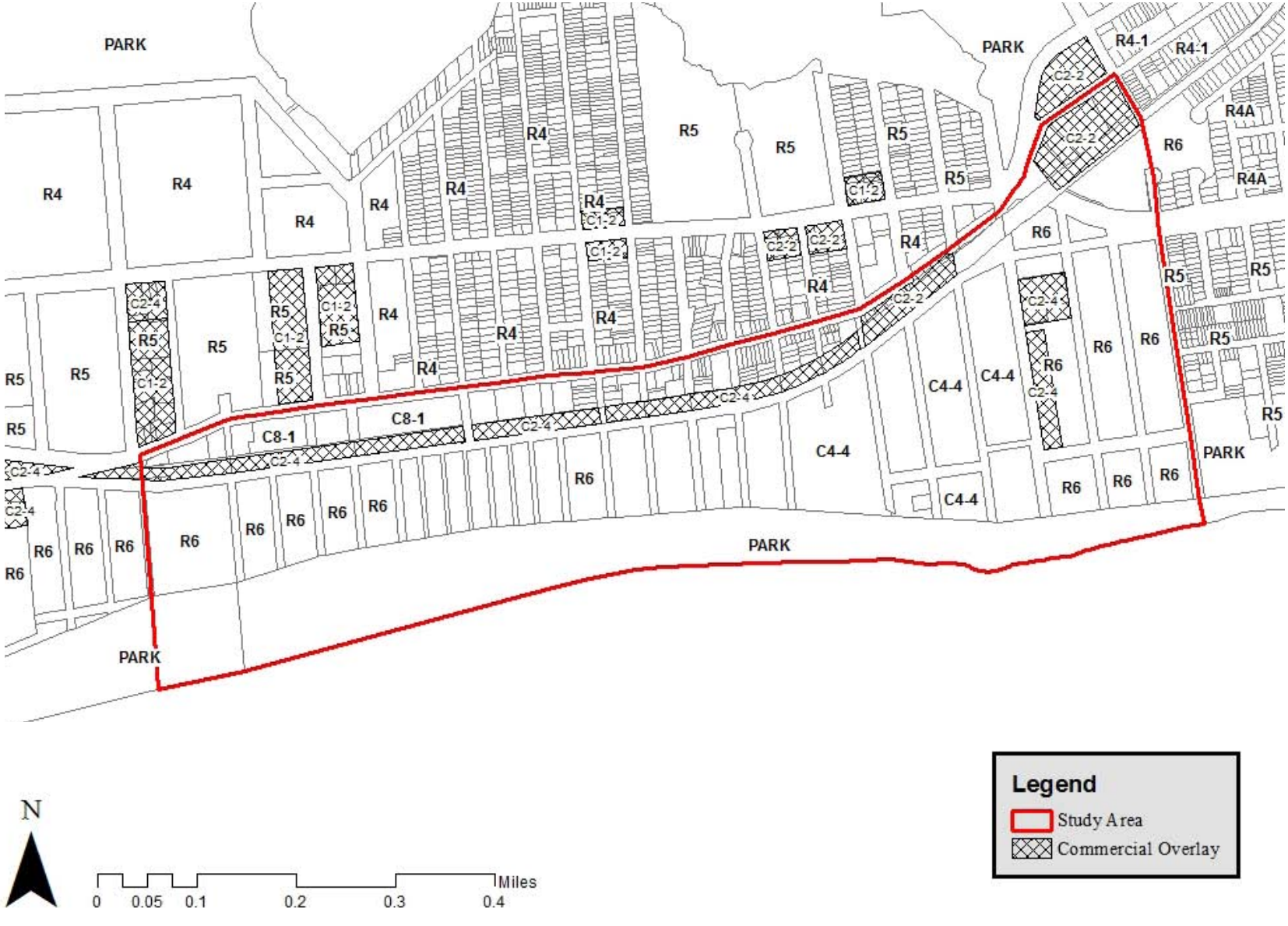
Figure 11. Number of Sales



In light of Sandy, housing prices in Arverne East and within the surrounding neighborhood may experience a decline. The risks associated with rising sea levels and climate change events may also contribute to higher foreclosure rates. The latest FEMA Advisory Base Flood Elevation maps will have major implications for current and potential homeowners, as well as businesses in the region. Stricter building code modifications for coastal properties within flood zones, combined with more costly financing and insurance costs could make new construction prohibitively expensive. The latest median sales price data for 25 sales that occurred between November 2012 and January 2013 did not reflect a decrease in price, however there was decline in listings, which could be attributed to either seasonality and/or storm impacts.[19] The long-term impacts of the storm on the housing market remain to be seen.

1.5 LAND USE AND ZONING ANALYSIS

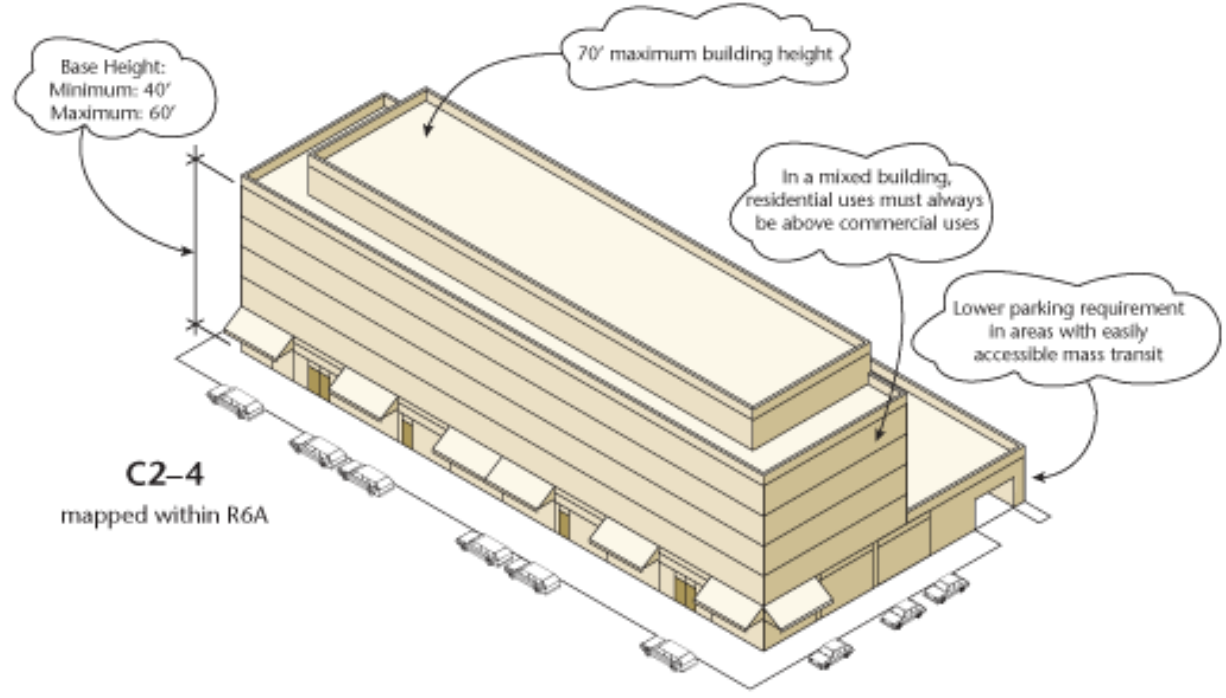
Figure 12. Zoning in Study Area



Zoning

Arverne East is mostly zoned R6 and C4-4, with a band of designated public parkland stretching along the southern perimeter of the study area (Figure 12). The current zoning mix in the study area promotes the development of a medium density residential community with a commercial district in between Beach 35th Street and Beach 40th Street. The R6 zoning district allows for a diverse range of residential building types, from three-story multi-family buildings on small lots to 13-story "towers in the park" on larger lots. R6 districts require a minimum lot width of 40 feet, which discourages the construction of small scale housing such as bungalows, once the predominant form of housing in this area. C4-4 districts are regional commercial districts that attract local and destination shoppers.

The mixed-use nature of C4-4 districts encourages both lively commercial streets and medium-density living arrangements, typified by continuous retail frontage on the ground floor and community facilities and/or residential apartments located above. A small portion of site between Rockaway Beach Boulevard and Edgemere Avenue is zoned as C8-1. This district allows for automotive and other heavy commercial services that require large portions of land with an FAR of 1.0. Commercial overlays (C2-2 and C2-4) run along the northern side of Edgemere Avenue as well as along a portion of Beach 35th Street. Typical uses include neighborhood grocery stores, restaurants, and beauty parlors, and C2 zones allow for additional uses, such as funeral homes and repair services. When used in mixed-use buildings, commercial uses must be located below residential use and limited to one or two floors.

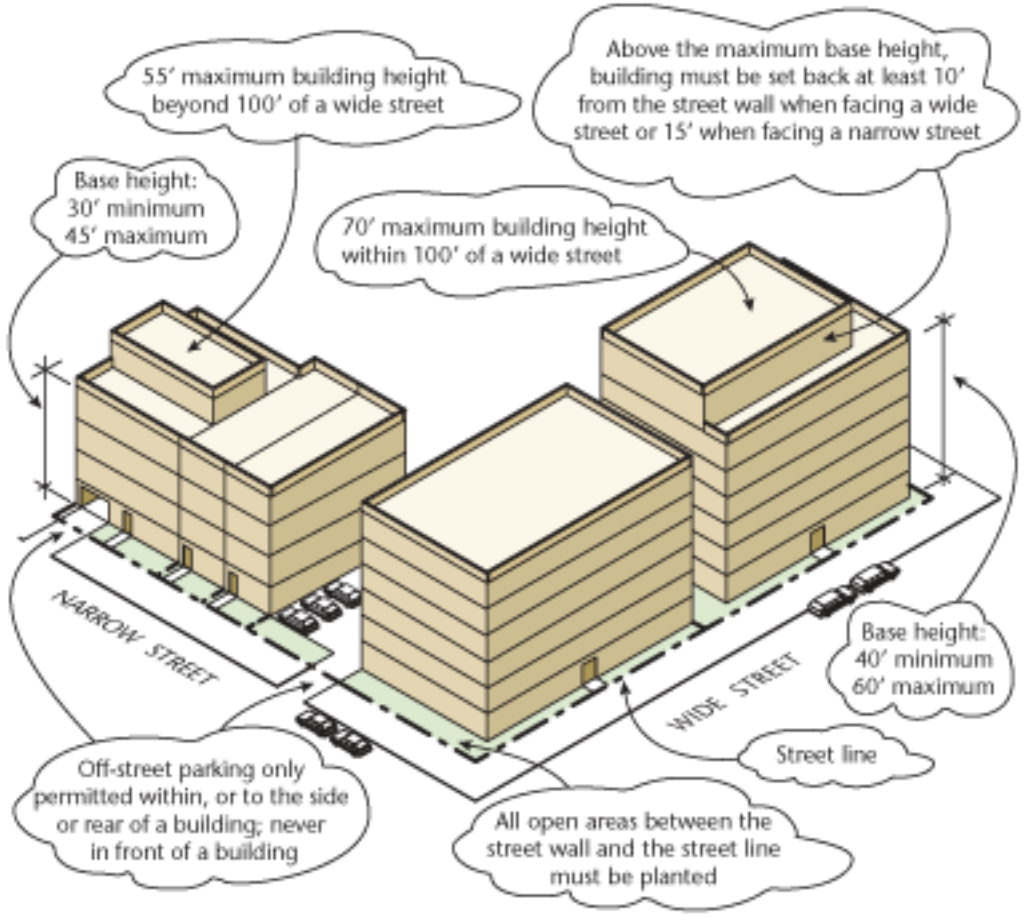


C1 & C2 Commercial Overlay Districts										
	C1–1	C1–2	C1–3	C1–4	C1–5	C2–1	C2–2	C2–3	C2–4	C2–5
Commercial FAR within R1–R5	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Commercial FAR within R6–R10	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Depth of Overlay District (in feet)	200	150	150	100	100	150	150	150	100	100

Land Use

The majority of the study area's land remains vacant, with a scattering of manufacturing and residential uses along the northern perimeter of the study site (Figure 13).

Aerial photographs of the study area in 1924, 1951 and 1996 (Figures 15, 16, 17 respec-



R6 Quality Housing Option							
R6		FAR (max)	Lot Coverage (max)		Base Height (min/max)	Building Height (max)	Required Parking[4] (min)
			Corner Lot	Interior/Through Lot			
	Wide Street[1]	3.0[2]	80%	65%	40–60 ft	70 ft	50% of dwelling units
	Wide Street[2]	2.43	80%	60%	40–55 ft	65 ft	
	Narrow Street	2.2[3]	80%	60%	30–45 ft	55 ft	

[1] *Outside the **Manhattan Core***

[2] *Within the **Manhattan Core***

[3] *3.6 FAR with **Inclusionary Housing designated area** bonus on a wide street; 2.42 FAR on a narrow street*

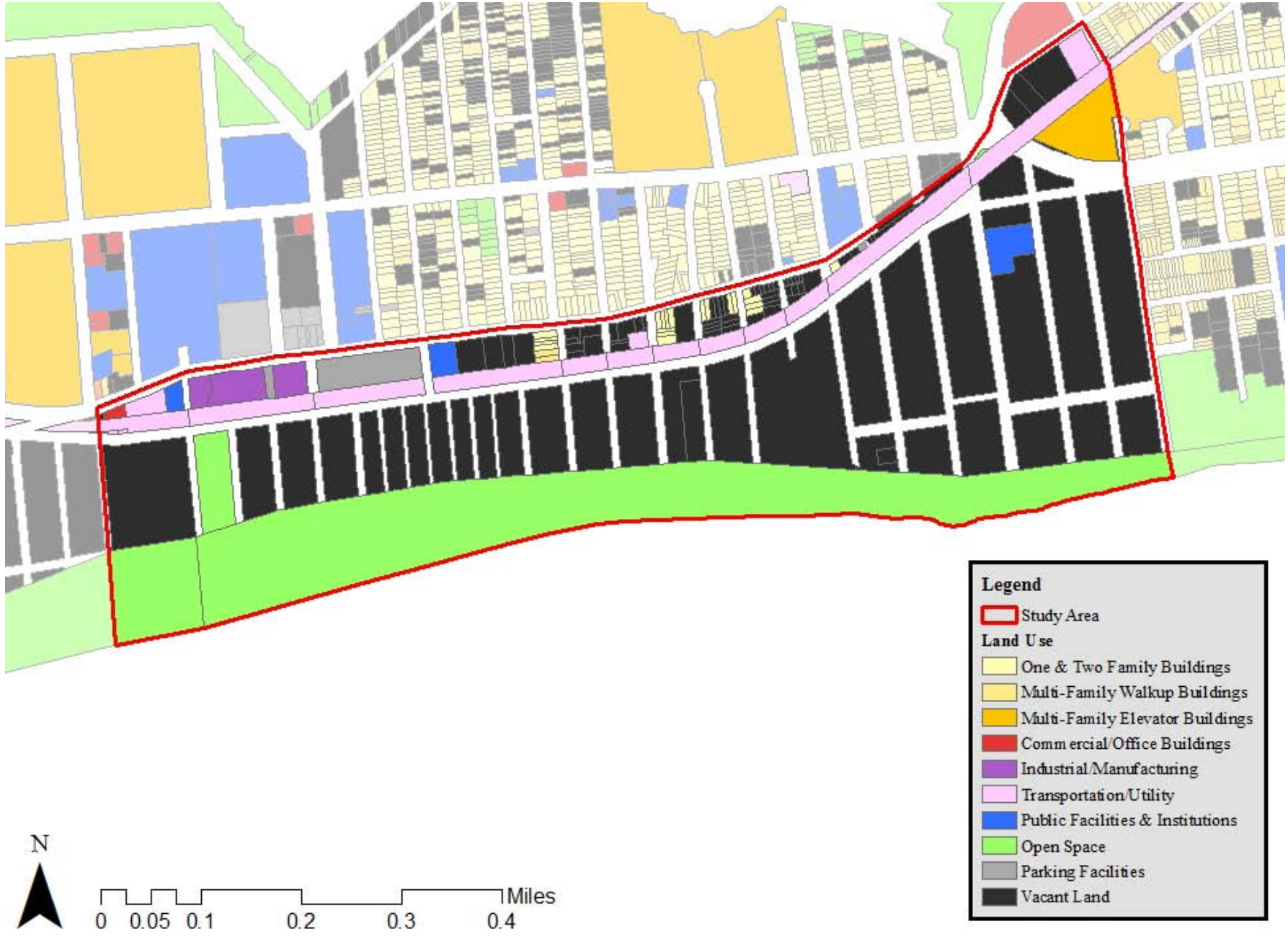
[4] *Waived if 5 or fewer spaces required*

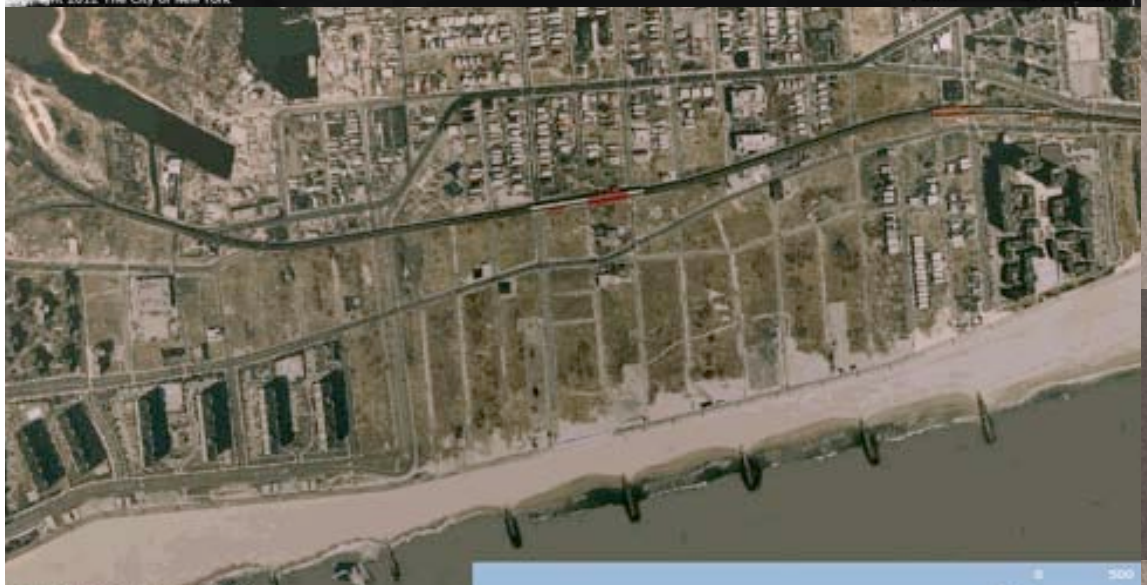
tively) reveal historical changes in land use and development within the study area, from the bungalow communities that once dominated the built and social fabric of the peninsula to the large swaths of vacant land resulting from the urban renewal efforts of the 1960s. In 2010, the Arverne East study area contained 37 buildings, with two or fewer buildings on each block.

Ownership

As of 2010, 64.4 percent of the land in the study area was city-owned and 20.9 percent of land was privately owned. The area's largest landowner is the New York City Department of Housing Preservation Department (HPD), which owns over half of the lots in the study area. HPD's land ownership reflects that the site was primarily designated for public affordable housing communities following the demolition of beachside bungalows. Other key landowners include the Department of General Service, Department of Parks and Recreation, and Department of Transportation.

Figure 13. Land Use in Study Area





Counterclockwise from left: Figure 14. Aerial of Study Area in 1924; Figure 15. Aerial of Study Area in 1951; Figure 16. Aerial of Study Area in 1996; Vacant Land in Arverne East with “Towers in the Park” in background.

Public & Community Facilities

A majority of facilities on the broader Rockaway Peninsula are classified as recreational or cultural facilities and consist primarily of libraries and parks. These facilities are highly concentrated along the western portion of the Rockaways. Facilities within the Arverne East study area are mainly parks, playgrounds, beaches, and natural areas. Despite the fact that over one in ten residents in the study area is a senior citizen, there are few facilities serving the needs of the elderly near Arverne East.

The primary municipal and public facilities within the study area are public elementary school P.S. 106, an adult care facility, a food pantry and the Far Rockaway MTA Bus Depot. Additional facilities within walking distance of Arverne East include:

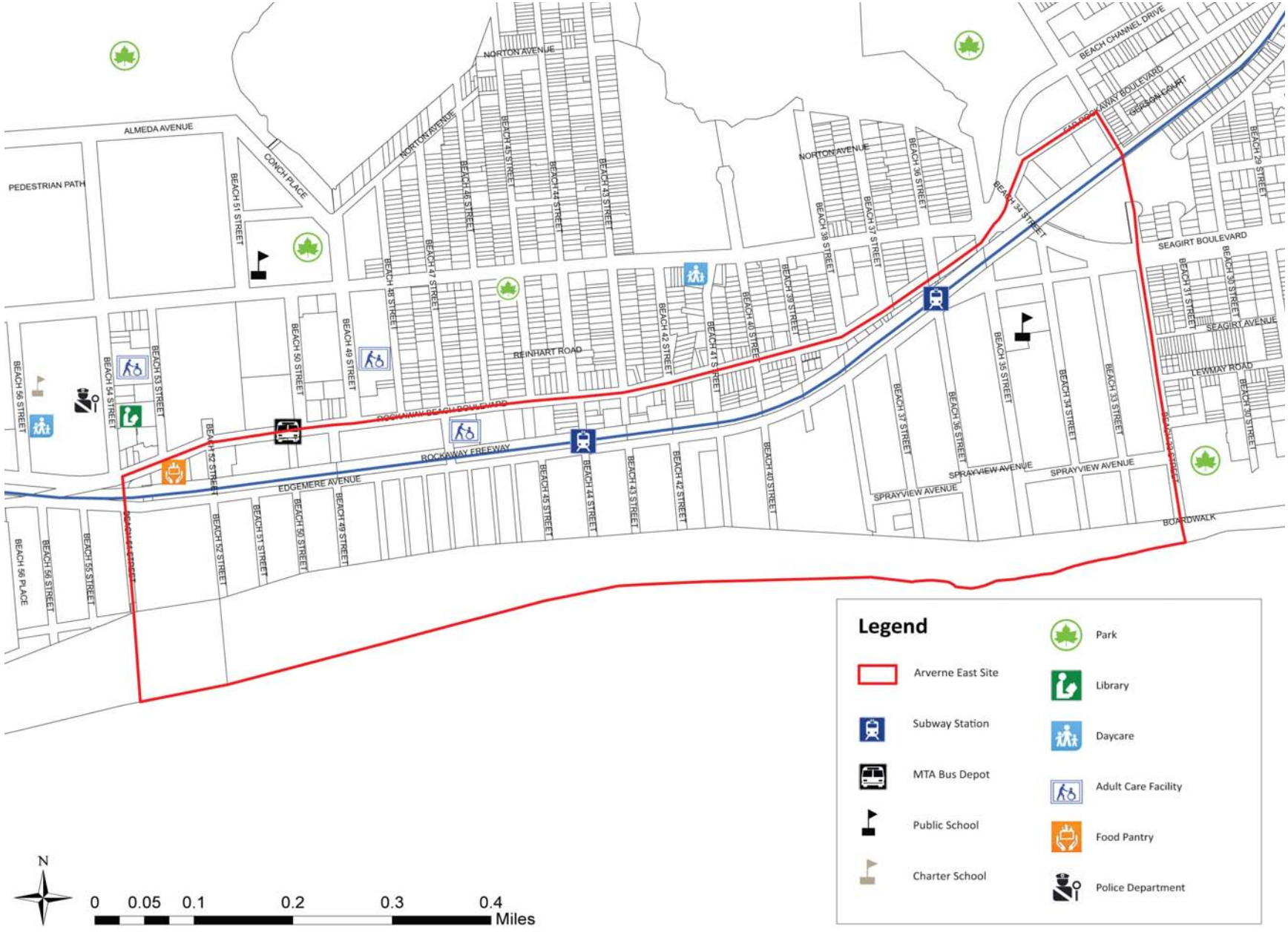
- Arverne branch of the Queens Library (312 Beach 54th Street)
- Far Rockaway Police Department (349 Beach 54th Street)
- Community Parents Head Start (4105 Beach Channel Drive)
- Bethel Mission Loving Day Care Center (338 Beach 56th Street)
- Rockaway Care Center (353 Beach 48th Street)
- Lawrence Nursing Care Center (350 Beach 54th Street)
- Rockaways YMCA, expected summer 2013 (Rockaway Beach Blvd. & Beach 73rd St)

Public and private schools nearby include:

- P.S. 105, The Bay School (420 Beach 51st Street)
- P.S. 43, on Beach 29th* (160 Beach 29th Street)
- Goldie Maple Academy Challenge Preparatory Charter School (365 Beach 56th Street)
- Far Rockaway High School Kappa Vi; Academy of Medical Technology – A College Board School
- Frederick Douglass Academy VI High School, (821 Bay 25th Street)

Figure 17. Ownership in Study Area

Figure 18. Public Facilities in Study Area



Open Space

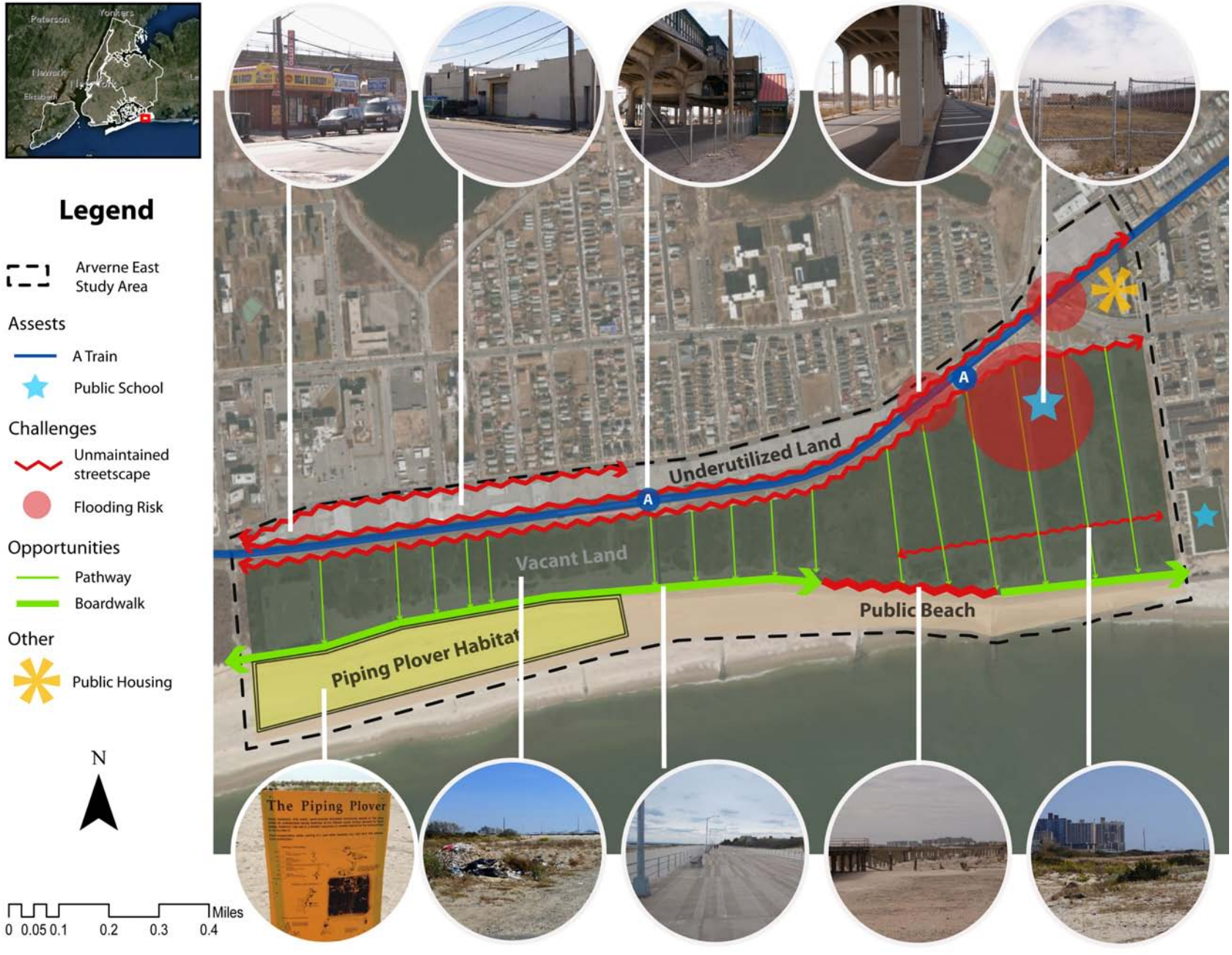
Open spaces are essential public assets that provide critical recreational, educational, social, economic and environmental benefits. According to an assessment by parks research and advocacy group New Yorkers for Parks (NY4P), Queens has the second lowest percentage of parkland in the five boroughs; 11 percent of the borough is dedicated to parks, compared to 14 percent citywide.[20] While the residents of the Rockaways are situated adjacent to 7.2 miles of beach, the provision of parklands for the Rockaway Peninsula falls below PlanNYC thresholds for underserved areas (2.5 acres of open space per 1,000 residents). Furthermore, the availability of 2.15 acres of parks and open space per 1,000 residents does not indicate the quality, accessibility and programming available at these spaces.[21]

Parks and open spaces within the immediate study area are limited; the study area includes five parking lots, the Rockaway Beach and Boardwalk, and the Beach 59th St Playground, a paved area with several poorly-maintained basketball courts.[22] Prior to the storm, some entrances to the shoreline were marked by structural damage and deterioration. Several site visits also revealed frequent litter and debris along the sand dunes and open areas.

Despite these challenges, the Rockaways and Arverne East are uniquely situated in proximity to a network of green and recreational opportunities affiliated with the Jamaica Bay wildlife refuge. Gateway National Recreation Area and Floyd Bennett Field offer outdoor and indoor recreation opportunities, as well as historical interest sites, such as the Historic Aircraft Restoration Project. In addition to urban camping, hiking trails, kayaking, gardening, astronomy trips, bird watching, Floyd Bennett Field hosts the Aviator Sports & Events Center for skating, climbing and basketball, as well as the Jamaica Bay Riding Academy and the Brooklyn Golf Center. The nearby Jamaica Bay Greenway also provides bikers and joggers connections to and from the broader region.

The Arverne Urban Renewal Area
In 2003, an Environmental Impact Statement (EIS) prepared for the Arverne Urban Renewal Area (AURA) identified natural resources that could be adversely impacted by development, as well as potential mitigation measures. The EIS describes the impacts of HPD's intent to develop 47 acres for mixed-use and designates 35 acres of parkland as well as a dune preserve to mitigate potential impacts.

Existing Conditions Map



1.6 TRANSPORTATION AND CIRCULATION

Road Network

The Rockaway road network is characterized by three primary East-West arterials; Beach Channel Drive, Rockaway Freeway and Rockaway Beach Boulevard. North-South roadways, numbered in ascending order from East to West, complete the circulation network. Several other East-West roads run for portions of the peninsula, including Shore Front Parkway, which runs along the southern edge of the peninsula in the area by the Arverne by the Sea development. While Shore Front Parkway is a major access route in that area, there is no consistent beachfront access road running the length of the peninsula, most notably for the Arverne East study area. Consistency is also lacking in the way that corridors run across the peninsula, for example Arverne Boulevard, north of the Rockaway Freeway, becomes Rockaway Beach Boulevard. In the same area, Rockaway Beach Boulevard, south of Rockaway Freeway and Arverne Boulevard, becomes Edgemere Boulevard. In areas where the island is comparatively narrow, such as the Arverne East study area, these East-West connectors become condensed; for example Rockaway Beach Boulevard is less than 300 feet from Rockaway Freeway, which is directly adjacent Edgemere Avenue.
The grid network breaks down around Beach 36th street, as one travels eastward. The peninsula particularly narrow at this point, reflecting the historic location of a canal on Beach 35th Street. Today, this location marks the intersection of Beach Channel Drive and Rockaway Freeway, and the beginning of Seagirt Boulevard, which services the southern portion of Far Rockaway. The addition of Beach 36th, 35th and 34th to the network creates areas of high volume and traffic in several different directions.

Traffic and Safety

East-west traffic on the Rockaways is concentrated along Rockaway Beach Boulevard and Beach Channel Drive and the number of traffic incidents corresponds with traffic patterns. According to CrashStat, from 1995 to 2009, there were a total of 21 pedestrian or cycling crashes in the study area. A majority of the accidents (62 percent) involved cyclists and two of the traffic incidents led to fatalities. Nearly all of the accidents within the study area occurred on Rockaway Beach Boulevard, with a higher cluster of accidents and fatalities near 54th street. In comparison, a higher number of pedestrian and cycling crashes were recorded for the same time period on Beach Channel Drive, to the north of the study area. A total of 70 crashes, predominantly involving pedestrians, occurred along the same 22-block stretch; one was a fatality. Further development in this area must be sensitive to creating safe environments along Rockaway Beach Boulevard, particularly for cyclists.

Automobile Use

Limited public transit options and long travel times contribute to high auto usage. Nearly half (48 percent) of Rockaway residents drive to work, a figure considerably higher than the 38.7 percent of Queens residents and the 22.7 percent of New York City residents who commute by car. Of Rockaway residents who commute by car, 81.5 percent drive alone. These relatively high driving rates, in conjunction with limited arterial options, give rise to heavy congestion during rush hours. In fact, 55 percent of those who commute by car spend an average of over 30 minutes getting to work.

Public Transportation

The A train is the sole train that runs to and through the peninsula. Prior to Superstorm Sandy, the A provided service to the Rockaways via Broad Channel, with stops from the Beach 90 Street station to the Far Rockaway/Mott Avenue station. Shuttle service was available from the Beach 90 Street station to the Rockaway Park/Beach 116th Street station. Despite this, turnstile counts for all the subway stations on the peninsula as of 2011 were among the lowest seven percent in the city. Residents also reported unreliable service schedules and frequent diversions to shuttle buses.

Public transit access to the Rockaways and Arverne East was further complicated when Superstorm Sandy destroyed tracks in Broad Channel. At the time of research, a special Rockaway shuttle line, the "H," replaced the Rockaway portion of the A line, from Beach 90 Street station to Far Rockaway/Mott Avenue station. Low ridership and fare collection at these sites, coupled with the financial hardship of the MTA suggests that service improvement may not be forthcoming.[23]

Today, bus service is the predominant means of access to and from the Arverne East study area. Two express buses service the Rockaways during weekday rush hours. The QM16 express travels between Neponsit and Midtown Manhattan, whereas the QM17 express bus travels between Far Rockaway and Midtown Manhattan. Seven additional local bus routes operate in the peninsula. Arverne East specifically is serviced by the QM17 express bus and the Q22 local bus between Roxbury and Far Rockaway.[24, 25]

The Arverne East Study Area contains subway stations at Beach 36 Street and Beach 44 Street. While both stops are situated in central locations, they are designed to integrate with the surrounding community. Many of the staircases from the elevated subway station do not connect to existing pedestrian sidewalks. Instead, staircases may lead to a vacant field, in the space directly under the train trestle, or in between two lanes of high-speed traffic.

Walking

According to Walk Score, a website that determines the walkability of various New York neighborhoods based on the density of amenities within a given area, the greater neighborhood of Arverne has a walk score of 49/100, which categorizes it as a "car dependent" neighborhood. New York City as a whole, on the other hand, has a walk score of 85/100.

The pedestrian experience in the Rockaways ranges widely in quality throughout the peninsula. The two primary east-west walking paths along the peninsula are the boardwalk and Rockaway Beach Boulevard. Prior to the storm, the boardwalk provided an uninterrupted east-west pedestrian and cycling path. However, the boardwalk is isolated from the broader network of streets and pathways and can feel dangerous at night. Sections of the boardwalk suffered heavy damages during Superstorm Sandy although the boardwalk remains largely intact in within the Arverne East study area.

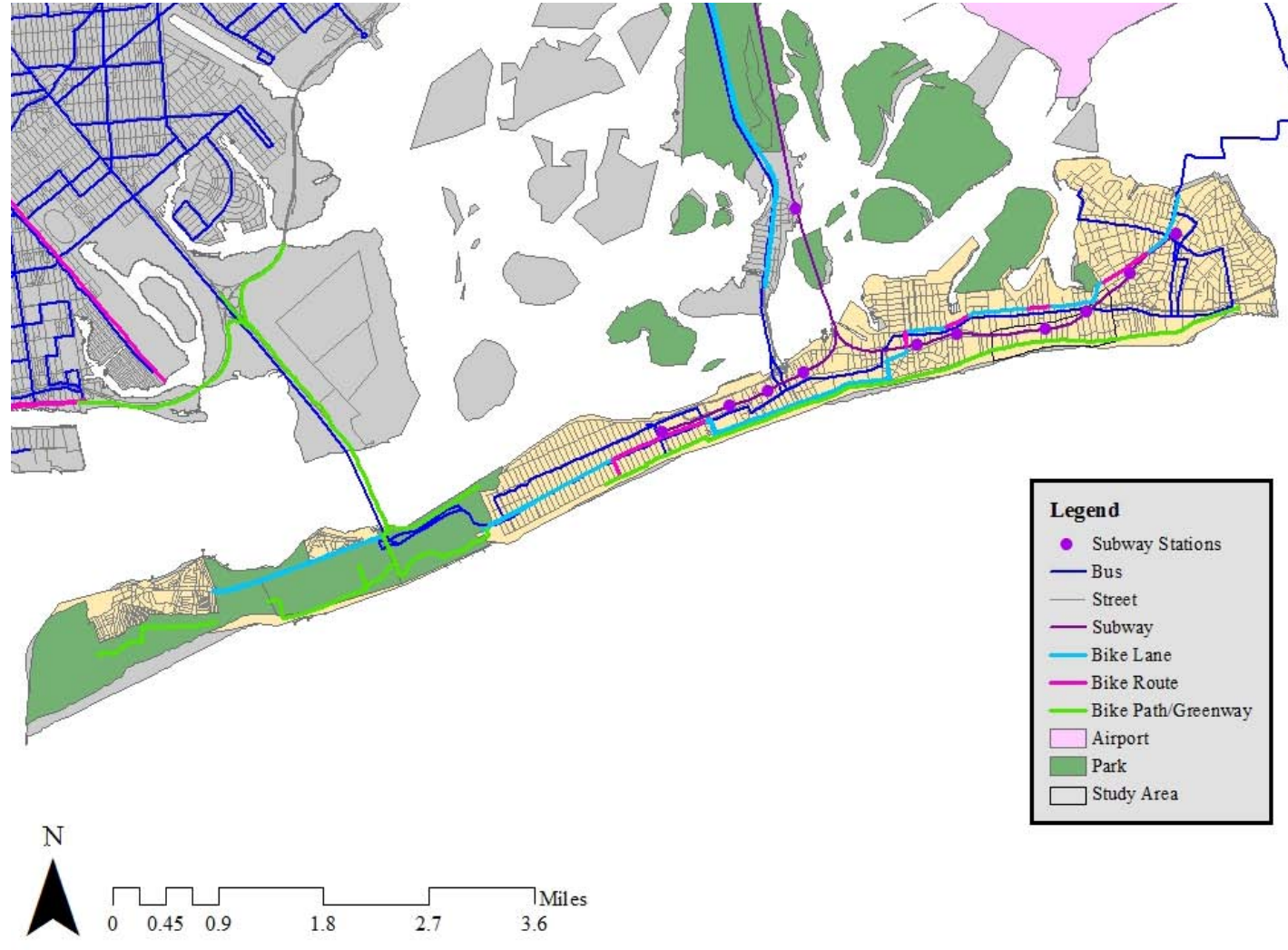
Pedestrian infrastructure along Rockaway Beach Boulevard is limited: several sidewalks are in disrepair and dimly lit; traffic and congestion levels are high during rush hours; and the vacant parcels of land adjacent to the Boulevard create a sense of isolation and insecurity.

Cycling

Approximately 1.0 percent of residents living near the study area commute to work via bicycle, compared to 0.4 percent of all Queens residents and 0.5 percent of all of New York City residents.[26] Prior to Superstorm Sandy, the boardwalk provided a protected, uninterrupted linear bike path between Beach 9th Street and Beach 126th Street. The boardwalk is in the process of being restored and it is expected that residents will regain access to this continuous bike path by the summer of 2013.

The other bike lane that runs the length of the peninsula zigzags primarily along Beach Channel Drive, Rockaway Beach Boulevard, and Shore Front Parkway. This path alternates between being a designated bicycle lane and a shared lane. The DOT's official New York City Cycling Map identifies Edgemere Avenue as a potential bicycle route that does not interfere with the recreational and pedestrian activities on the boardwalk. Although it is not a designated bike route, cyclists also use the Rockaway Freeway under the elevated subway line. Traffic-calming diagonal stripes to narrow the lanes serve as a de facto bike lane, since cars are prohibited from driving on the stripes.

Figure 19. Transportation in Rockaway



1.7 ENVIRONMENT AND NATURAL RESOURCES

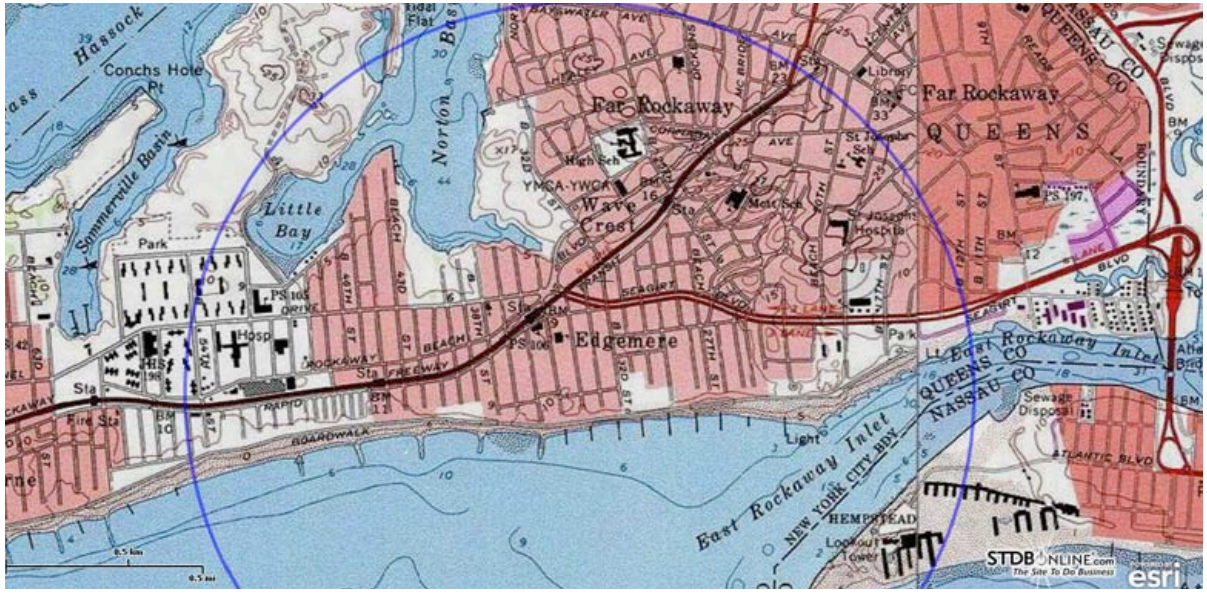
Topography

The historic topographical features of the study area are consistent with those of "barrier beaches" found elsewhere on the peninsula: a majority of the site lies approximately nine feet above sea level, with the exception of an undulating 10 to 11-foot dune barrier that meets the shoreline (see "The Effects of Superstorm Sandy and Lessons Learned" for topographical alterations caused by Superstorm Sandy). Due to years of neglect, the land has transitioned to the early stages of natural plant succession. The presence of plants such as berries, woody-stemmed shrubs, and small, sun-loving trees—such as the naturally storm-resistant yet invasive Callery pear (Pyrus calleryana)—suggest that the area's soil has been gradually fortified by an herbaceous plant layer, and is now in the second, or "shrub," stage of succession.[27]

The Function of Coastal Dunes and Barrier Islands

The peninsula's dunes, which occur naturally and are reinforced by the U.S. Army Corps of Engineers, provide essential coastal protection to individuals, businesses, and the structures that house them. The Rockaway Peninsula possesses one of the many "barrier beaches" that line the Long Island's southern coast. Barriers primarily develop on coasts with low tidal range and relatively high wave energy. The formation of barrier beaches may represent: a longshore spit (a jutting landform that occurs due to waves meeting the beach at an oblique angle, and back-washing perpendicular to the shore, moving sediment down the beach) which has been broken through by storms; post-glacial sea-level transgressions, which swept sediments toward the present-day coastline; or the submersion of a sand dune or beach berm (a flat-topped ridge or bar on the landward side of a beach), forming a lagoon behind the landform.[28]

Figure 20. Topography of Eastern Rockaways



Due to their ability to absorb much of the force of incoming waves, coastal sand dunes are often considered the first line of coastal defense during storms. Dunes often require an anchor, such as naturally growing grasses and other vegetation to prevent the sand from blowing or washing away. This phenomenon has led many coastal communities to promote the formation of dunes through the planting of anchors. Residents of nearby Long Beach, New York, for example, arranged thousands of discarded Christmas trees along the beach to catch sand blown by the wind and promote dune growth.[29] Observations of the study area suggest that

dunes with a heterogeneous mix of trees, shrubs, and grasses fare especially well after storms.[30]

In an undisturbed setting, dunes often arrange themselves into complementary systems: a primary system, which is positioned closest to the coast and bear the brunt of storm surges; and a secondary system, upon which the aforementioned vegetation would grow. Long Island's Fire Island is a prime example of an Atlantic barrier island that grades from a primary dune along the ocean to salt marsh along the bay, and suggests what barrier formations such as the Rockaway Peninsula may revert to if left to nature. The dominant vegetation includes pitch pine (Pinus rigida), beach grass (Ammophilia breviligulata), wax myrtle (Myrica cerifera), bayberry (M. pensylvanica), shadbutsh (Amelanchier canadensis), and common greenbrier (Smilax rotundifolia).[31]

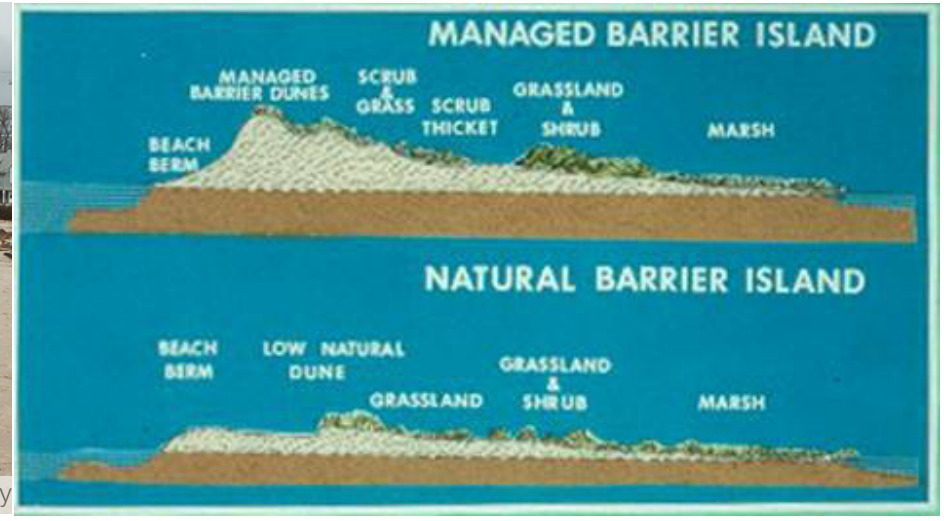
The creation or fortification of a dune through re-nourishment, a process of replacing eroded sand with sand from an outside source, requires extensive time, energy and cost. The Army Corps of Engineers estimates that re-nourishment costs approximately $10 million per mile, a sum that is often prohibitive. Re-nourishment efforts also often fail to create the complex systems that provide robust protection; current requirements for dunes include only a grass layer, and most post-storm maintenance goes to fortify the primary dune. The potential environmental hazards of re-nourishment, which requires continual dredging, can bury wildlife habitats, such as shallow reefs, and diminish invertebrate prey for shorebirds, surf fishes, and crabs. In time, local beach-quality sand is depleted, requiring sand to be shipped in from distant locations and further increasing costs.

The interplay between tidal forces and sand can also take the form of barrier islands, which can mitigate ocean swells and other storm events. Historically, two such barrier islands—Hog Island and Shell Island—existed off of the coast of the Rockaway Peninsula, but were eventually reclaimed by the sea during storms. Since then, the U.S. Army Corps of Engineers' continual dredging for commercial shipping lines has prevented their reformation.

The formation of landforms such as dunes and barrier islands are the product of an ever-changing natural world. Learning from and allowing for these natural processes to occur can assist efforts to create safer and more resilient coastal communities.

Photo credit: J.G. Coleman Photography

Pitch pine dunes on sand dunes



Barrier island cross section drawings

1.8 MARKET ANALYSIS

While New York City is often regarded as one of the strongest global economic markets, the Rockaways and Arverne East experienced a significant amount of disinvestment, particularly in the 1980s and 1990s. Recent investment in the area has mostly taken the form of retail and commercial activity within new housing developments such as Arverne by the Sea, which features a Stop & Shop supermarket and will include a new YMCA. Summer crowds have created new demand for food and drink businesses to flourish along the boardwalk, however, the vast majority of this economic activity is centered several miles west of the study area.

Local Industries

According to North American Industry Classification System (NAICS) data, the Rockaway peninsula contains a total of 1,101 business establishments, the majority of which exist to the west of the study area, in the neighborhoods of Far Rockaway, Neponsit, Belle Harbor, and Rockaway Park Seaside. There are a total of 580 business establishments in Far Rockaway and Arverne (Zip codes 11691 and 11692). Of the 580 establishments in the vicinity of the study area, over one-fourth, or 158, fall within the health care and social assistance category. These firms account for a majority (68 percent) of all health care and social assistance businesses on the peninsula. Retail trade establishments account for approximately one-fifth of all businesses within Far Rockaway and Arverne. Accommodation and food services, real estate and rental and leasing services, and services categorized as "other" account for nearly half of the remaining businesses.

Retaining Spending Leakages

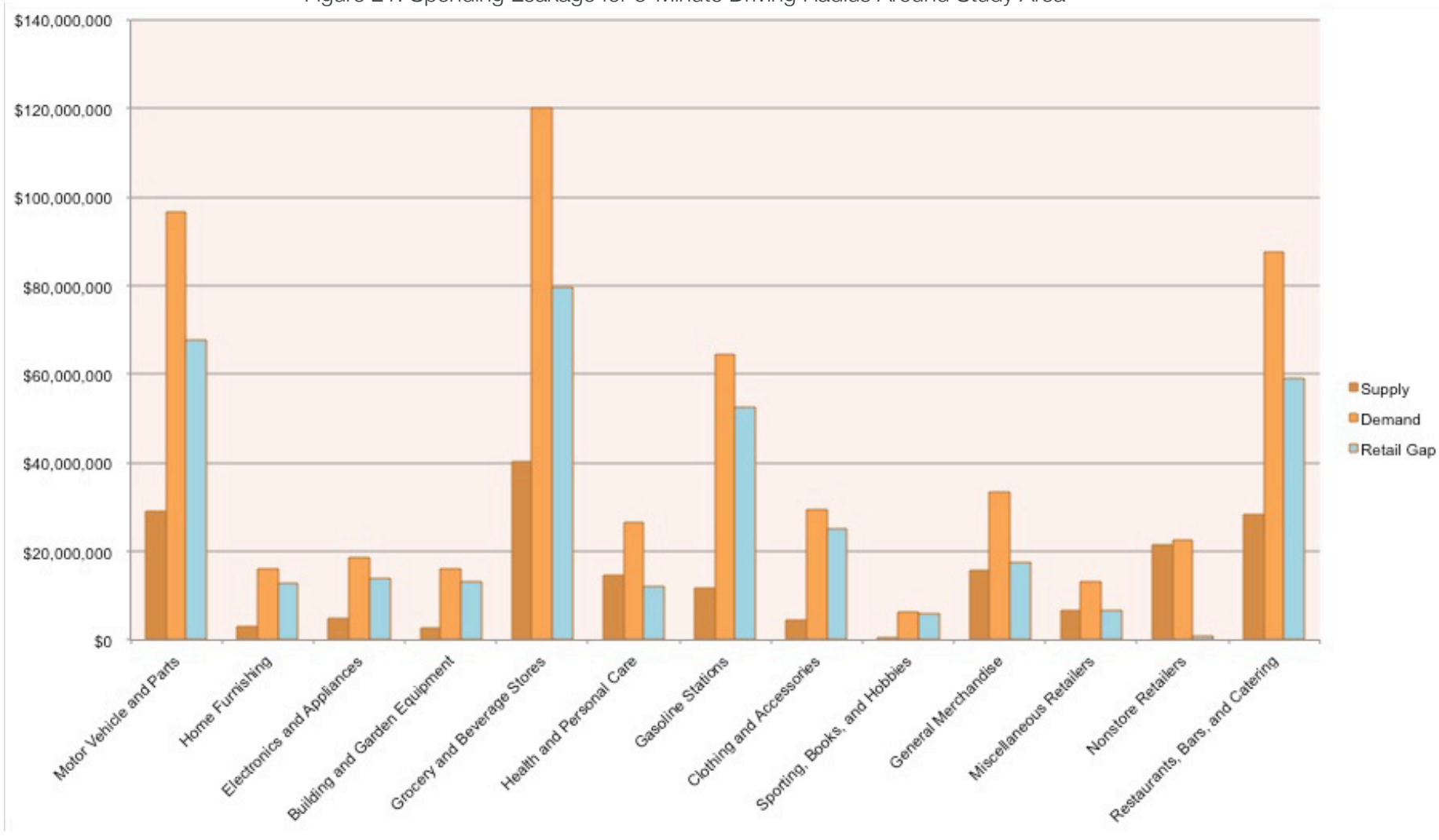
Site To Do Business (STDB) is a private online database that aggregates information about spending habits, consumer lifestyles, and existing business patterns. A STDB analysis reveals a significant spending leakage within a five-minute driving radius around the Arverne East study site in nearly every single category of goods and services. The only exceptions to this are florist shops and direct selling establishments, which both capture all the local demand for these goods, in addition to attracting business from residents that live beyond the five-minute driving radius.

As of 2010, the greatest spending leakage in the area was in category of grocery store spending. Residents who live within this five-minute drive radius spend upwards of $100 million a year on groceries; less than $32 million of those expenditures were consumed within the same radius, whereas $68 million was spent in grocery stores located beyond a five-minute drive from residents' homes. This dramatic leakage occurs in spite of the fact that a large Stop & Shop supermarket recently opened at the corner of Beach 74th Street and Rockaway Beach Boulevard.

"Food Services & Drinking Places" are also poorly represented within the vicinity of the study area. The retail potential for these services is nearly $90 million per year, yet less than one-third of this potential is captured in the neighborhood. Additional retail spending categories with significant spending leakages include "Motor Vehicle & Parts Dealers," at almost $68 million, "Gasoline Stations," at more than $52 million, and "General Merchandise Stores," at nearly $18 million. The STDB spending forecast for 2015 predicts even greater leakages in these areas as local population growth and spending power are expected to outpace local businesses development. The spending leakage for groceries is estimated to increase from $68 million to nearly $88 million. Similarly, food services and drinking places leakages may increase from $59 million in 2010 to over $73 million in 2015.

A growing population with increasing demands for locally available goods and services, particularly in the area of grocery stores and restaurants, may bring needed investment and businesses to Arverne East. There will likely be local revenue and leakage impacts from Superstorm Sandy as a result post-storm service disruptions. Some businesses were damaged to the point of disrepair, which will likely lead to additional leakage. At this time, the exact extent of the financial impacts of the storm on local businesses and spending have not been fully calculated.

Figure 21. Spending Leakage for 5-Minute Driving Radius Around Study Area



Source: Site to do Business, 2010

Hotel Profile and Tourism in the Rockaways

Despite a rich history of tourism and hotel establishments, there are no resorts or beachfront hotels in the Rockaways, save a small hotel called D Piper Inn on Beach 114th Street between Rockaway Beach Boulevard and Ocean Promenade Walkway. There are several hotels located in proximity to JFK International Airport and plans are currently underway to build a La Quinta hotel within the study area at Beach 44th and Edgemere, however this offering greatly differs from the economic development-spurring developments that have been seen in other coastal communities. Outside of the peninsula, there is a luxury 150-room beachfront resort in the City of Long Beach—the Allegria—which opened in 2009. The Allegria has a full-service spa, restaurant, roof-top pool, and conference/event space. This type of hotel would be the closest competitor to what would be an option for the Arverne East site.

The lack of overnight accommodations does not reflect a lack of demand. Recent visitors to the Rockaways are exploring innovative accommodations, since traditional resort and beachfront hotel options are limited. In the summer of 2011, a new style of accommodation for more adventurous visitors, called a boatel, opened in a section of Marina 59 in the Sommerville basin of Jamaica Bay. The Boggsville Boatel sold out last summer and will be closed in 2013 for repairs from Superstorm Sandy damage, but is planning to reopen next summer. The boats in this boatel also serve as mediums for local artists. The success of this type of experimental accommodation could spark similar boatels in the bay marinas throughout the peninsula.[32]

Photo credit: Raymond McCrea Jones / New York Times

Concession stand in the Rockaways

A wide variety of concession stands have sprung up along the Rockaway Beach boardwalk, ranging from ice cream and burgers to arepas and empanadas that cater to the demanding palates of New Yorkers. Currently, these stands are concentrated far west of the study site between Beach 86th and Beach 106th streets.

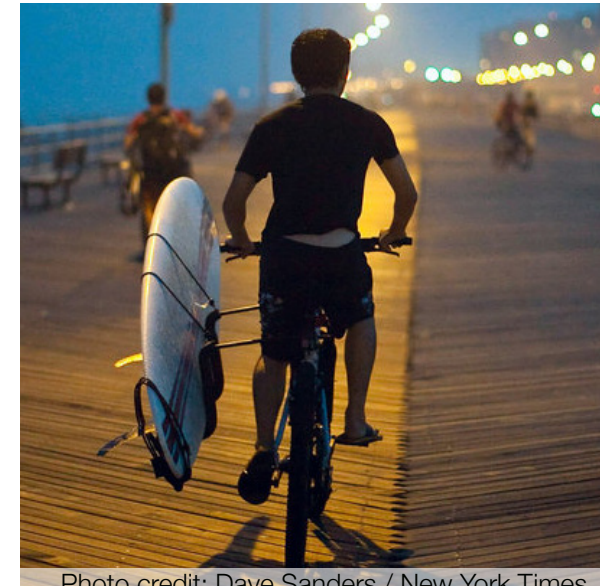


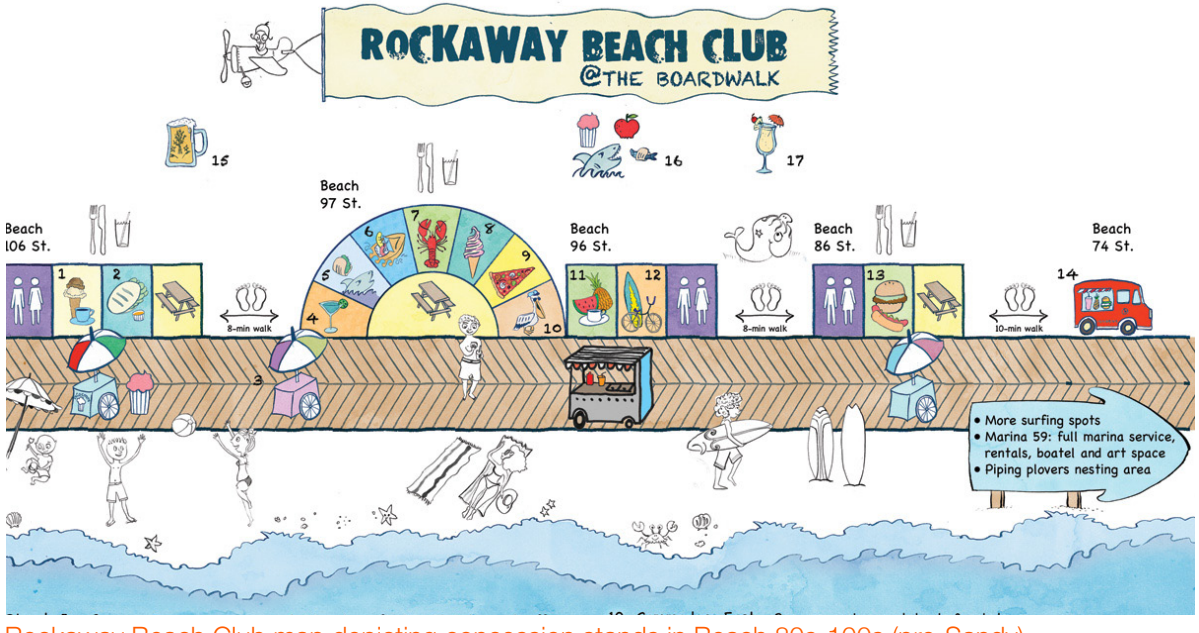
Photo credit: Dave Sanders / New York Times

Visitor Statistics

Positioned properly, the Rockaways could tap into New York City's tourism market share as well as nearby coastal destinations such as the New Jersey shore. Rockaway Beach has become increasingly popular over the past few years, attracting an average of four million visitors each year.[33] Given the lack of hotel options, it is assumed that a majority of these visitors were local day trippers. These visitors represent a small portion of the 50.9 million tourists who visited New York City in 2011. New York City itself has also need a significant increase in tourism, up from the 35.2 million visitors in 2001. Eighty percent of visitors in 2011 were from the U.S. and stay for an average of 2.5 days. The remaining 20 percent were from abroad and stayed for an average of 7 days, with the top five international markets being the United Kingdom, Canada, Brazil, France, and Germany. In total, visitor spending in 2011 equaled $34.5 billion, which generates more than 300,000 jobs throughout the city and more than $8 billion in taxes.[34]

New Jersey's shoreline would be a primary competitor to the Rockaways and paints a picture of the potential tourist market. The shoreline and Atlantic City attract 72.8 percent of New Jersey's 81 million visitors. Nearly three-fourths (72.4 percent) of all New Jersey visitors come from New Jersey, Pennsylvania, New York, and Connecticut. Many of these visitors go to New Jersey for short trips or weekend getaways; in 2012, 35.4 percent of visitors only came for the day while 34.4 percent stayed overnight. The demographics of New Jersey visitors who originate from New York are varied; the average age is 46 with an even split between the 18-34 year, 35-54 year, and 55+ year categories; 60 percent have no children; average income is $88,017; and the generational breakdown is 25 percent Millennials, 30 percent GenXers, and 32 percent Boomers.[35]

A development in Arverne East offering services to day-trippers, weekend getaway visitors, and layover visitors from JFK could make these markets accessible to the Rockaways. The Rockaways are in close proximity to the John F. Kennedy International Airport, which served 47.7 million passengers on 408,913 flights in 2011. Over 70 airlines operate from JFK and the airport has reported a four percent increase in number of visitors since 2009.[36]



Rockaway Beach Club map depicting concession stands in Beach 80s-100s (pre-Sandy)

JFK location relative to potential Arverne East hotel

KEY STAKEHOLDERS AND PUBLIC OUTREACH

2.1 KEY STAKEHOLDERS

Numerous parties will be instrumental in the eventual development of the Arverne East study area. The following focuses on principle stakeholders who could be directly affected by future development in Arverne East.

New York City Department of Housing Preservation & Development (HPD)

HPD is the current landowner of the vacant properties within the Arverne East study area. Prior to issuing the 2006 RFP for Arverne East, HPD conducted an Environmental Impact Statement (EIS) of the area, which permanently designated certain areas as nature and dune preserves. HPD awarded the RFP to L&M Equity Participants, with the understanding that construction would begin in 2008. The subsequent economic recession led to severe financial setbacks that have delayed the project. While seven years have passed since the RFP was initially rewarded, HPD remains committed to the prior RFP parameters and developer selection. As of last November, HPD noted that it would prefer to work within the envelope of the current EIS, with minor modifications, rather than re-initiate the lengthy EIS process.

Developers

L+M Development Partners, the Bluestone Organization, and Triangle Equities are the joint-venture development team for Arverne East, a 97-acre site that lies directly to the east of the Arverne by the Sea development. The 2006 proposal includes 47 acres of housing and commercial space, a 35-acre nature preserve, and a 15-acre dune preserve. The proposed housing in the developers' initial plan consists of approximately 100 affordable houses, 200 market rate houses, 600 apartment units between six mid-rise buildings, and 300 low-rise co-op units. Construction was slated to start in 2008, with completion slated for 2013. Factors that have prevented the development team from moving forward with the proposal include the 2008 recession, an estimated $100 million in infrastructure development costs, as well as the new environmental and infrastructure concerns that have arisen in light of Superstorm Sandy. The city has yet to offer any subsides for the high infrastructure costs beyond the standard tax credit and tax-exempt bonds available for affordable housing developers. The effects of Sandy have led the developers to hold a design competition, FARROC, emphasizing innovative design and development approaches to address local environmental vulnerabilities.

On the day of the storm, L+M closed on their purchase of Ocean Village, an 11-building ocean-front apartment complex located between Beach 56th and Beach 59th which fell into disrepair over the past 40 years. L+M plans to completely rehabilitate the complex and transition it into a moderate-income community, complete with social service centers and green building features over the next three years. Although Ocean Village is not located within the project study area, it is situated directly west of the site and is a part of L+M's portfolio, therefore development of Arverne East should relate to L+M's vision for Ocean Village.

Queens Community Board 14 (CB14)

CB14 encompasses the entire Rockaway peninsula and represents a wide range of community interests and issues. CB14 initially supported the development group's unofficial Arverne East concept, on the condition that 100 percent of the new housing would be market-rate and that the development would provide many jobs to local residents. CB14 withdrew their support from the project after it became increasingly clear that the official plan would include a substantial number of affordable units. CB14 leaders state that there is widespread sentiment within community members that the Rockaways have dedicated more than their fair share of land to affordable and subsidized units. CB14 envisions that attracting households with greater levels of disposable income will do more to revitalize the local business economy. CB14's new vision for Arverne East stresses building as little new housing as possible; if housing must remain in the plans, then they stand by their initial assertion that all new housing should be market rate. Ideally, CB14 wants the land in Arverne East be dedicated to destination big-box retail and active recreation facilities so that it can be an economic engine for the region.

Local Residents and Community Groups

There are dozens of civic associations operating in the Arverne East neighborhood, including:

- Arverne Civic Association
- Norton Basin Edgemere Stewardship Group
- Beach 41st St Tenants Association
- Friends of Mott Creek
- Frank Avenue Civic Association
- Deerfield Civic Association
- Arverne Action Association
- Arverne by the Sea Tenants Association
- Rockaway Youth Taskforce
- NYCHA Edgemere Housing Tenants Association
- NYCHA Ocean Bay Community Development Corporation
- Bayswater Civic Association
- West Lawrence Civic Association

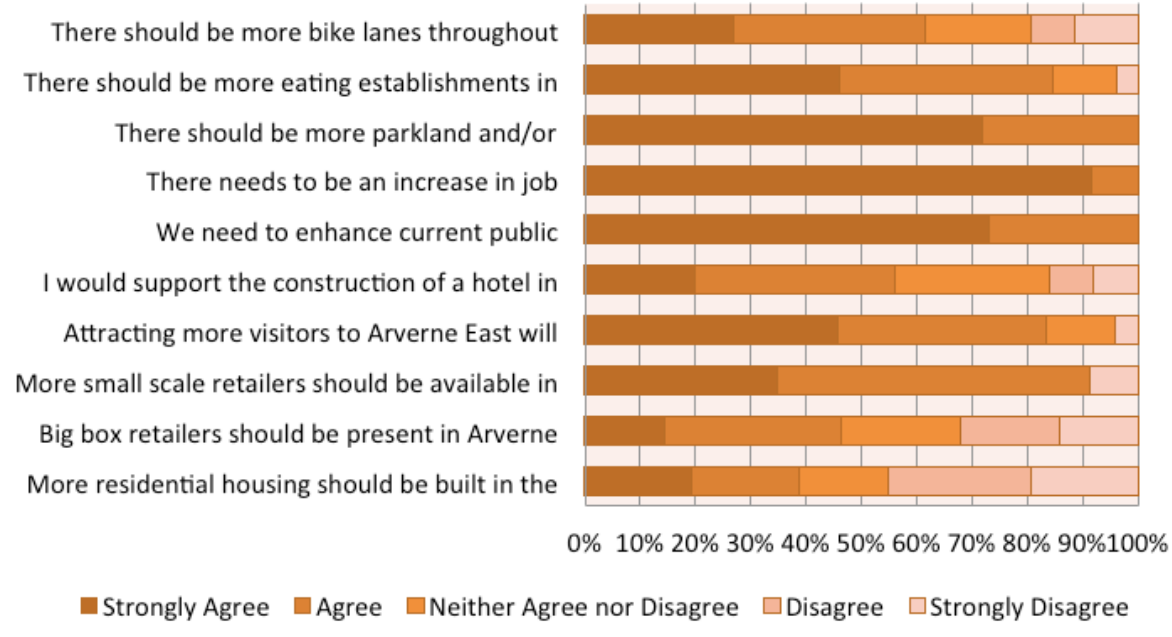
In response to Superstorm Sandy, a number of new community organizations have formed and are actively engaged in local discourse.

2.2 PUBLIC OUTREACH METHODS AND RESULTS

Community Planning Workshop and Survey

On March 7, 2013, RWA and Waterfront Solutions convened a community-planning workshop on the Arverne East study area. The workshop was hosted in the community room of Ocean Village apartment complex, located in the Arverne neighborhood of the Rockaways, Queens. Outreach for the workshop was targeted towards local groups including the Arverne Civic Association, Norton Basin Edgemere Stewardship Group, Beach 41st St. Tenants Association, Friends of Mott Creek, Frank Avenue Civic of Edgemere, Deerfield Civic Association, Arverne Action Association, Arverne By the Sea Tenants Association, Rockaway Youth Taskforce, NYCHA Edgemere Housing Tenants Association, NYCHA Ocean Bay Community Development Corporation. Bayswater Civic Association, and West Lawrence Civic Association. These are groups that operate and have constituencies in or near the study area and possess unique knowledge and perspectives on Arverne East.

Figure 22. Survey Result Summary



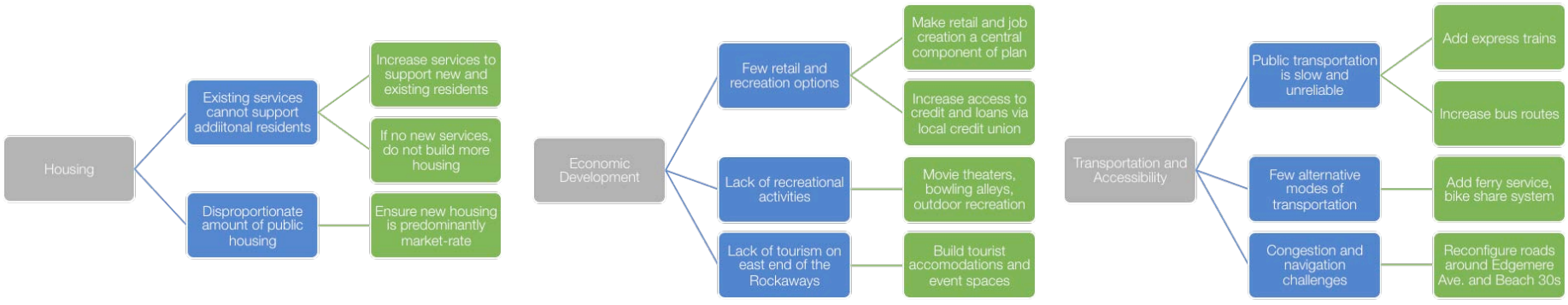


Figure 23: Diagrammatic Representation of Community Workshop Discussions

Approximately 50 participants were in attendance, including local residents, community board leadership, civic organizations, government agencies (HPD, Parks Dept) and Arverne East developers (Bluestone, L&M). The Waterfront Solutions team led a brief presentation profiling the history, physical boundaries, natural landscape, demographics, market and industries of the site.

Following the presentation, workshop attendees completed anonymous surveys that addressed the themes that would be discussed throughout the workshop. The survey also contained a demographic section, which provided Waterfront Solutions and RWA with the ability to better understand how such indicators might inform policy or development preferences. Survey results are summarized in Figure 22 and in more detail in a report titled *Arverne East Community Planning Workshop*.

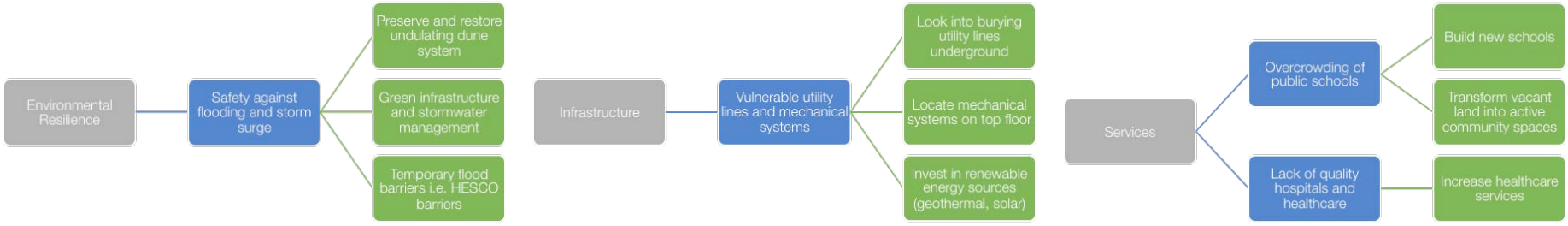
Once surveys were completed, facilitators for the community led table discussions focused on the challenges and solutions pertaining to transportation, infrastructure, housing, economic development, and environmental resilience. Each table was provided a large map upon which participants were able to identify key issues and ideas. Following the roundtable discussions, each group reported the input back to the workshop attendees in a collective debrief session.

Workshop Limitations

Despite the overall success of the workshop in gathering community input on the Arverne East development, residents noted that the scheduling of the workshop from 5pm-7pm on a weeknight prevented many from attending. This was also reflected by the fact that approximately half of workshop attendees arrived late, many of whom did not have enough time to complete the opinion survey that others had been given time to fill out prior to the roundtable discussions. The workshop facilitators would have also benefited from additional training, which was limited due to time constraints. Lastly, due to the length and scope of the Capstone cycle, the March 7th workshop was the only public forum for residents to voice their concerns and contribute ideas to this report. Ideally, Waterfront Solutions and RWA would have held multiple community workshops and/or would have worked with a focus group on an ongoing basis to further develop these ideas.

Housing

Housing was a key theme that generated extensive discussion. Many participants spoke about the challenges and implications of additional new housing. Several participants stated strong opposition to new housing, a sentiment that is strongly linked to the legacy of a high concentration federally subsidized public housing in the Far Rockaways. Additional challenges, including a lack of quality social services, emergency evacuation preparedness and limited employment and recreation opportunities, were cited in discussions around housing. Other participants stated that the development of additional housing may be acceptable if incorporated into a mixed-use project that provides quality services for the communities at large and is designed to serve the housing needs of current residents.



Quality of Life: Commercial, Retail, and Recreation

The need for commercial, retail, and recreational options on the peninsula was a high priority topic. Residents and stakeholders cited limited necessity retail and commercial options such as grocery stores, laundromats and general convenience stores. A number of workshop participants also raised big box stores or outlet malls as a desirable retail solution with the local employment opportunities.

There was also support for a hotel with a conference center as a means of diversifying the local market, supporting tourism and providing jobs. Participants were largely supportive of developments that would support tourism and visitors.

Participants highlighted the lack of recreational options such as movie theaters, bowling alleys, malls, and restaurants for local residents or visitors as a key quality of life factor. Participants also focused on the opportunity to provide outdoor recreation leveraging the peninsula's natural waterfront resources, such as water sports, marinas and quality parks. One participant highlighted the need for healthy, local recreation options in light of high rates of youth gang participation and substance abuse.

Services

Workshop participants were unanimous in their support for new schools to serve current and future residents. Despite a large young population, local schools are limited in number and resources. In addition to schools, participants also cited the need to transform vacant spaces, particularly those near the existing school, into active recreational public spaces or community gardens to add value, promote safety and provide healthy recreation opportunities. Participants voiced concern over the lack of quality hospitals and healthcare options in the area, despite a sizable aging population.

Transportation and Accessibility

As a result of limited local commercial/retail and recreation options, many residents must leave the Rockaways for their shopping and recreational needs. Given the transportation and accessibility challenges on the peninsula, these trips to Brooklyn, Long Island, Queens or Manhattan can take up two hours by public transportation.

Residents reiterated accessibility challenges, including the fact that transportation within and off of the peninsula can be challenging. Buses are often unreliable, there are no express trains, and ferry options are minimal. The Long Island Rail Road (LIRR) Rockaway Beach Branch, decommissioned in 1962, provided fast and efficient service to Manhattan, and residents would benefit by having this line re-instated. Alternative modes of transportation such as ferry options were also widely discussed and supported. According to the residents, bike transportation is used frequently; however, there are mixed opinions regarding whether bike lanes should be located along the Rockaway Freeway. Workshop participants suggested innovative local network options including a local bike share system or a bike and ride system connected to bus-rapid transit. Some residents stated that the boardwalk is the best place for bike

lanes and that Rockaway Freeway would be better used as dedicated bus rapid transit. However, other residents were not opposed to utilizing the freeway for bike travel.

Residents pinpointed Edgemere Avenue around the Beach 30's as an area where traffic patterns and circulation must be reconsidered due to congestion and navigation challenges. Given that future development that will likely be condensed around this area, east-west traffic could be adversely impacted if motorists enter and exit within a 10-block area along Edgemere Avenue.

Infrastructure

Power restoration after Sandy was a long and arduous process. Workshop participants cited the need for stormproof and resilient utility lines, which are currently located above ground and susceptible to strong winds and frequent flooding. While placing utilities underground is costly endeavor, participants stressed the importance of reviewing this as an option for the safety of residents and long-term viability of the community. Additionally, workshop participants noted that any new construction should require that mechanical systems be located on the top floor.

Participants also expressed support for renewable energy sources, such as geothermal and solar power systems.

Environmental Resilience

The resiliency of the site and safety of residents against flooding and storm surge were high-priority concerns expressed at the workshop. In addition to the preservation and restoration of an undulating dune system, use of green infrastructure, and designs to manage storm water, storm barriers and walls were explored as possible hazard mitigation measures. Discussions ranged from broad needs to specific solutions, such as a short-term, temporary flooding barrier that can provide interim protection. HESCO barriers temporary dikes comprised of large, collapsible wire mesh containers with heavy-duty fabric liners loaded with sand. These barriers are quick to set up and can serve as potential short-term solutions for flood control.[37]

Community workshop participants

Photo credit: The Davenport Public Library, Davenport, IA

HESCO barriers in use during a flood in Davenport, IA

BEST PRACTICES
FOR INTEGRATED COASTAL MANAGEMENT

The Rockaways cannot be divorced from the environmental features that shape it. The study area's relationship with nature, and its proximity to the ocean are both the area's strongest assets and its greatest risks. Given that extreme climate and weather events are increasing in frequency and intensity, a plan for the future of the Rockaways must incorporate the tenets of resilience and integrated coastal management. Resilience, formally defined as "an ability to recover from or adjust easily to misfortune or change," is a key framework that can help the Rockaways navigate an increasingly unpredictable future by emphasizing flexibility and the ability to anticipate and withstand shocks and disturbances.[38, 39]

Today, nearly 200,000 New Yorkers live less than four feet above current high tide levels. If sea levels are to rise four feet by 2080, over one-third of the city's streets will fall within a flood risk zone. These risks could be reduced if new policies and plans consider the changing relationship between our built and natural environments. Best practices in integrated coastal management found herein can help the Rockaways to adapt to this changing relationship

Structural Interventions

A number of structural measures that can help address risks in susceptible areas. Elevation or relocation of at-risk structures in coastal or other low-lying areas can potentially reduce damage to residential or commercial buildings, roadways, and utilities.

If critical facilities cannot be relocated or such relocation is cost prohibitive, flood proofing may reduce costs from storm damage. Flood proofing interventions may include: anchoring a building to resist collapse and movement; installation of watertight closures; reinforcement of walls; usage of sealants to reduce seepage through walls; installation of pumps to control interior water levels; installation of check valves to prevent the entrance of flood water or sewage flows through utilities; and the installation of electrical, mechanical, utility, and other equipment and contents above the likely flood level.

Barrier and embankment systems such as earthen berms, groynes, seawalls, and breakwaters that can temporarily retain, deflect or collect water represent traditional hard infrastructure responses to flood and surge threats. In the case of heavy rains, flood or a storm surge, conveyance measures can be used to carry potential floodwaters away from areas of risk. These improvements include channels, storm sewers, and other infrastructure such as bridges to help mitigate the impacts of moving floodwaters. Green infrastructure also provides key conveyance benefits by retaining, filtering and/or reducing the velocity of volumes of water.

Protection, Management, and Mitigation

Traditionally, hard infrastructure has been a common response to protecting coastlines, yet these mechanisms come at a significant financial cost and high risk of failure. The length of the Atlantic coastline prevents seawalls from being a feasible option for protecting the ocean-side of the Rockaways and the broader Long Island landmass. Seawalls also lack flexibility in the face of changing conditions and sea level rise. Jetties can reduce impacts in areas where they are placed, but by design, they redistribute wave impacts to other areas and cause erosion by disrupting littoral drift. Long-term resilience and coastal protection cannot be achieved through hard infrastructure alone.

Continued research and data gathering will inform the conversations, policies, and practices that promote resilience. Prior to Sandy, the Army Corps of Engineers was involved in a multi-year study to evaluate soft infrastructure options for the Rockaways, while balancing their mandate to preserve navigation routes. This study was put on hold due to financing limitations. Post-Sandy, federal funding has become dedicated to coastal restoration to pre-storm conditions. Though federal financing resumes work on the original study, lengthy state and agency approval processes suggest that the study and any actionable items will not be ready for another year.[40]

With the increased threats of flooding, storm surges, and wave damage from extreme weather events, communities must not only take actions to protect against hazards,

but also prepare to manage events. Hazard management begins with data analysis, including post-flood evaluations of flood levels, floodplain reference marks that establish benchmarks, and elevation reference marks. Exercises in asset mapping help communities identify key available resources and assets, and help to initiate the process of identifying gaps. As data is gathered, visualization is critical to developing a shared vision for the community's flood management plans—this may take the form of sketches of ideas and models. Impact analyses are used in brainstorming to assess consequences of flood management planning. Scenario analyses and performance based planning are further employed to evaluate the effectiveness of a proposed plan.

Mitigation plans, particularly for floods, are a key part of state and local decision making, due to their impacts on capital improvement plans. These plans help identify structural or nonstructural measures to reduce damage in future flooding events. In addition, they can communicate community needs, serve as a tool to request funding, and guide future development. Hazard Mitigation Plans establish a community vision and guiding principles for reducing hazard risk and mitigating vulnerabilities. While these plans are not flood-specific, they are required by several federal grant programs including the Hazard Mitigation Grant Program and the Pre-Disaster Mitigation Program.[41]

Low-Impact Development and Green Infrastructure

Low-impact development (LID) and green infrastructure are systems or practices that mimic natural water collection, conveyance, and storage through innovative design. Green infrastructure "uses vegetation and soil to manage rainwater where it falls" versus traditional "gray" infrastructure, which directs and disposes of rainwater through pipes.[42] These techniques aid in flood mitigation and stormwater management, both of which are important issues that be addressed prior to development in Arverne East. New York City has developed an adaptive Green Infrastructure Plan, providing an opportunity for Arverne East to incorporate modern-day green infrastructure technologies and standards that will

A green roof atop the New York City Parks Department's Five Borough Administrative Building on Randall's Island

An example of a blue roof, designed for water retention

limit the amount of runoff from the site and lessen impacts from flooding and sea level rise. Land-use planning restricting new development in sensitive coastal or low-lying areas and limits on impervious surfaces also helps to achieve LID. Examples of LID and/or green infrastructure include green roofs, blue roofs, trees and tree boxes, rain gardens, vegetated swales or median strips, pocket wetlands, infiltration planters, porous and permeable pavements, protection and enhancement of riparian buffers and floodplains, and rain barrels. Incorporating low-impact development into adaptive management practices can expand the capacity of systems to account for dramatic increases in rainfall and flooding resulting from extreme natural events.

Green roofs provide a number of benefits, including stormwater retention capabilities. Installation costs range from $10 per square foot to $25 per square foot with annual maintenance costs ranging from $0.75-$1.50 per square foot.[43] Although these costs are higher than the installation of a traditional roof, a green roof provides substantial energy cost savings over time. Many municipalities and states, including New York, are incentivizing the construction of green roofs. New York State offers a one-time property tax abatement of $4.50 per square foot up to $100,000 for eligible green roofs, which the developers for Arverne East should review.[44]

Blue roofs are designed to delay the flow of stormwater during peak flows by ponding stormwater on the roof and controlling its release over a period of time. Stormwater can be reused for purposes such as irrigation, where potable water is not required. New York City has instituted a pilot project to compare green and blue roof performance at several sites.[45] For lower-density portions of the site, cisterns and rain barrels can capture rainwater for reuse. Higher density structures can utilize water diversion technology to move non-potable water into irrigation systems and other uses that do not require potable water, such as toilets.

When looking for examples of successful implementation of LID and green infrastructure, it is imperative to consider **Arverne by the Sea**, which lies just west of the study area. In stark contrast to the homeowners found on all sides of the development, homeowners from this nearly completed waterfront community "suffered no real flooding or damage to their homes."[46] Arverne by the Sea's relative good fortune has received much attention, as it can be heavily attributed to elements in the development's very design and construction, including its infrastructure investments. Arverne by the Sea features:

- the addition of five feet to grade for the entire site, using a half-million cubic yards of fill (note that Arverne East's environmental impact statement requires residences to be one foot above the 100-year floodplain on buildable areas)
- underground utility lines and submersible transformers
- a sophisticated drainage system of underground chambers, wide street mains, and storm drains on each house property, that connects to large sewer mains (which were installed during the reconstruction of public streets, as part of an agreement with the city) and is specifically designed to handle flood surges
- green infrastructure in the form of a natural buffer of sand and beach grass that was maintained near the boardwalk.[47]

Photo credit: Arverne by the Sea

Adaptive Management

Adaptive management aims to reduce vulnerability and risk through an iterative evaluation and decision-making process. The success of adaptive management requires an ongoing monitoring process that incorporates flexibility to adjust to new information and technology. This ongoing process and long-term viewpoint allows municipalities and states to: improve their understanding of sea-level rise impacts on the local economy, the local ecology, and the built environment; process the effectiveness of measures employed; quickly promote measures that are working; and eventually have a proactive planning process in response to climate change.

Developed barrier islands do not have the option to retreat inland in order to avoid the effects of sea-level rise on their infrastructure and buildings. **Satellite City** is a barrier island city off the east coast of Florida with less than two percent of undeveloped land and more than 50 percent of its tax base located six feet above sea level. Since the city is built on unconsolidated sand on top of porous limestone bedrock, traditional protective measures such as dikes, levees, and seawalls are not feasible options. Several highly developed barrier island communities in South Florida, including Satellite City and the Florida Keys, have been reviewing and updating their master plans to incorporate adaptive management techniques. Satellite City is developing a realistic timeline of future actions, implementing no-regret or low-regret policies that create "benefits in the short term, no matter how the climate changes in the future and even if the potential long-term benefits are never realized", and providing a legal basis to implement their plan.[48]

Photo credit: VRBO.com

Federal, State, and Local Policy Measures

Land use regulations are a critical part of coastal management and flood mitigation. Measures include: zoning; building code regulations; infrastructure design standards; subdivision regulations; developer agreements; development codes; and floodplain management regulations. In practice, examples of such measures include:

- Structural elevation requirements stipulating freeboard requirements or the elevation of a structure above the base flood elevation (BFE)
- "No net fill" regulations that require all fill placed in a floodplain must be balanced with at least an equal amount of soil material removal to ensure "no net loss" of floodplain storage (a loss of storage area results in an increase in flow downstream and, ultimately, higher flood elevations downstream)
- "No adverse impact" (NAI) regulations measure adverse effects or impacts in terms of increased flood peaks, increased flood stages, higher flood velocities, increased erosion and sementation, or other impacts the community considers appropriate.

Municipalities have the authority to create and update their comprehensive plans to incorporate appropriate measures to address sea-level rise. Certain actions, however, must be made at the state level to enable or increase the effectiveness of local-level efforts.

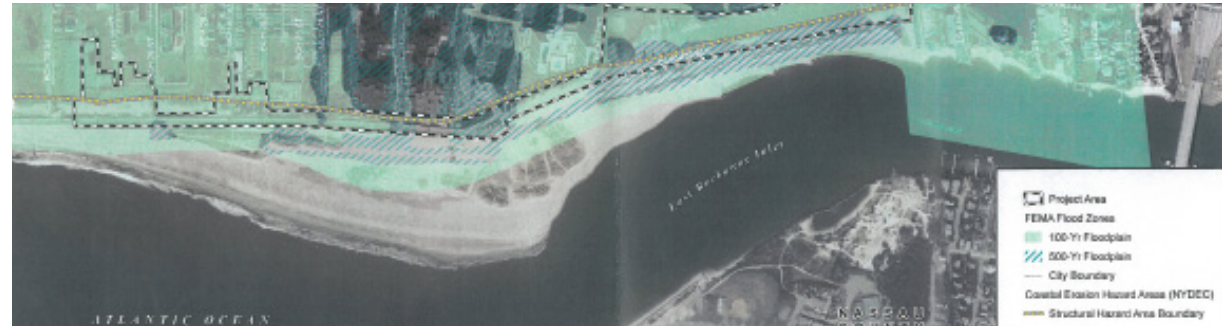
New York State's Local Waterfront Revitalization Program (LWRP) is a community input based plan and program addressing waterfront issues in a community that is adopted by the municipality and approved by the Secretary of State under the Waterfront Revitalization of Coastal Areas and Inland Waterways Act. The program follows a process that helps communities vision and implement their ideas, with Department of State guide materials.

The LWRP process can help build and reflect community consensus, improving a community's ability to attract development and helping establish continuing partnerships with state and local government agencies and community organizations. The LWRP is a tool for identifying needs and guiding technical assistance and financial assistance. The plan also helps ensure that funding, permitting and actions of state and federal levels align with the goals of the LWRP.[49] Under the 2002 New York City LWRP, the city has completed a 2011 New York Comprehensive Waterfront Plan: Vision 2020, which includes an inventory of the City's waterfront to guide waterfront uses, redevelopment, and protection.[50]

Collaboration between state environmental departments, regional planning authorities, emergency management, conservation authorities, and other coastal states is critical when assessing, prioritizing, and protecting sensitive coasts and wetlands. With access to federal funding and broader legislative powers, states have more resources to develop and assess climate change adaptation strategies. These actions can provide tools for municipalities as they develop their own comprehensive plans. States can also steer development away from coastal areas by reducing funding, tax breaks, and incentives for private development in these zones. Prior to issuing new development permits, states and localities can require the use of low-impact development techniques.

Many coastal states can establish coastal zones prohibiting construction to address the risks associated with coastal development; however, many of these boundaries are outdated. For example, Florida last updated its Coastal Construction Control Line in 1978.[51] In the wake of Superstorm Sandy, New York State is in the process of reviewing the state Coastal Erosion Zone. The final decision will have important repercussions for development in areas such as the Rockaways.

Figure 24: Coastal Erosion Map of the Arverne East area



Rendering of a future dike relocation along the Netherlands' River Waal, exemplifying "soft where possible, hard where necessary" water management

The Netherlands has been on the forefront of forward-thinking, adaptive policy initiatives that strive to protect and anticipate the impacts of flooding events and sea level rise. The Netherlands' National Water Act articulates the government's legal obligation to protect against the threats of flooding. In addition to requiring periodic infrastructure assessments, the Water Act provides funding for strengthening substandard infrastructure. National-level requirements regarding the level of flood protection that must be achieved have been established alongside specific guidelines for coastline protection and performance. These funds are provided by the Ministry of Infrastructure and the Environment, Rijkswaterstaat (local water authorities), as well as contributions from provincial/municipal entities. Contributions vary by year and project needs, enabling projects to respond to recent events, policy, or technology.[52]

After a disastrous flood in 1953, the Delta Commission, a governmental advisory board dealing with the country's water, launched a long-term integrated evaluation and coastal protection plan. Today, the Delta Commission brings together a wide-ranging group of regulators and experts in the Ministries of Economic Affairs, Agriculture and Innovation, the Interior, Finance, Infrastructure and the Environment, along with the Prime Minister, municipalities, provinces, business groups, and civil society. A yearly Delta Programme proposal is reviewed by the Cabinet and funding is part of the Ministry of Infrastructure and Environment's budget. This plan provides for flood safety, freshwater supplies, and planning cost estimates on a yearly basis, adjusting to changing needs and natural events. A separate Delta Fund has been proposed to provide for Delta Programme investments such as dike management or construction, sand deposit maintenance, and research. From 2020 onward, a minimum of €1 billion per year will be dedicated to ensure the implementation of the program.[53]

The Netherlands' water management strategies have evolved from traditional flooding protection to an emphasis on accommodation and sustainable urban design. Today, the driving water management principle of the Dutch is "soft where possible, hard where necessary." Dynamic coastal management (natural sand distribution replenishment schemes; grooved dunes; creeping islands); flexible use of space (adaptable and portable, simple structures); and dynamic natural management (drifting dunes) are implemented where possible. While hard infrastructure interventions continue to exist recent policies have incorporate overflow channels, water storage, and discharge features in the landscape. On an urban design scale, adaptive water management principles and practices have been incorporated in building codes that allow for floodable lower levels of buildings and garages, as well as the elevation of critical infrastructure.

These efforts run alongside provincial climate adaptation action programs and innovate spatial planning and design. Dutch cities have been leading the way in creative solutions such as underground water storage for storm water and water plazas that can serve as recreational areas and storm water basins. These design mechanisms are complemented by subsidies for residential green roof installations that reduce storm water runoff, sequester carbon, and provide energy savings. Room for the River, for example, is a program that provides more flooding area to the river in 30 strategic locations—acknowledging rising water levels and the danger of dike failure.

VISION

4.1 PLANNING FRAMEWORK

Arverne East presents an opportunity to build in a thoughtful, contextual way, by leveraging local assets to foster a community-oriented wellness and recreation hub that serves as model for coastal environmental, economic and social resilience.

This vision for an enriching environment that provides community services, recreation, employment opportunities and environmental protections emerged from a process of stakeholder interviews, public outreach, site visits and research which strove to pinpoint appropriate responses to current community needs and assets. An intentional focus on environmental, environmental and social resilience can offer protections to current and future community members and visitors, while remaining flexible to accommodate future trends and changes.

ENVIRONMENTAL RESILIENCE: Systems that anticipate and adapt to short and long-term environmental changes, which might take the form of a waterfront network of resilient open spaces, environmental infrastructure and adaptable mixed-uses.

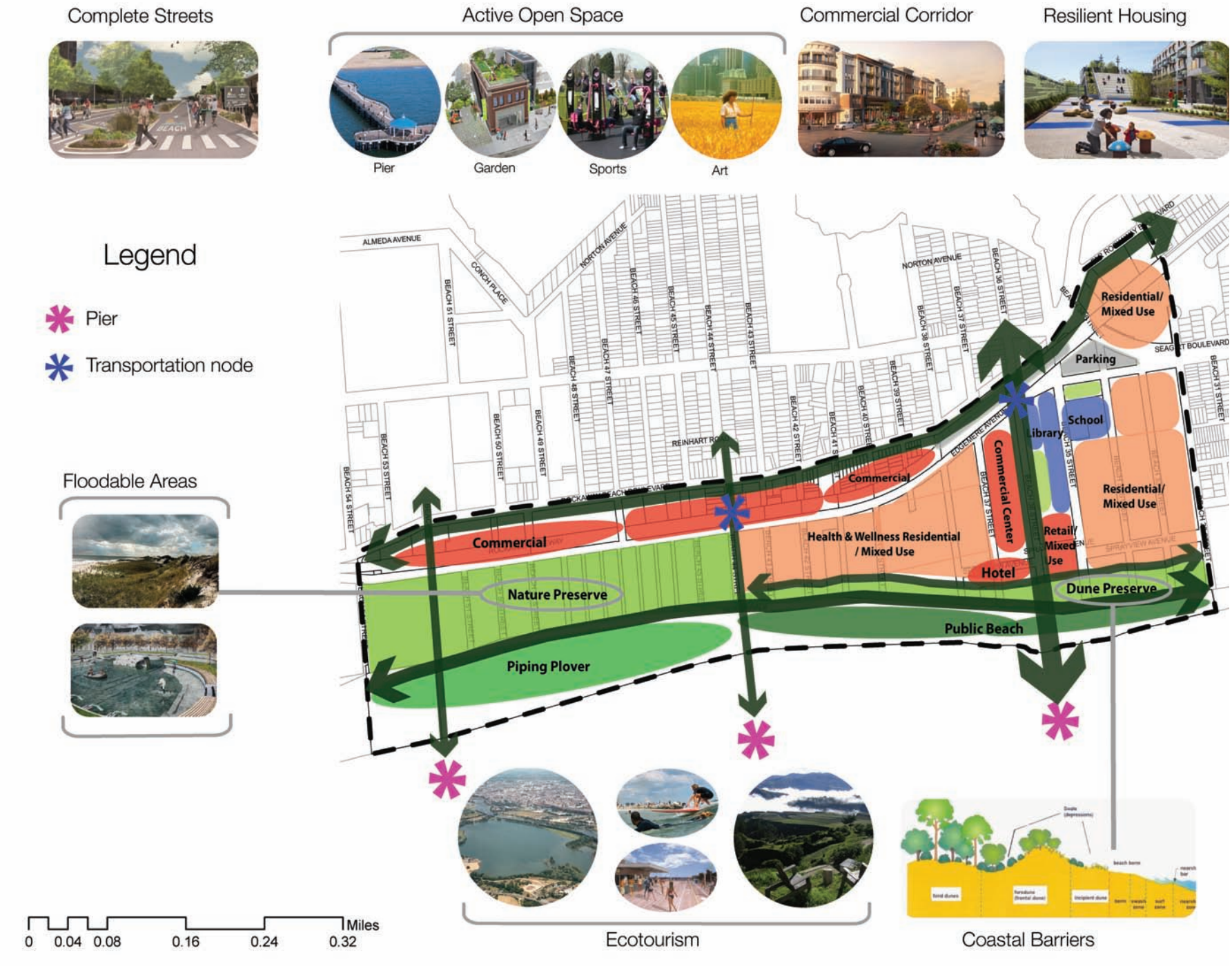
ECONOMIC RESILIENCE: A local commercial and recreation hub serving the needs and aspirations of existing residents, future community members, and visitors contributes to the strength of the local economy by introducing diversity, increasing investment and improving flexibility and responsiveness to ongoing trends.

SOCIAL RESILIENCE: Spaces and uses that promote positive interaction and exchange can help build social capital and community identity. A wellness district that promotes active, healthy living for everyone ranging from young to old can serve to uplift the needs and contributions of all members of the community, by promoting accessibility, connectivity and health-oriented recreation and commercial uses.

Photo Credit: Stephan Schack (Flickr)

Sunken Forest in Fire Island, NY

Concept Map for Arverne East



ENVIRONMENTAL RESILIENCE

Goal: Promote development that anticipates and adapts to short- and long-term environmental changes.

Environmental resilience refers to an area's ability to anticipate, respond and adapt to natural disturbances. Any discussion about the future of the Rockaways is inextricably linked with planning for environmental risk. At the onset of this project, Rockaway Waterfront Alliance identified a broad range of environmental and natural hazard vulnerabilities as key considerations for this study, including high flooding risk, storm surges, high winds, inadequate stormwater infrastructure, exposed utility lines, and lack of evacuation planning. In a post-Sandy world, these issues have risen to the forefront of conversations with city agencies, developers, local civic organizations, residents, and business owners. All feedback and information we received from local leaders and residents was framed in the context of safety and resilience. While this focus may result from post-disaster awareness, and consequently diminish as collective memory fades, taking steps now to ensure community safety, environmental integrity, and the functioning of ecological systems while disaster response resources and attention are available is critical to the long-term viability of the Rockaways as a place to live, work, and play.

A waterfront network of resilient open spaces, environmental infrastructure, and mixed-use development that can adapt to changing physical, economic, and social needs is key to enhancing the area's environmental resilience. This includes incorporating broad policy and planning with soft and hard infrastructure solutions to mitigate flooding and sea-level rise impacts in order to ensure immediate needs as well as long-term safety.

Objective I: Incorporate risk and vulnerability assessments into broad decision-making and planning mechanisms.

Site resiliency and resident safety in the case of flood and storm surge events was identified as crucial concerns at the public workshop. The development of Arverne East is a rare opportunity to implement innovative design and building that strives for coexistence with nature through the incorporation of risk and vulnerability assessments into broad decision-making and planning activities.

Shoreline facing east at Beach 44th

Vulnerable above-ground infrastructure

Renewable energy potential (Photo credit: BOEM)

Recommendation: Resilience policy and planning can take several forms, including:

- Guide growth away from high-risk locations and locating critical facilities in less vulnerable areas.
- Incentivize the (re)introduction and protection of natural systems and buffers.
- Retrofit existing buildings and facilities that cannot be relocated.
- Monitor and update programs and plans on regular basis.
- Participate in New York City's Local Waterfront Revitalization Program (LWRP) planning processes and updates to the New York City Comprehensive Waterfront Plan: Vision 2020.
- Enforce the Coastal Zone Management Act, which manages coastal resources and balances economic development objectives with environmental conservation.[54]

The American Planning Association's (APA) Safe Growth Audit guide offers an evaluation technique to assess and vision for the growth of communities which face natural hazards.[55]

BASIC SAFE GROWTH AUDIT QUESTIONS[56]

COMPREHENSIVE PLAN

Land Use

- Does the future land-use map clearly identify natural hazard areas?
- Do the land-use policies discourage development or redevelopment within natural hazard areas?
- Does the plan provide adequate space for expected future growth in areas located outside natural hazard areas?

Transportation

- Does the transportation plan limit access to hazard areas?
- Is transportation policy used to guide growth to safe locations?
- Are movement systems designed to function under disaster conditions (e.g., evacuation)?

Environmental Management

- Are environmental systems that protect development from hazards identified and mapped?
- Do environmental policies maintain and restore protective ecosystems?
- Do environmental policies provide incentives to development that is located outside protective ecosystems?

Public Safety

- Are the goals and policies of the comprehensive plan related to those of the FEMA Local Hazard Mitigation Plan?
- Is safety explicitly included in the plan's growth and development policies?
- Does the monitoring and implementation section of the plan cover safe growth objectives?

ZONING ORDINANCE

- Does the zoning ordinance conform to the comprehensive plan in terms of discouraging development or redevelopment within natural hazard areas?
- Does the ordinance contain natural hazard overlay zones that set conditions for land use within such zones?
- Do rezoning procedures recognize natural hazard areas as limits on zoning changes that allow greater intensity or density of use?
- Does the ordinance prohibit development within, or filling of, wetlands, floodways, and floodplains?

SUBDIVISION REGULATIONS

- Do the subdivision regulations restrict the subdivision of land within or adjacent to natural hazard areas?
- Do the regulations provide for conservation subdivisions or cluster subdivisions in order to conserve environmental resources?
- Do the regulations allow density transfers where hazard areas exist?

CAPITAL IMPROVEMENT PROGRAM AND INFRASTRUCTURE POLICIES

- Does the capital improvement program limit expenditures on projects that would encourage development in areas vulnerable to natural hazards?
- Do infrastructure policies limit extension of existing facilities and services that would encourage development in areas vulnerable to natural hazards?
- Does the capital improvement program provide funding for hazard mitigation projects identified in the FEMA Mitigation Plan?
- Do small area or corridor plans recognize the need to avoid or mitigate natural hazards?
- Does the building code contain provisions to strengthen or elevate construction to withstand hazard forces?
- Do economic development or redevelopment strategies include provisions for mitigating natural hazards?
- Is there an adopted evacuation and shelter plan to deal with emergencies from natural hazards?

Objective II: Integrate complementary soft and hard infrastructure interventions to fortify existing and future structures and functions.

Recommendation: Replenish the coastline with a vegetated double dune system to protect against storm surges.

As "the first line of defense for coastal towns during storms," a bolstered dune preserve topped with a heterogeneous mix of trees, shrubs, and grasses, can absorb much of a storm surge's force. A vital component of the environmental resiliency of the site focuses around the preservation and enhancement of a coastal dune system.

The most effective coastal dune system tends to be an undulating one with a primary, or sacrificial, dune closest to the beach, and secondary, permanent dunes in the back, with swales between each dune. Coastal vegetation anchors the dune structure to prevent sand dispersal. The appropriate type of vegetation needs to be planted in the correct zones, with smaller shrubs and grasses focused in the sacrificial dune area, and larger trees and shrubs that are tolerant of sandy soil and have stronger root systems (such as the indigenous pitch pine) throughout and behind the secondary dunes. The site is currently subject to some invasive species, which creates a monoculture that decreases the effectiveness of the relationship between the dune system and vegetation anchors. A variety of non-invasive species will need to be planted and maintained in the preserve.

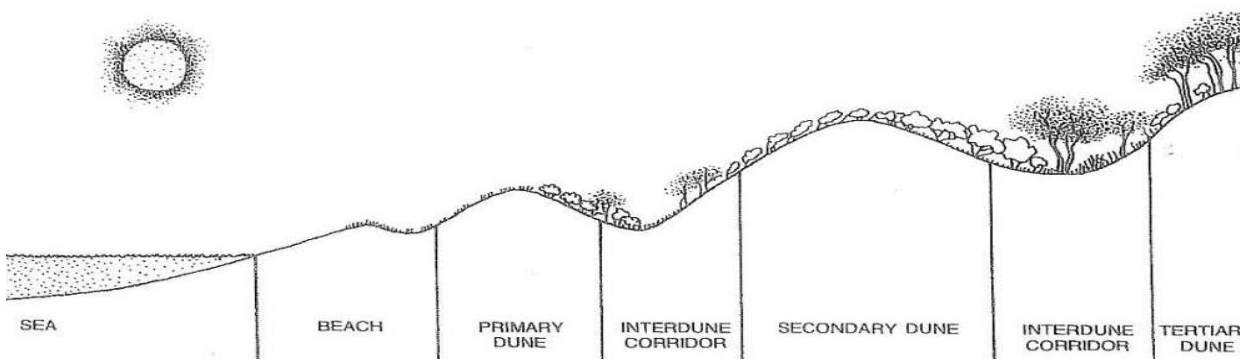
Although the dunes can affect beach views and re-nourishment efforts can be costly to maintain, a dune preservation zone needs to be maintained as part of a more comprehensive environmental resiliency program than currently proposed in the EIS. Participants in the March 2013 workshop stressed their concerns regarding safety from flooding and storm surge and encouraged exploration of alternative and innovative flood mitigation strategies.

Recommendation: Elevate site above Advisory Base Flood Elevation (ABFE) levels.

Elevating the site above ABFE levels, or the 1 percent annual chance flood hazard elevation can improve the resilience of the site, open spaces and any development in the face of flood or storm hazards.

Recommendation: Explore off-shore mechanisms that leverage natural forces to provide protection against the storms and erosion.

The Dutch have developed a number of creative solutions to capitalize upon natural forces to fortify their coastlines, in pursuit of the goal of living with water. One such solution, "the sand motor project," along the coastline of the Dutch Province of Zuid-Holland, relies on natural wind, wave and ocean current forces to renourish and bolster coastlines for coastal hazard protection. The amount of sand needed to renourish the coastline over a period of up to 20 years was pre-determined.



Rendering source: American Planning Association

The most effective coastal dune system tends to be an undulating one with a primary, or sacrificial, dune closest to the beach, and secondary, permanent dunes in the back, with swales between each dune. Coastal vegetation anchors the dune structure to prevent sand dispersal.

This method is an alternative to traditional beach re-nourishment projects that are typically required every three to five years.[57] This option was presented to residents during a workshop sponsored by RWA in January 2013 and received support for further review as a potential option for the Rockaways.

Recommendation: Consider multifunctional flood defense and stormwater management and retention mechanisms.

Multifunctional flood defense combine protection from storm surge and water inundation with usable space. Local residents expressed interest in interventions that both adapt to the reality of flood risks and protect against these hazards. Examples of projects that incorporate defense with traditional uses include the combination of retail and office space with storm barriers; public squares, recreational space, and garages that serve as retention zones; and floating houses. Projects that are most viable for Arverne East include floodable public recreation space or ground floors and underground parking spaces that double as water retention zones during storms.[58] This could be a viable option for Arverne East, but it would require a redesign of building scale and location, recreation location and design, and topographical alterations to the site.

Much of the parkland specified in the Arverne Urban Renewal Area's environmental impact statement is situated on the low-lying western portion of the study area. Prone to flooding, this area should serve as a space for active recreation and the preservation of indigenous, water-tolerant plant species in dry weather, and as a catch basin for precipitation and diverted stormwater in wet weather. Diverted stormwater can be directed by a series of right-of-way bioswales designed and sited by an expansion of existing, multi-departmental efforts by the Departments of Environmental

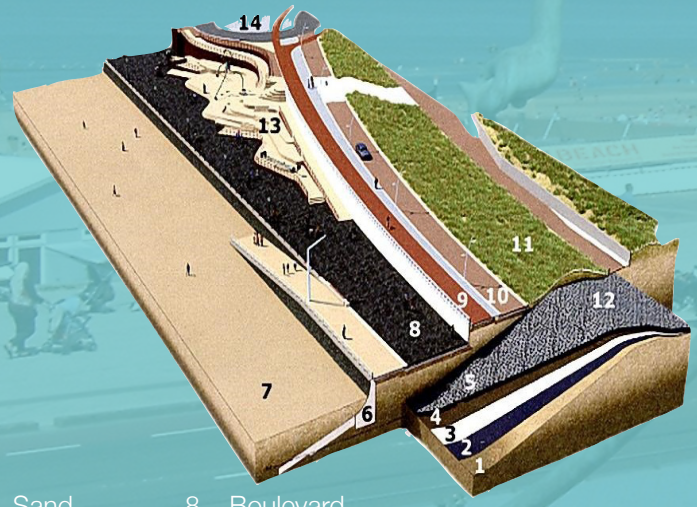
Zuid Sand Motor Project, Netherlands

Left: July 2011
Below: October 2012

Photo credit: Dutch Water Sector

Case Study: Boulevard at Scheveningen, The Hague, Netherlands[59]

The Netherlands have embarked on new and innovative techniques to protect their coastal communities from flooding. In April 2013, a coastal boulevard in Scheveningen that combines recreation, multi-modal transportation routes, and an underground dike providing additional reinforcement from coastal flooding, was opened. Designed by Spanish architect Manuel de Solà-Morales, the multipurpose boulevard consists of a 1 kilometer long and 12 meter high curving sea wall that replicates a dune system, thereby allowing the wall to be lower and creating an aesthetically pleasing alternative to flood defense. The reinforcements are fully underground and integrated into the boulevard, and the beach was widened for additional recreation space. Various transportation modes are separated onto different levels, improving safety and user experience.



1. Sand
2. Slag
3. Geotextile
4. Slag
5. Basalt block
6. Seawall
7. Beach
8. Boulevard
9. Bike path
10. Roadway
11. Dune
12. Dike
13. Sculpture
14. Bus loading

Photo credit: Bel Air Hotel, The Hague

Rendering credit: Eternal Beau, DPI Animation House

Protection, Transportation, and Parks and Recreation.

The nature of the Rockaways renders it susceptible to flooding from the Bay side during minor storm events and high tide. Norton Basin, near Bays Water Park, is located approximately 1,000 feet away from the northern portion of the site and a high risk of flooding. Land in this area should be constructed for the primary purpose of handling flooding and should not include low-scale residential development.

Recommendation: Study feasible resilient building forms and locations, including mid-rise buildings with flood proof ground-floor uses and/or environmental buffers.

The current development plan calls for a mix of low-rise and mid-rise buildings, which will primarily be used for housing. In response to the public call for more resilient structures and discussions with residents and planners, one option would be to increase the number of mid-rise buildings and decreasing the number of low-rise buildings. This would accommodate the necessary environmental protections and support the level of activity in order to make development economically viable. Wide-scale, low-density development reminiscent of historical bungalows are not a resilient use of the land due to flood risks and the need to elevate and incorporate costly environmental buffers. Development should be concentrated between Beach 32nd and Beach 38th north of Spray View Avenue to minimize flooding impacts to the built environment, with various water diversion methods to move storm water away from the developed site and into surrounding floodable space.

Recommendation: Incorporate green infrastructure in existing and future developments

Given that the site is located within a floodplain and is in close proximity to major bodies of water, stormwater management is a vital component to any development plan in Arverne East. The site is in a unique position to serve as an example of successful ways to incorporate resilient building practices and green infrastructure into new construction.

In conjunction with large-scale flooding mitigation strategies, the site should incorporate smaller scale green infrastructure techniques to protect nearby waterways, lessen flooding impacts, and reuse water. Such tools that can be used in Arverne East include green and blue roofs, natural drainage systems, use of pervious materials, and stormwater capture and reuse (cisterns and rain barrels).

Green and blue roofs

Both green and blue roofs require a flat roof and a certain load capacity, making them more feasible for new construction such as that proposed for Arverne East. Initial per-

Photo credits (from left to right): TecEco; The Calhoun School; City of Warrenville, IL

Pervious materials

Green roof

Bioswale

formance has shown that green roofs provide more benefits than blue roofs, including stormwater retention, reduction in urban heat island effect, energy efficiency, and usable green space. However, green roofs are significantly more expensive to install and maintain.[60]

PlaNYC sets forth policy recommendations aimed at encouraging developers to install green roofs, sidewalks and porous parking lots in order to capture excess rainwater and runoff. This is being examined through a pilot program that offers a $4.50-per-square-foot tax abatement for green roofs that cover more than half a rooftop.

Natural drainage systems
Residents and stakeholders described frequent flooding from even the most minor of storm events as a large challenge. Natural drainage systems can help mitigate this by reducing the volume and velocity of stormwater entering infrastructure systems Examples of natural drainage systems include porous materials on sidewalks narrowing of streets, and landscaped street edges (such as bioswales and rain gardens) to control the flow from the street's impervious surface. Bioswales are useful components to green infrastructure plans and are best incorporated close to impervious surfaces to treat water before it enters a waterway. Positioning bioswales and rain gardens close to roads will aid in keeping polluted stormwater out of waterways.

Pervious Surfaces Pilot Project for Flood-Prone Roadways
Observations of the study area have shown that flooding can be a problem on the roadways found within it. The sandy soil found on the peninsula contains the ideal conditions for the accelerated infiltration of stormwater. By paving the roads and sidewalks with pervious surfaces, depressed areas in the road would be less likely to flood, and sewage infrastructure would be less likely to overflow with stormwater.

Recommendation: Retrofit and build new infrastructure to be storm-proof.

Power restoration after Sandy was a long and arduous process ranging from days to months. Public workshop participants cited the need for storm-proof and resilient utility lines, which are currently located above ground and susceptible to strong winds and frequent flooding.

The majority of electrical lines in the Rockaways are above ground, making the electrical distribution system vulnerable to severe weather events. Of NYC's boroughs, Queens has the most exposed overhead lines at more than 5,500 miles.[61] The cost of burying existing overhead electrical lines is estimated to be $1 million per mile and would ultimately be passed onto consumers.[62] However, the benefits of undergrounding—primarily lower incidences of prolonged blackouts and avoidance of safety issues from downed lines—could outweigh the costs in the long run. In February 2013, the NYC Council unanimously voted to explore the feasibility, costs, and benefits of undergrounding electrical lines in vulnerable areas such as the Rockaways.[63] Electrical lines currently running through the study area are above ground, but any new development on the site should require the

A waterfront network of resilient open spaces, environmental infrastructure, and mixed-use development that can adapt to changing physical, economic, and social needs is key to enhancing the area's environmental resilience.


Photo credit: Paul de Ruiter Architects
Underground garage and water reservoir at Museumpark in Rotterdam

undergrounding of all existing and new electrical, cable, and telephone lines and installation of submersible transformers. Arverne-by-the-Sea followed these best practices and avoided extensive blackouts experienced on the rest of the peninsula during Superstorm Sandy.[64]

Recommendation: Modernize energy transmission and distribution systems.

A modern energy transmission and distribution system can help ensure the reliability of power delivery so that the community can quickly recover from disturbances. Local resilient energy systems can be built through the development of a microgrid, which is a localized system of electricity generation, energy storage, and loads and do not require connection to a traditional central macro grid. The microgrid could function autonomously during disruptions to the broader network and is also capable of importing the power it generates into the macro grid, in concert with local renewable energy production. The importance of a modern energy grid was evident during the aftermath of Superstorm Sandy, when energy disruptions lasted weeks. Local civic organizations and volunteers helped bring solar power to local organizations and residents to facilitate faster recovery. These efforts could have expedited recovery had there been an established means of local distribution of energy produced on-site.

Objective III: Reduce the local carbon footprint by reducing energy demand and encouraging local renewable energy

Case Study: Sendai Microgrid Project, Japan

Located on the Tohoku Fukushi University in Sendai City, Japan, the microgrid was designed in 2004 as a demonstration project of the New Energy and Industrial Technology Development Organization. The microgrid has several generation sources: two gas engines, a phosphoric acid fuel cell, and a photovoltaic array. During the devastating earthquake in Japan in 2011 that disrupted the Tohoku district's energy supply, the Sendai microgrid successfully operated, providing uninterrupted heat and power to hospitals and other customers. Sendai displays the importance of microgrids in times of disasters, diversity of power sources, backup equipment, and comprehensive operations and training.

Source: Microgrids at Berkeley Lab

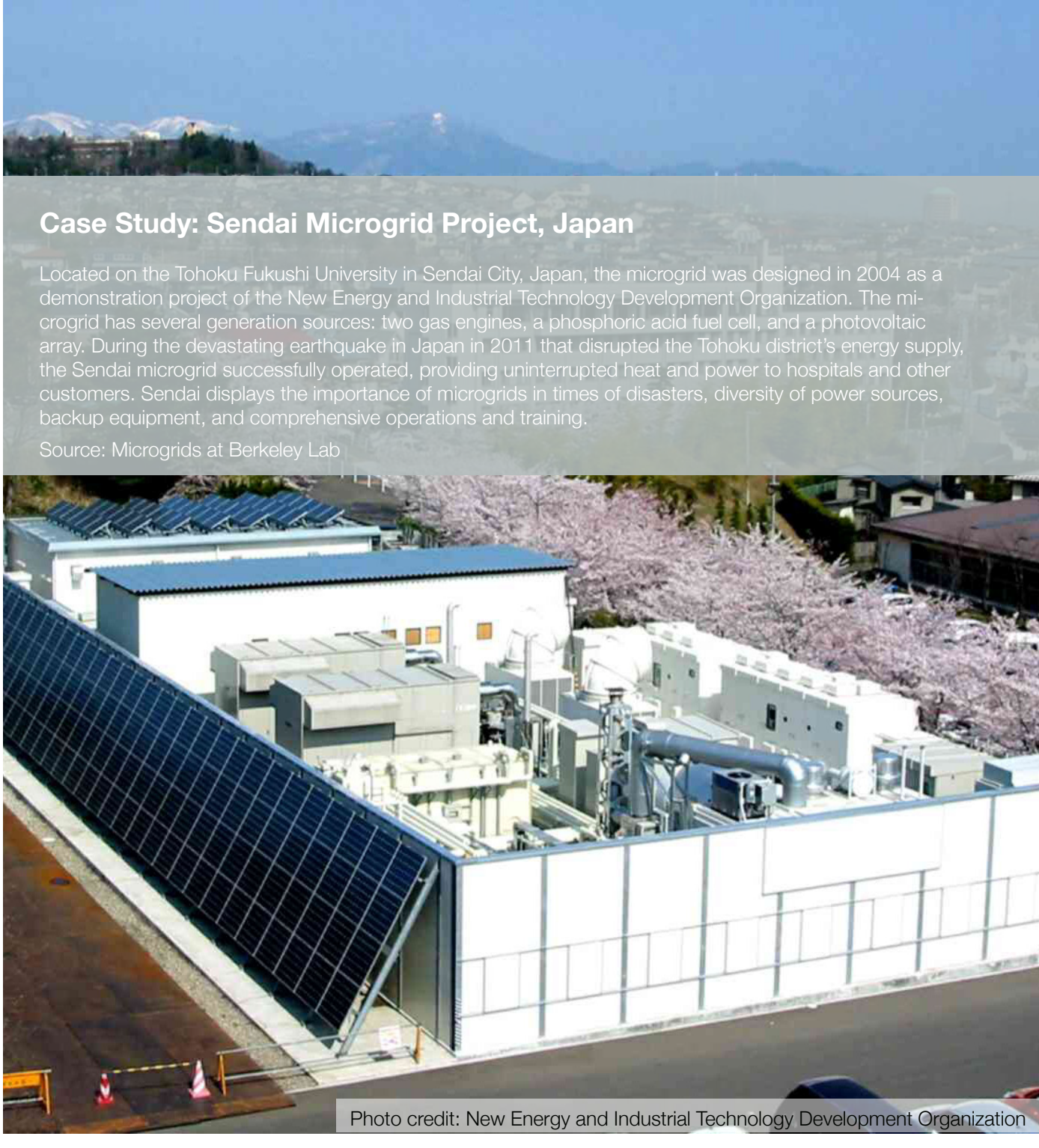


Photo credit: New Energy and Industrial Technology Development Organization

Photo credit: Visitsamsoe.dk

Case Study: Samsø-Danish Energy Self-Sufficient Island

An offshore wind farm comprising 10 turbines (making a total of 21 altogether including land-based windmills), was completed, and funded by the islanders. The people of Samsø heat their homes with straw burned in a central heating system and power some vehicles on biofuel which they also grow. Now 100% of its electricity comes from wind power and 75% of its heat comes from solar power and biomass energy. An Energy Academy has opened in Ballen, with a visitor education center.[65]

networks to lessen susceptibility to grid disruptions.

Recommendation: Green building retrofits in existing structures and energy efficient building design for any new development can help increase energy efficiency and reduce energy demand.

Adoption of Leadership in Energy and Environmental Design (LEED) standards for future development would greatly improve any development's ability to ensure its own self-sufficiency. LEED is a set of guidelines that provides building owners and operators with a concise framework for implementing measurable green building design, construction, operations, and maintenance solutions.

Recommendation: Provide energy efficiency information and financing.

According to PlaNYC 2030, New York City will create a not-for-profit corporation, the New York City Energy Efficiency Corporation (NYCEEC), which will provide an information center to provide comprehensive, updated information on energy efficiency funding and tax incentives. The framework seeks to "provide cleaner, more reliable, and affordable energy" through incentivizing and using renewable energy sources (ex. Solar, wind, biogas) and the promotion of cogeneration systems that capture the heat by-product of electricity production for heating and cooling use. According to PlaNYC 2030, currently there are five solar thermal projects in Rockaway Peninsula.

ECONOMIC RESILIENCE

Goal: Bolster the economic vitality of the area by creating opportunities and establishments that empower and serve the needs and aspirations of current and future residents.

Objective I: Develop mixed-use residential and retail that responds to existing and projected needs and markets.

PlanNYC 2030 estimates New York City will grow by one million new residents between 2000 and 2030. Housing a growing number of residents with different needs, preferences and incomes is a persistent challenge. In a relatively built up city, any vacant plot of land—let alone one situated on the waterfront— presents a valuable opportunity.

In addition to housing market potential, the significant amount of local spending leakages suggest that Rockaway residents' desire to purchase certain goods and their inability to find these goods on the peninsula is not currently met. Retail establishments could serve as amenities and attractions to residents and visitors, bolstering the economic attractiveness of mixed-use establishments.

Recommendation: Introduce medium density mixed-use housing, office and commercial retail, with elevation and ground-level adaptive green infrastructure for storm resilience.

Medium density developments can provide the conditions allowing for adaptive ground-floor infrastructure such as ground-floor, floodable parking, camouflaged and buffered by a green infrastructure berm. This would offer ample parking, while providing temporary water retention zones during storms events. A reduction of retail or residential usage on the ground level can reduce risks and costs related to storms. Additional vertical density can help better justify and financially support first floor use of parking. Residential and commercial space can also bolster the economic viability of the necessary extensive stormwater infrastructure improvements. The developer must review the costs and benefits of going above and beyond existing requirements by elevating buildings with ground-level retail, even though building codes for structures in floodplains do not require elevation of ground-floor retail. This may make it difficult to attract retailers to the area if they do not have protection against flooding, which will make insurance premiums costly.

In contrast to the single-family, pitched roof homes found in the surrounding community, rooftops on higher density buildings can and should be used for dynamic, adaptable purposes that satisfy resilience in terms of

Case Study: Seapointe Village, NJ

Seapointe Village is a master planned vacation/resort community along the southern tip of the New Jersey Shore comprised of a mix of homes, townhouses, mid-rise and garden residences along a beachfront. The development is built up from ground elevation and contains substantial green infrastructure as a buffer between the ocean and the residential structures. Parking spaces are located on the ground floor, and camouflaged by plantings that serve as stormwater infrastructure and buffers from storm-related hazards.

Photo credit: Activerain.com

Case Study: Via Verde

Via Verde, located at Brook Avenue and East 156th Street in the Bronx, merges "the latest green concepts with high-quality architecture" to create a public-housing project unlike any other in the United s housing." Shaun Donovan, former commissioner of the city's Department of Housing Preservation and Development and President Obama's current secretary of housing and urban development—who was instrumental in the development of Via Verde—describes it as an opportunity to "re-engage design with the issue of affordable housing." The facility features: a medical clinic enlisted to occupy the retail space on the ground floor of the tower; a fitness center was devised not for the basement but for the prime spot, with a load of light and great views on Via Verde's 40,000-square-feet of terraced roof atop the town houses. The roof is planted with garden plots and fruit trees, is lined with communal garden plots that will allow tenants to grow their own fruits and vegetables, and boasts a storm water reclamation system that recycles water for irrigation. These rooftops also provide a destination for walkers who can either climb up to them from the courtyard or step down to them after a workout, promoting a healthier lifestyle.[66]

Photo credit (left to right): Grimshaw Architects, David Sunberg

economy (with uses such as urban agriculture), environment (with uses such as green and blue roofs for water retention), and social structure (with uses such as gardens and event spaces).

The need for medium density becomes apparent comparing interests among existing and emerging stakeholders, as well as the financial realities of the economically sustainable projects. Participants in the March 7 workshop suggested that the development of additional housing might only be acceptable if it is incorporated into a mixed-use project that provides quality services for the entire peninsula and is designed to serve the housing needs of current residents. A lack of quality social services, emergency evacuation preparedness, and limited employment and recreation opportunities, was also an issue that many spoke passionately about. Realistically, in order for such services to locate in the area, an environment attractive to emerging stakeholders must be realized.

Emerging stakeholders will be concerned with the form that this development would eventually take—a form that will ensure a return on the investment that they would consider making. The site's developers seek to create a profitable environment, one that appeals to prospective homeowners and that offers retailers an adequate customer base. A number of indicators suggest that there is a demand for housing (as illustrated by 50 percent of Arverne by the Sea properties currently sold at prices ranging from $559,000 to $995,000) and for retail (as suggested by spending leakages in sectors such as grocery stores, food services and drinking places, and motor vehicle and parts dealers).

Recommendation: Amend/modify current zoning to promote mixed-uses.

Areas currently designated as exclusively residential should be rezoned to accommodate mixed-use to better support vibrant

centers of activity. The current zoning found within Arverne East consists mostly of the R6 and C4-4 designations, while a small amount of C8-1 can be found between Rockaway Beach Boulevard and Edgemere Avenue. The area's current zoning scheme would separate uses in a way that may inhibit robust inter-connected uses and the provision of retail and other services that support current and existing community members.

There are also functional and aesthetic considerations that should apply to Arverne East. As one of the few vacant waterfront areas left within the city's limits, the future Arverne East development must balance capitalizing and being sensitive to the site's natural ocean vistas and waterfront access. One such method is to "step" height and bulk requirements in a way that produces development with higher height allowances closer to Beach Channel Drive, and gradually reduces height as this development nears the water. Respecting the extension of existing street patterns in placing building footprints would also would allow for the protection of public viewsheds along North-South corridors. The desired effect would be a built environment that cascades toward the water, creating numerous rooftop spaces that can offer the public access to open and active spaces beyond the bustle occurring on street level.

Photo credit: Koette, Kim & Associates

Case Study: Toronto's East Bayfront

The East Bayfront is a waterfront community planned for mixed use development, set apart by its relationship to the water and its distinctive parks and public spaces. Like the vision for the Arverne East, the East Bayfront will contain a significant amount of park and open space, and a main street that is pedestrian, transit and cyclist friendly. Residential, retail and commercial uses are planned to be integrated into the network of developments and open spaces. Mid-rise mixed-use developments are designed to maximize views of the waterfront.[66a]

Objective II: Introduce innovative hotel and accommodations establishments to fill market gap, provide employment and capitalize upon local tourism and airport proximity.

Hotels and the tourism industry are proven economic drivers that provide jobs and revenue to local economies. Tourism represents five percent of global GDP, contributes to eight percent of total employment, and is the number one export in 60 countries. Involving local communities in tourism can help reduce poverty and benefit the local economy. Additionally, the energy intensity involved in and the effects on local ecological resources from tourism have led to greening of hotels and a rise in ecotourism, which are also increasing demand for green jobs.[67] The proximity of the site to the coast and to one of the most densely populated metropolitan regions in the United States make the addition of a hotel a feasible option that can spark redevelopment efforts in the Rockaways.

Community feedback showed support for the construction of a hotel and recognition of benefits from an increase in visitors. There is also unanimous support for an increase in parkland and recreation and job opportunities.

Community feedback showed support for construction of a hotel (56 percent of survey participants agreed and 28 percent neither agreed nor disagreed) and recognition of benefits from an increase in visitors (83 percent agreed that more visitors would benefit Arverne East). There is also unanimous support for an increase in parkland and recreation, which a hotel would naturally link with, and job opportunities. Additionally, several participants brought up the need to utilize the beach to its full potential and recognized the value the proximity to the coast brings to this site. A hotel with multiple recreation and business amenities that capitalizes on and promotes resilience of the beach can serve to fulfill multiple needs for the community. A hotel in close proximity to retail establishments will bring additional outside revenue into the area. There are very few restaurants in the area and an annual spending leakage of $47.7 million within a five-minute drive time from the site represents this lack of supply, which a hotel could also provide.[68] This space also provides lodging options for friends and family of current and future residents, as well as short-term business or water recreation-focused visitors for whom proximity to the central business district is not a priority. In keeping with the resiliency measures mentioned throughout the recommendations section in this report, the design of the hotel should include the utilization of the lower floors for disguised and floodable garage space.

Recommendation: Create a destination that can host day-trippers and weekend visitors.

As mentioned earlier, 90 percent of visitors to New Jersey drive from within 250 miles to visit the state's beaches. The majority of these visitors come for weekend getaways and day trips. Since Rockaway Beach would target this market, any hotel or resort built on the site should cater to weekend and short-term getaways by offering special one- and two-day packages.

Recommendation: Establish a partnership with international airlines operating at JFK through guest room and meeting/conference space agreements.

JFK International Airport is located approximately 20 minutes from the Rockaways and services more than 70 airlines. A number of international airlines travel through JFK and require long layovers for its staff, indicating that there is an untapped opportunity in the Rockaways to service this market by offering hotel/conference space that can be used for staff training and educational sessions. In an era when global international travel requires heightened cultural training and awareness, these partnership opportunities would allow for airlines to maximize staff time and maintain a competitive edge in service provision. Additional measures, such as providing exclusive shuttle service for airline staff to/from JFK would assist in attracting airlines to partner with the hotel. These partnerships, along with traditional room block rental agreements could help ensure the viability of the

Case Study: Grootbos Private Nature Reserve, South Africa

Although not set in an urban location, this resort is established in a nature reserve on a coastal setting. This lodge provides a wide array of services for guests that revolve around the beaches and flora/fauna of the site. The Rockaways can use a similar model to provide coastal recreation, whale watching activities, and educational opportunities similar to Grootbos' programs. Incorporating day trip adventures and day access to the site would help to tap into the extensive day-trippers market that New York provides.[73]

Photo credit: Grootbos Private Nature Reserve

hotel during the off-season.

These arrangements have already been reviewed in detail and were determined to be a potentially viable opportunity for a hotel in this site. A waterfront hotel offers a distinctive view, addresses an underserved need associated with JFK, provides off-season business for the hotel, and provides additional job opportunities for local residents. In comparison to nearby hotels in close proximity to JFK that provide conference space, a hotel within the Arverne East site would be located in a more restful environment that would be beneficial to airline staff who are traveling frequently through various time zones.

Recommendation: Serve as a model for urban ecotourism and utilize nearby recreation and environmentally sensitive regions in and around the peninsula.

Ecotourism is defined as "responsible travel to natural areas that conserves the environment and improves the well-being of local people." The Rockaways' proximity to several recreational and environmentally sensitive regions such as Jamaica Bay, wildlife sanctuaries, Gateway National Park, Broad Channel, Bayswater, and the Atlantic Ocean offers an opportunity to serve as an example of urban ecotourism that operates at the intersection between and preservation of urban environments with the surrounding ecology. The hotel can utilize these regions to conduct tours, educational programs, and recreation off the hotel's site with training programs and employment as tour guides, operators, and developers prioritized for locals.

Urban ecotourism is a relatively new concept and its formal definition has been contested.

Case Study: Black Sheep Inn, Chugchilan, Cotopaxi, Ecuador

Located in a rural Andean location, Black Sheep Inn is an example of an ecotourist destination that is 100 percent community operated. This model serves to benefit the community by prioritizing jobs for local residents. The Inn focuses on maintaining sustainable practices and to preserve the surrounding ecosystem, such as permaculture, composting toilets, utilization of onsite solar and wind energy systems, zero waste, onsite organic gardens, and gray water reuse. Additionally, the Inn has educational programs for tourists on the local ecology, sustainability education, and reforestation program of the Iliniza Ecological Reserve.[69]

Photo credit: Black Sheep Inn

In 2004, a declaration at the Urban Ecotourism Conference defined urban ecotourism as "an ongoing opportunity to conserve biological and social diversity, create new jobs and improve the quality of life" and centered around four goals:

1. "Restoring and conserving natural and cultural heritage including natural landscapes and biodiversity, and indigenous cultures;
2. Maximizing local benefits and engaging the local community as owners, investors, hosts, and guides;
3. Educating visitors and residents on environmental matters, heritage resources, sustainability;
4. Reducing our ecological footprint."[70]

Currently, there are few examples of urban ecotourism resorts, as many ecotourism resorts tend to be outside of urban areas. However, there are some examples that can provide potential models for future resorts to incorporate into their models. There is the opportunity for Arverne East to provide an all-encompassing framework for urban ecotourism resorts that go beyond "going green." Elements of ecotourism, such as community involvement/ownership, educational programs, preservation of the natural environment, and use of green design and technology, can all be incorporated into a hotel or related business in Arverne East.

In keeping with the health and wellness theme of this report's planning framework, the resort can also provide resort-style amenities that focus on rejuvenation and relaxation.

Recommendation: Incentivize community ownership/operation of facilities.

An important component of sustainable development is the involvement of the community in the operation and ownership of local developments. Unemployment is high in the Rockaways and the retail trade and accommodation/food service industries are primary employers in the area. Hence, there are many residents who possess the necessary skills for a job in the hotel and food service industry, many of whom may be out of work. A hotel that includes recreational facilities, event space, and catering facilities would provide permanent jobs to local residents, along with temporary construction jobs. Additionally, the hotel can operate off-site recreation, tours, and educational programs to the many nearby parks and environmentally sensitive regions with employment priority and training programs for locals. Green technology throughout the hotel and green operations training programs would also bring new green jobs to locals. The hotel can link with non-profits and educational institutions to conduct training and job placement services within the hotel to locals.

Recommendation: Provide event and conference space, as well as catering hall facilities to provide additional amenities to residents and visitors.

Despite a stunning waterfront backdrop, the Rockaways do not have prominent beachfront event venues for local community or attraction events, such as weddings, conventions, and parties. Currently, there is a lack

Case Study: Hotel Sunset Boulevard, Mossuril, Mozambique

The Hotel Sunset Boulevard is located in an up-and-coming tourist destination along the coast of Mozambique that, until recently, had been largely undeveloped. The hotel works in partnership with the Teran Foundation's College of Tourism to give free training to locals in hotel operations, language, literacy, math, nutrition, and restaurant operations so that they may develop the necessary skills to maintain employment in the hotel industry. The graduates of the program have the opportunity to work at the Hotel Sunset Boulevard, which is now 90 percent operated by locals who have attended the program. The Sunset Boulevard is also located away from urban centers, but provides an example of a partnership between an educational program and placement into the tourism industry for locals who are well versed on the history, culture, and benefits of their home, which ultimately brings a richer experience for tourists.[71]

Photo credit: Hotel Sunset Boulevard

of space available for such uses, with only a handful in operation. These sites are limited in that they are relatively small and unaffiliated with lodging options; the closest hotel options are near JFK. The provision of event and conference space draws upon a strong history of event halls within the outer boroughs. A convention and event space could also serve as an evacuation site, however, its close proximity to the water would require additional fortification techniques to allow for it to house locals during storms.

Objective III: Invest in new and existing community anchors as a way of creating local jobs and strengthening the local economy.

Anchor institutions are usually nonprofit corporations or publicly owned enterprises, such as hospitals or universities ("meds and eds"), that are strongly rooted in their communities. Whereas most for-profit corporations may relocate to obtain lower labor costs or greater profits, anchors typically have an economic self-interest in helping to ensure that the communities in which they are based remain safe, vibrant, healthy, and stable.

Robust anchor institutions have the potential to address key concerns that were raised at the community workshop, such as the need for more local jobs, increasing opportunities for asset ownership, and preventing resources from leaking out of the community. Anchor institutions can leverage their institutional and financial power to go beyond their traditional industry-specific missions by adopting a holistic, multi-sector approach to building a robust local economy that can better handle external economic shocks.

The most significant anchor institution in the study area's vicinity is St. John's Episcopal Hospital, located on Beach 20th Street just north of Seagirt Boulevard. St John's is the largest employer in the Rockaways, with over 1400 employees. Peninsula Hospital Center on Beach 50th Street was the other closest major medical facility, however it shut down in 2011 after failing a medical lab inspection, leaving St. John's as the only full service hospital serving the Rockaways and Five Towns communities. As such, St. John's role in the peninsula has become more important than ever. The addition of thousands of new residents to Arverne East could have significant implications on St. John's capacity to provide adequate care, which was heavily impacted after the influx of patients after Superstorm Sandy. It is therefore within the hospital's interests that the new development contribute positively to residents' health and economic wellbeing in addition to being stormproof, otherwise Arverne East would further strain the local hospital system rather than help relieve it.

Residents at the community workshop were also vocal about the insufficient capacity of other local institutions, especially those serving young people. Community members noted that classrooms at public schools are overcrowded and students generally do not have many after-school options. The Arverne

Photo credit: Groodbos Private Nature Preserve

Whalewatching at Grootbos Reserve, S. Africa

Photo credit: Lac de Main Theme Park

Lac de Maine, Angers, France

Photo credit: Queen's Children's Library

Queen's Children's Library Discovery Center

Branch of the Queens Public Library located near the study site is small but provides residents with access to 18 public computers and programs such as job training and small business services. This branch was badly damaged by four feet of flooding during Superstorm Sandy, which destroyed much of their laptop and book collection. Workshop attendees also expressed support for attracting businesses with missions to create social and economic impact in the communities they work in, such as credit unions.

Recommendation: Work closely with St. John's Episcopal Hospital throughout the Arverne East development process to create programmatic and economic linkages.

St. John's Episcopal Hospital currently has a Community Service Plan that maps out their approach to preventative healthcare in the Rockaways and Five Towns, but does not include non-healthcare related ways that they can contribute to the health and wellbeing of the community. Encouraging the hospital to expand their mission beyond health care by explicitly adopting economic development strategies will provide benefits to both the hospital and the community. The hospital can adopt certain measures such as sourcing from Rockaways-based businesses (including new ones that will a part of the Arverne East development), sourcing from women and minority owned businesses, and hiring locally for certain types of jobs. These actions could contribute significantly to the local economic multiplier effect resulting in increased investment in Arverne East and the rest of the

Photo credit: University Hospitals

Case Study: University Hospitals Vision 2010 Program, Cleveland, Ohio

The University Hospitals Vision 2010 Program was based primarily in Northeast Ohio, home to a mix of low and middle-income communities. The teaching hospitals in this area committed to including as many local minority and female owned businesses as possible, achieving an economic multiplier effect by directing spending toward businesses based in the City of Cleveland and the greater Northeast Ohio region, producing lasting change in Northeast Ohio by pioneering a 'new normal' for how business should be conducted by the region's large institutions. The results were overwhelmingly positive. At the height of the recession, Vision 2010 helped inject more than $1 billion into the region through contracts to local companies and wages paid to construction and other workers. The hospitals awarded 110 small MBEs and FBEs with ranging from $20,000 to $27 million. This provided the opportunity for these firms to learn new skills and to strengthen their capacities by gaining hands-on experience working in a hospital setting. Although this case study covers a much larger geographical area than St. John's Episcopal Hospital does in the Rockaways, their approach can be scaled down and still have significant impact on the local population.[70a]

Case Study: Bethex Federal Credit Union, Bronx, NY

The Bethex Federal Credit Union is a Community Development Financial Institution that was founded in 1970 by a group of women on welfare who initially wanted to provide other women on welfare with access to small savings accounts and credit in case of emergencies. Its growth is attributed to building partnerships with a variety of institutions such as Cooperative Home Health Care Employees, a worker-owned company of home health care service providers that offers favorable credit union membership terms for its employees. Currently, BFCU is a respected not-for-profit financial institution with over $28 million in assets, serving over 5,000 members. It provides financial education and small savings accounts to local elementary school students, serves as the credit union for several Bronx-area churches, and provides its members with small business loans ranging between $500 and $4 million. In May 2012, the credit union launched an incubator program to jump-start small businesses in the area. The BFCU serves as a model for community development as it successfully integrates its services with the needs of other local anchor institutions, thereby creating a more resilient local economic network.[70b]

Rockaways.

The proposal to turn Arverne East into a hub for health and wellness would benefit from involving decision makers from St. John's hospital early in the development process so as to determine existing an project needs, as well as new services in the area that would complement the ones currently being offered at the hospital.

Recommendation: Create a network of anchors connecting the Beach 59th Street Rockaway Institute for Sustainable Environment with a new a library located between P.S. 106 and the commercial corridor, encouraging residents to use spaces for social, cultural, recreational, and educational activities.

The Rockaway Institute for Sustainable Environment (RISE), which will inhabit the decommissioned Beach 59th Street Firehouse, will provide a visitors' center for community-based programs, and cultural activities focused on environmental issues. This "living laboratory" aims to increase the vibrancy of the local community by fostering interactions between artists, scientists, residents and visitors and bringing economic development, jobs, and resources.

Leveraging these existing plans on the western edge of the site and providing for a community use near the eastern core can create a network of community anchors to further facilitate a vibrant, resilient community. With additional visitors and residents to Arverne East, the existing Arverne Branch library will soon become insufficient. The addition of a new library, or the expansion of the existing Arverne Branch, can provide the community with an additional anchor institution. The library can include storm-proofing measures to serve as a space for evacuees or emergency services in times of weather related emergencies.

A new library could serve as a community gathering space with modern equipment and innovative programming, appealing to both young people and older adults such as after-school tutoring, reading programs, financial literacy courses, small business development classes, etc. Libraries are increasingly moving towards becoming social and cultural spaces, by hosting talks, readings, and musical concerts, in addition to becoming engines of innovation -places for making, creating, and sharing.

An ideal location for this library would be between Beach 34th and Beach 35th, as this would provide linkage between the activity on Beach 36th (the location of the proposed primary commercial corridor) and P.S 106 on Beach 33rd. There is also already a high concentration of residents here, in the high-rise towers located on Beach 32nd and Seagirt Boulevard.

Photo credit: Rockaway Waterfront Alliance

Rendering of Beach 59th Street Rockaway Institute for Sustainable Environment (RISE)

Recommendation: Target a credit union to locate a new branch in Arverne East.

Residents at the workshop voiced their support for alternative banking models that would reinvest money in the local community and provide residents with an opportunity to build equity. Credit unions are financial cooperatives owned and controlled by its members that typically charge lower fees than regular banks. They provide affordable services and opportunities for low-income members to bank, save, and take out non-predatory small personal or business loans and mortgages. Their loan policies are flexible to their memberships whereas other banks maintain rigid lending policies. They also tend to donate directly toward local community charities and non-profits or invest in local community development efforts.

A credit union for Arverne East and the Rockaways would serve an institutional anchor since it would provide financial services with the goal of lifting households out of poverty, helping small businesses become successful, and is directly invested in the overall economic development of the community in which it is situated.

Case Study: Free Library of Philadelphia

The Free Library of Philadelphia's purpose in recent years has been to lead the city to economic recovery and ongoing prosperity. Ever since adopting this mission, the library has had a tremendous social and economic impact on the city. The library has focused on five areas: (1) Job seekers --people who needed to get back to work (2) Small businesses and entrepreneurs (3) New Americans; immigrants, most of whom are small business owners (4) Being high tech savvy (5) Pre-K Excellence; reaching children as early as possible since early readers are more successful later in life. With its innovative programming that is focused to providing residents with critical resources during an economic downturn, it is able to boast the following accomplishments in 2010: helped 24,000 people learn how to read; helped 979 people get a job, resulting in $30 million in annual wages and $1.2 million in annual wage tax revenue; started and/or grew 8600 businesses.

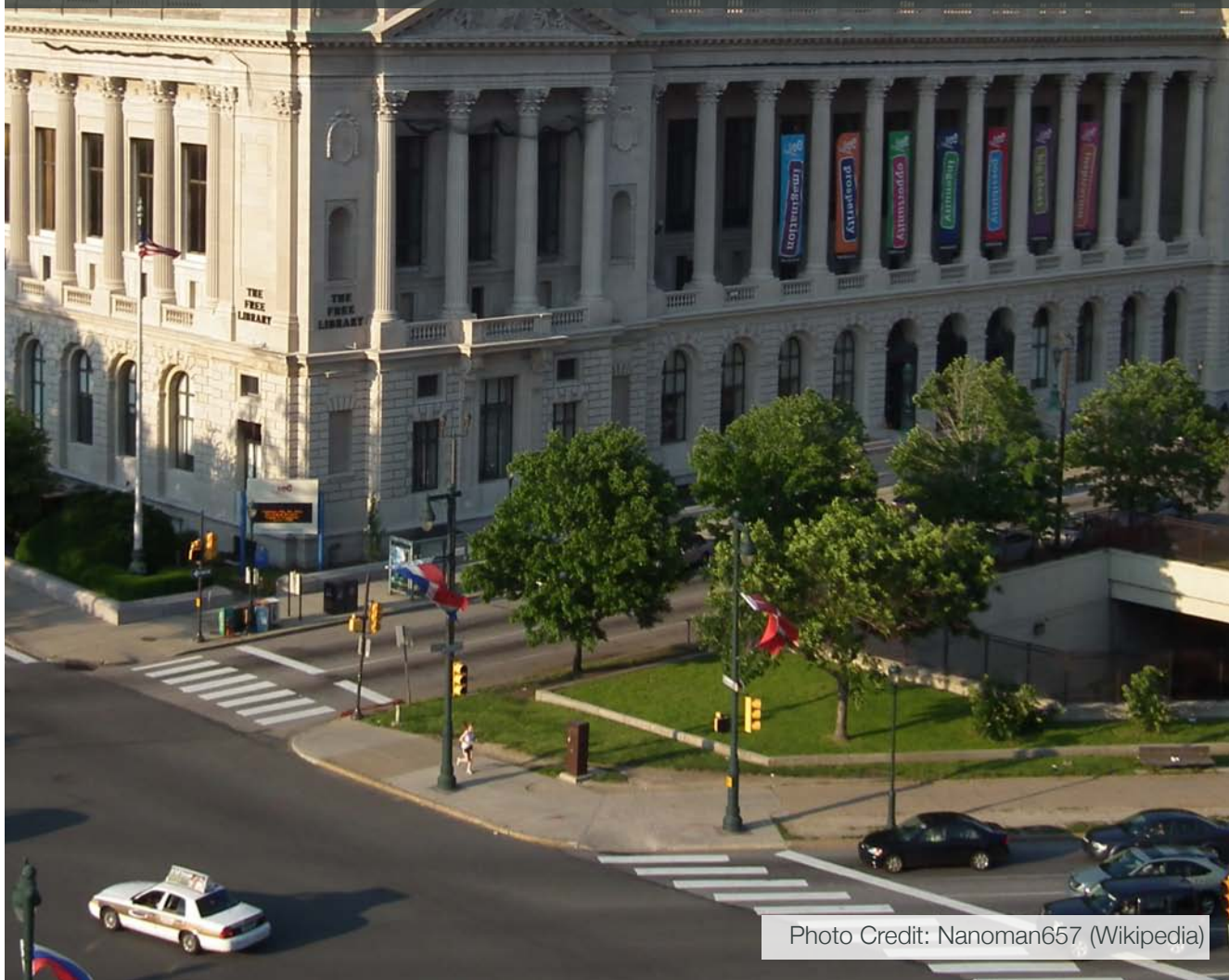


Photo Credit: Nanoman657 (Wikipedia)

SOCIAL RESILIENCE

Goal: Create spaces and uses that promote positive, healthy interaction and exchange, and help build social capital and community identity.

Objective I: Foster a health and wellness district that promotes active, healthy living environments through accessibility, connectivity and health-oriented recreation and commercial uses.

In order to create an environment that encourages health and wellness, we recommend designating Arverne East a Health and Wellness District to incentivize and attract an array of consumer-based health facilities and services. Health and wellness is key to developing a more socially resilient community. A healthy community reflects a sense of mental and physical well-being, and is the foundation for achieving other goals. For instance, a healthy workforce is critical to building local economies, skills, and knowledge.

A large and growing aging population, as well as the lack of health and social assistance facilities in the immediate vicinity of Arverne East reveal underlying health disparities. Notable obesity, asthma, and diabetes rates, coupled with limited fresh and healthy food access indicate health care challenges that complicate the goal of ensuring the wellness of individuals and the community. Participants at the community workshop expressed concern over lack of medical care and stressed that added development that would bring additional residents to the area would put additional stress on an already strained healthcare facility. After the closing of Peninsula Hospital in 2012, the only medical facility on the peninsula is St. John's Episcopal Hospital with 257 beds. With a population of 112,518 individuals on the peninsula, the capacity cannot support the entire population.

Recommendation: Establish a community health center to provide multiple, non-urgent primary health care services for all residents, in particular, low-income, uninsured and underinsured members of the community.

There is currently only one non-urgent health care provider near Arverne East: the Joseph P. Addabbo Family Health Center located at 62nd Street and Beach Channel Drive. Although the clinic provides basic services, residents complain an average waiting times of over one hour. Poor service is also an

Photo credit: Okaloosa County Parks

Beach Walkover, Ft. Walton Beach, FL

Photo credit: Garden State Yoga

Yoga studio, Bloomfield, NJ

Photo credit: Taqwa Community Garden

Community Garden, Bronx, NY

indicator of limited capacity to serve local needs. The closing of the Peninsula Family Health Center (PHC) in 2011, which was located between Beach Channel Drive and Rockaway Beach Boulevard between 50th and 53th streets, placed further strain on the system.[72] The emergency room of Peninsula Hospital provided care for more than 30,000 patients per year and tens of thousands from direct admissions. A substantial percentage of PHC's admissions went to hospitals outside of Rockaway, with 13.5 percent of residents going to Nassau County, 9.5 percent to Brooklyn, 8.3 percent to Manhattan, and 12.7 percent to Queens hospitals outside of Rockaway. Although three ZIP codes (11691, 11693, and 11694) accounted for 87.3 percent of PHC's total inpatient volume, PHC only served 20.8 percent of that market. The declining patient activity greatly contributed to the hospital's deteriorating financial condition.

There is a strong need for additional and better quality health care in Arverne East and the broader peninsula, as discussed at the public planning workshop. It is in the community's best interest to establish a community health center that could provide a wide variety of resources close to home. The community health center could provide multiple, non-urgent primary health care services for all residents, including administering exams, evaluations, and vaccinations. It could will provide on-site outpatient care.

According to the New York State Department of Health, after the closure of PHC, the next steps will be to monitor the implementation of the $5.2 million HEAL grant and the sale of the Peninsula Hospital building and nursing home. Large health service providers could take advantage of the grant and vacant space to set up a community health center. The community health center should work with both St. John's Hospital and the Addabbo Clinic to better transfer urgent patients. It is also possible for the community health center to utilize the Peninsula Hospital building and nursing home for health care services, which helps to lower construction costs for a new facility.

Recommendation: Initiate various activity programs to encourage healthy lifestyles to the community

In order to create a healthy community, it is important to focus on prevention and public health. Given the fact that 23 percent of residents in Rockaway Peninsula report being obese, and 31 percent of residents in Arverne East are 18 years or under, it would be helpful to initiate health programs such as an Obesity Prevention Program to promote smart eating, physical activity, and maintenance of healthy weight levels for all residents.

Recommendation: Establish a community garden site as an experiential and learning center for local residents, integrating its efforts with nutritional, obesity-reduction, and healthy medicine programs.

Given the topography and scale of Arverne East, a community gardening site could be set up as a community learning and experiential center to cultivate small amounts of fruits and vegetables, and provide educational opportunities on food cultivation and systems. The site's proximity to the coast, strong winds and salt would require specific design services, installations, and continual maintenance of the edible urban gardens. This could help local residents make better use of their community gardens and build knowledge of what to grow and when. Community gardens can encourage social engagement and ecological education on undeveloped land on a relatively short time frame. In collaboration with local public schools and library, the community garden could also integrate its efforts with nutritional, obesity-reduction and healthy medicine programs, which together contribute to a community centered on health and wellness.

The current site includes prime spots adjacent to PS 106, facing the street and is surrounded by chain-linked fencing. The

Case Study: Harris Obesity Prevention Effort (HOPE)

HOPE is a major initiative at the NYU Langone Medical Center to prevent childhood obesity, which could be brought to P.S. 106 in Arverne East. HOPE is dedicated to the development, evaluation, and dissemination of evidence-based practices for families and educators to help young children establish healthy behaviors around eating, physical activity, and sleep to prevent childhood obesity. HOPE is also committed to providing evidence-based treatments to morbidly obese adolescents who already suffering from physical and mental health consequences of obesity.[73]

Case Study: The Fairgate Community Health Center in Stamford.

The Fairgate Community Health Center offers acute, non-urgent primary health care services including exams, diagnostic tests, evaluations, and vaccinations. It also provides onsite care for typical ailments such as earaches, skin problems and sore throats, and will educate patients in managing diabetes and hypertension.[73a]

Photo credit: Vita

adjacency to the school can enhance science lessons and provide recess and after-school, community-oriented activities while connecting with the area's broader health and wellness objectives, and adding value to fallow land.

Recommendation: Develop additional health-related facilities and programming to increase opportunities for local residents to stay active and be healthy.

A yoga studio, health food store, fitness and physical therapy centers, as well as other private medical/dental health care practices in Arverne East can serve the whole peninsula as these types of services are presently lacking in the area.

Objective II: Promote social resilience through connectivity and open space interventions that foster connectivity, exchange, and collaboration.

Improved connectivity and open spaces can reinforce the systems that support learning, adaptation, self-organization and response to events and systematic shocks that may challenge the community in the years to come. These steps toward social resilience further the safety, well-being and longevity of the Rockaways as a place to live, work, and play.

In interviews with stakeholders and during community outreach meetings, residents and local civic organizations noted that Superstorm Sandy galvanized broad, interdisciplinary, long-term conversation across a wide range of local stakeholders regarding the future of the Rockaways. This sense of cooperation, collaboration and broad interdependency is critical for a socially resilient Rockaway, as it ensures the building of social capital and robust networks.

Planning and policy measures to address social resilience are critical due to the vulnerability of the Rockaways. In addition to the area's environmental susceptibility, poor local street and road networks and a lack of community spaces that serve as areas for gathering and exchanging resources hinder the continual creation of social capital. The current concentration of poverty, limited services and low educational attainment levels further challenge efforts to improve the quality of life and perceptions of Arverne East.

Arverne East represents a key opportunity to build the spaces and infrastructure that will support the needs and aspirations of current

and future residents, businesses and visitors. The fact that the land is predominantly vacant presents vast opportunities to shape the space into a form that answers the community requests for common spaces, recreational opportunities, an improved environment and better connectivity. These additions can help undergird the functioning of the community throughout times of change and promote swift collaboration, knowledge exchange and community building that allows for adaptation to and recovery from any kind of stress. Quality public spaces and networks can provide a strong base to build upon existing and emerging social processes and structures that define and perpetuate a community.

Strong multi-modal transportation options can help a broad range of residents and visitors connect to the businesses, services, schools, jobs and attractions that make an area appealing and productive. This is particularly important in the Rockaways since the peninsula is comprised of communities that span a range of income, education and language proficiency levels. Furthermore, the Rockaways are located a significant distance from the city's business centers, resulting in lengthy trip times and a heightened reliance upon transit and road network connections for the continual flow of information, people and goods in and out of the peninsula.

Recommendation: Create a versatile public square as the centerpiece for a larger network of year-round recreational destinations for residents and visitors.

Arverne East currently lacks a central open space where residents can congregate for leisure or evacuate to during times of emergency. An open public square with seating, tables, programmable space and/or innovative landscaping could provide opportunities for a multitude of free, public uses. All survey respondents agreed that the area needs more parkland and open recreation spaces.

Recommendation: Develop active recreation nodes near school areas (Beach 32nd and Beach 54th) to encourage outdoor street life throughout the day.

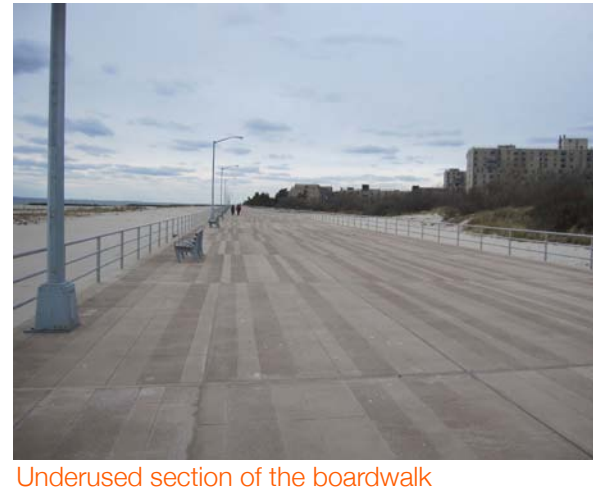
Residents are largely dissatisfied with the lack of activities for young people and children in the Rockaway Peninsula, particularly in the eastern end. Investing in public recreation such as playgrounds, basketball courts, and community centers close to existing schools, such as PS 106 (Beach 32nd St.) and Goldie Maple Academy and Challenge Preparatory Charter School (Beach 56th St.) can provide students with convenient after-school access to facilities.

Recommendation: Foster short-term uses such as public art installations by local and visiting artists or camping on vacant sites to foster local arts, discussion and visitors.

New York City has a rich history of activating vacant space through art. In the 1980s, Creative Time programmed the Battery Park construction site for five years before it was

Outdoor gym equipment


Vacant lot next to P.S. 106


Underused section of the boardwalk

developed. In the spring of 2013, the Museum of Modern Art (MoMA) opened the doors of its VW Dome 2 in the Beach 90s section of the Rockaways to house temporary art exhibitions, community events, film and performances.[74] The introduction of this major art institution signals opportunities to attract arts groups and local artists to play a hand in activating conversation and spaces in the Rockaways. Public art can be installed on a short time frame and create destinations while parts of any large-scale project are being constructed and brought on-line.

Recommendation: Designate a nature preserve along the western portion of the site (Beach 44 - Beach 55) with walking paths and a nature education center promoting environmental education and ecotourism.

The 2005 NYC Department of Housing Development and Preservation (HPD) Request for Proposal (RFP) for Arverne East designated the establishment of a nature preserve as a mitigation measure in response to Environmental Impact Statement (EIS) findings of significant impacts resulting from development. While future development may look markedly different from the original HPD outline, the designation of a nature preserve or open space that serves as an environmental buffer was raised in stakeholder interviews, workshop breakout groups and surveys. The existing piping plover sanctuary along the beach can pose beach connectivity challenges, but can also serve as a natural asset with careful siting of a nature preserve that can attract birders and ecotourists.

The designated nature preserve should incorporate pathways and limited activities that allow for walking and ecotourism related activities that will not compromise the integrity of the local ecology. An educational nature center for visiting students and visitors can serve to host small-scale exhibits on the local shoreline, plants, animals and the piping plover sanctuary and disseminate information on local nature-related events and recreation.

Studies for this nature preserve should include a re-examination of the piping plover nesting area, the impacts of the storm and possible beach access mechanisms for residents. Residents noted that the piping plover preserve has traditionally been monitored by urban park rangers and serves as a barrier to accessing the beach. While piping plovers are sited in the area, stakeholders noted that the site's designation as a preserve was potentially fraught with political motives.

Recommendation: Create dual-purpose water retention and active area (Beach 44 –Beach 40, behind retail/mixed use) containing active recreation through playgrounds for adults and children.

Multi-functional open spaces that can serve both as environmental buffers and stormwater retention areas were introduced to participants of a January 20, 2013 RWA work-

Agnes Denes' "Wheatfield - A Confrontation," Battery Park Landfill, NY, 1982

shop on environmental resiliency, health and planning by a representative of the Consulate General of the Netherlands, where such spaces have been designed along flood-prone waterfronts. This kind of flexible open space adds value by protecting development along Edgemere Avenue during storm events, in addition to providing much needed recreation opportunities. The area would serve as a link transitioning users from the quiet pace of the nature preserve to the activity of the commercial corridor and respond to community desires to provide recreation opportunities and spaces for at-risk youth.

Recommendation: Active recreational spaces respond to community needs for spaces and activities that can serve as a "third place" for all members during times of leisure.

The needs of the local youth population were reflected in public outreach discussions and survey results. Facilities that "encourage the younger generation to stay out of trouble" were of particular interest to many stakeholders. In addition to providing basketball courts and sports facilities, intentional programming within open recreation spaces such as markets, musical concerts, movie screenings, festivals and local artwork displays can further respond to needs for positive, productive intergenerational activities for youth and elderly.

Case Study: Waterpleinen Stormwater Park Concept by Urbanisten

Designed by Florian Boer of 'DE URBANISTEN' and architect Marco Vermeulen of 'Studio Marco Vermeulen, Rotterdam is piloting innovative water plazas that combine the utility and attraction of playgrounds and community spaces with water storage.

During dry weather, and in light rain, the below-grade plaza serves as a public recreation space. During heavy rains or flood events, the plaza serves as a temporary water retention area. The plaza contains a series of pumps, valves and filtration systems that are triggered by heavy rains and allow water to gradually be discharged after the storm event.[74a]

Photo credit: De Urbanisten

Case Study: Bellevue, WA

In order to address rapid urban development and its effects on community character, open space, and the environment, the city of Bellevue, Washington, developed a comprehensive stormwater and natural resource management program. Land close to bodies of water were acquired and designated as open space. The Utility and Parks departments formed a partnership to develop a network of neighborhood parks that incorporated recreational and stormwater features. For example, recreational uses such as tennis courts were built over stormwater vaults and soccer fields also served as detention basins. In the 1990's, Bellevue's Utility department partnered with a private developer to build a park that masks a stormwater treatment facility next to a new commercial and residential development.[75]

Recommendation: Build elevated recreational piers and walkovers (Beach 54th, 44th, 36th Streets) that provide north-south connections to the beach and destination viewing areas.

There are barriers across the project site, including the poor streetscaping of the existing North-South roads, large swaths of vacant and overgrown land, and the roped off Piping Plover habitat. In particular, the closed off nature of the Piping Plover habitat hinders broader circulations along the shore. While limited access is critical for reducing anthropogenic impacts on natural habitats, beach walks with platforms that extend out along the edges of this habitat can create a destination for visitors and create focal points along North-South connectors. More extensive beach walkovers and piers can contain landscaping, as well as pedestrian and cycling facilities.

Recommendation: Connect to broader parks network, including Jamaica Bay and the Gateway National Recreation Area.

A renewed look at the study area and its context within the broader peninsula and region of Southern Queens reveals opportunities to build a robust open space network by building upon and existing playgrounds, parks, wildlife sanctuaries and preserves within the broader region, including the Brant Point Wildlife Sanctuary, Terrapeninsula Preserve, Thursby Basin Park, Dubos Point Wildlife Sanctuary, Rockaway Community Park, Michaelis-Bayswater Park and O'Donohue Park. The site is uniquely adjacent to both beach and bay, with possibilities to capitalize upon Marina and recreation activities facing the Jamaica Bay.

The NYC Department of Parks and Recreation (DPR) and the National Parks Service are partnering on the establishment of kayak, canoe rental, bike rental and mobile food units on city and federal land throughout Jamaica Bay and the Rockaway Peninsula. Food and biking concessions are planned for the Jacob Riis Park area, and Bayswater Park to the north of the study area on Beach 32nd will host food, cycling and canoe stations. A bike concession is also planned for Beach 59th Street.[76] Additional cycling and food concessions should be explored within the site area in conjunction with the recreation and activity areas part of the broader health and wellness district.

Case Study: Ocean Breeze Fishing Pier, Staten Island

The Ocean Breeze Fishing Pier is a 835 feet long and 30 feet wide fishing pier that offers public recreation, sight-seeing and deep-water fishing opportunities. The large steel and concrete recreational pier incorporates an innovative curved design that reduces the shading effects, as compared to conventional piers. The pier has been a key project in the effort to revitalize Staten Island beach areas.[77]

Photo Credit: Panaramio.com

Photo Credit: Statenislandusa.com

Photo Credit: NYC Parks

Objective III: Promote connectivity and enhanced multi-modal transportation network that enables people to access community spaces, assets, resources and each other.

Recommendation: Extend lateral beach road along south side of site to promote porousness and accessibility, and delineate between beach and development areas.

Public perceptions of a difficult to access beachfront, couple with a study of the road networks of the broader Rockaway peninsula reveals that the study area differs from communities to the West and other shorefront ocean communities in that there is no lateral beach road. This route would ensure continuity with the communities Rockaway peninsula to the West and connect this area to the broader community by promoting site access for individuals of varying levels of physical capability, as well as fire access and evacuation.

The beach road should also be considered in the larger context for establishing a double dune system as an area of depression that could be surrounded by dune structures.

Recommendation: Design complete streets to promote accessibility and circulation for people of different ages, backgrounds, physical and economic capability.

Complete streets promote safety and accessibility for all users regardless of physical ability, age or transportation mode. Making the street network more welcoming for pedestrians, cyclists, drivers, buses and other public transit users can promote a more pleasant environment for healthy physical and economic activity. Complete streets can include improved streetscaping to create more pleasant pedestrian and cyclist experience through landscaping, updated sidewalk pathways, bike lanes, increased lighting and clear signage. This kind of intervention responds to public perceptions of a poorly maintained and unwelcoming pedestrian environment and can potentially mitigate cycling, pedestrian and auto casualties. This is particularly important for this site because multi-modal transport better serves a wide range of ages and income levels, and reduces fossil fuel dependency. Complete streets are also powerful vehicles for incorporating green infrastructure through bioswales and vegetation to reduce stormwater runoff.

Recommendation: Improve cycling environment and facilities through demarcated bike lane under the Rockaway Freeway train track and a local bike share program

Nearly two-thirds of survey participants expressed support for bike lanes and bike lane expansion. According to residents at the public outreach workshop, bike transportation is used frequently, however, there are mixed opinions regarding whether bike

Rendering of a complete street (Rendering credit: Rockaway Watefront Alliance)

Rendering of bike path under train trellis

lanes should be located along the freeway. Residents stated that the boardwalk is the best place for bike lanes and that the freeway would be better used as dedicated bus rapid transit. However, other residents were not opposed to utilizing the freeway for bike travel. The Rockaway Freeway already serves as an impromptu bike path and has increased in importance as an East-West connector after the boardwalk was damaged during Sandy. Creating a network of bike lanes with a redundant pathway can enhance the resiliency of the area by ensuring access in the case of an emergency.

Workshop participants also suggested looking into innovative local network options including a local bike share system or a bike-and-ride system connected to bus rapid transit. Expanding New York's Citi Bike program to include the Rockaways and Jamaica Bay would provide residents and visitors with increased recreational options and a greater ability to explore the area. In the interim, a bike rental company should be allowed to temporarily set up near the boardwalk during the summer, at a low cost, to test the local market's demand for bikes and bike tours.

Recommendation: Reinstitute ferry service between the Rockaways and Lower Manhattan.

A ferry connection leverages the area's shoreline assets and promotes connectivity to the broader community by facilitating the flow of information, knowledge and goods in multiple ways. During our public outreach session, participant residents voiced strong support for a ferry system servicing the Eastern portion of the Rockaways. Possible ferry stops could be cited at a location that serves both Arverne by the Sea and new Arverne East residents. In 2007, prior to the economic recession, Arverne by the Sea planned to develop a Marina which would include a 33-slip marina that could potentially house ferry operations. The development of Arverne East is an opportunity to revisit the viability of building a Marina that could house ferry operations servicing residents and visitors to Arverne by the Sea, Arverne East, and the broader neighborhood.[78] Secure bike racks or parking stations and a supplementary shuttle to the ferry terminal from the site could promote ferry usage by residents and visitors.

A 2011 NYC Economic Development Corporation (EDC) Citywide Ferry Study cited low ridership on the 2010 pilot service between Jacob Riis to Lower Manhattan. Commuting times comparable to subway trips, as well as a small number of commuters in the vicinity of the ferry landing were likely contributors to the lower ridership levels. The study found that ferry service during the summer months targeted at visitors attracted higher ridership.[79]

Despite this, the findings of this study do not reflect feasibility for the Arverne East area or the post-Sandy public realization that local train infrastructure and service is extremely vulnerable and harder to reinstall after a disturbance or natural event. The level of public support and interest in a ferry service warrants further study. In addition to servicing Arverne East residents and businesses, a ferry system, particularly in the summer, could

Photo credits (from left to right): NYC MTA; The Bergen Network

The A train's damaged causeway

Extend QM15 service to Far Rockaway

be a powerful stimulus for tourism.

Recommendation: Re-align the road network near the intersections of Rockaway Freeway and Beach Channel Drive, between Beach 34th and Beach 35th Street.

Community workshop participants identified the intersections of Rockaway Freeway and Beach Channel Drive, between Beach 34th and 35th as a key area in need of traffic design improvement. Local residents noted that roads and intersections are confusing and difficult to navigate in this particular area. The nearby Beach 36th Street A train station exit further adds to congestion and poor circulation in this area. Given the area's current traffic congestion, further development could complicate the east-west flow along this route. A study to redesign these road crossings could benefit the community by promoting safety and circulation for all modes of transportation.

Recommendation: Expand bus route and stops at the MTA Bus Depot from Howard Beach.

Improved and increased public transit connections have long been a community priority. Nearly 40 percent of local residents report taking public transportation to work and 70 percent of commuters report daily trips to work lasting over an hour. Residents report unreliable and slow public transit service result in long trip times, therefore network improvements are critical. All participants in the public outreach survey agreed that the expansion of local public transportation options is a priority.

As of May 2013, the A train remains under reconstruction and is scheduled to return to service by the summer of 2013. City officials cited concerns over improvements to the A train line despite poor service levels due to the overall budget situation of the MTA.

Despite these limitations, increased and improved public transit options along MTA Bus routes can be implemented with little change to current operations. In 2011, a Rockaway Task Force report was released which focused on improvements to bus service to and from the Rockaways. Some key recommendations included extending the QM15 express bus service to Far Rockaway. The QM15, which is housed at the Far Rockaway bus depot, currently terminates at Howard Beach and unloads all passengers before traveling to the depot empty. There is an opportunity to provide service to the eastern portion of the Rockaways by activating passenger service along the last portion of this bus trip. Studies for new bus service routes, including one that goes across the Marine Parkway Bridge, which is the most direct route from the Rockaways through Brooklyn, to Lower Manhattan were also proposed. These recommendations can increase transit options for residents and visitors without drastic changes to the existing public transit system.

REVIEW OF RECOMMENDATIONS

Environmental Resilience

Objective I: Incorporate risk and vulnerability assessments into broad decision-making and planning mechanisms.
Resilience policy and planning can take several forms
Objective II: Integrate complementary soft and hard infrastructure interventions to fortify existing and future structures and functions.
Replenish the coastline with a vegetated double dune system to protect against storm surges.
Elevate site above Advisory Base Flood Elevation (ABFE) levels.
Explore off-shore mechanisms that leverage natural forces to provide protection against the storms and erosion.
Consider multifunctional flood defense and stormwater management and retention mechanisms.
Study feasible resilient building forms and locations, including mid-rise buildings with flood proof ground-floor uses and environmental buffers.
Incorporate green infrastructure in existing and future developments
Retrofit and build new infrastructure to be storm-proof.
Modernize energy transmission and distribution systems.
Provide energy efficiency information and financing.

Economic Resilience

Objective I: Develop mixed-use residential and retail that responds to existing and projected needs and markets.
Introduce medium density mixed-use housing, office and commercial retail, with elevation and ground-level adaptive green infrastructure for storm resilience.
Amend/modify current zoning to promote mixed-uses.
Objective II: Introduce innovative hotel and accommodations establishments to fill market gap, provide employment and capitalize upon local tourism and airport proximity.
Create a destination that can host day-trippers and weekend visitors.
Establish a partnership with international airlines operating at JFK through guest room and meeting/conference space agreements.
Provide event and conference space, and catering hall facilities to provide additional amenities to residents and visitors.

REVIEW OF RECOMMENDATIONS

Economic Resilience, cont.

Incentivize community ownership/operation of facilities.
Serve as a model for urban ecotourism and utilize nearby recreation and environmentally sensitive regions in and around the peninsula.
Objective III: Invest in new and existing community anchors as a way of creating local jobs and strengthening the local economy.
Work closely with St. John's Episcopal Hospital throughout the Arverne East development process to create programmatic and economic linkages.
Create a network of anchors connecting the Beach 59th Street Rockaway Institute for Sustainable Environment with a new a library located between P.S. 106 and the commercial corridor, encouraging residents to use spaces for social, cultural, recreational, and educational activities.
Target a credit union to locate a new branch in Arverne East.

Social Resilience

Objective I: Foster a health and wellness district that promotes active, healthy living environments through accessibility, connectivity and health-oriented recreation and commercial uses.
Establish a community health center to provide multiple, non-urgent primary health care services for all residents, in particular, low-income, uninsured and underinsured members of the community.
Initiate various activity programs to encourage healthy lifestyles to the community
Establish a community garden site as an experiential and learning center for local residents, integrating its efforts with nutritional, obesity-reduction, and healthy medicine programs.
Develop additional health-related facilities and programming to increase opportunities for local residents to stay active and be healthy.
Objective II: Promote social resilience through connectivity and open space interventions that foster connectivity, exchange, and collaboration.
Create a versatile public square as the centerpiece for a larger network of year-round recreational destinations for residents and visitors.
Develop active recreation nodes near school areas (Beach 32nd and Beach 54th) to encourage outdoor street life throughout the day.
Foster short-term uses such as public art installations by local and visiting artists or camping on vacant sites to foster local arts, discussion and visitors.
Designate a nature preserve along the western portion of the site (Beach 44 - Beach 55) with walking paths and a nature education center promoting environmental education and ecotourism.

REVIEW OF RECOMMENDATIONS

Social Resilience, cont.

Create dual-purpose water retention and active area (Beach 44 –Beach 40, behind retail/mixed use) containing active recreation through playgrounds for adults and children.
Active recreational spaces respond to community needs for spaces and activities that can serve as a “third place” for all members during times of leisure.
Build elevated recreational piers and walkovers (Beach 54th, 44th, 36th Streets) that provide north-south connections to the beach and destination viewing areas.
Connect to broader parks network, including Jamaica Bay and the Gateway National Recreation Area.
Objective III: Promote connectivity and enhanced multi-modal transportation network that enables people to access community spaces, assets, resources and each other.
Extend lateral beach road along south side of site to promote porousness and accessibility, and delineate between beach and development areas.
Design complete streets to promote accessibility and circulation for people of different ages, backgrounds, physical and economic capability.
Improve cycling environment and facilities through demarcated bike lane under the Rockaway Freeway train track and a local bike share program
Reinstitute ferry service between the Rockaways and Lower Manhattan.
Re-align the road network near the intersections of Rockaway Freeway and Beach Channel Drive, between Beach 34th and Beach 35th Street.
Expand bus route and stops at the MTA Bus Depot from Howard Beach.

NEXT STEPS

Each of the recommendations provided will require a process of additional research, stakeholder engagement and collaboration, sourcing of financing, and potential re-zoning depending on which parts of the framework are incorporated into a final plan and where they would be positioned. Additional research is required on a number of items, including:

- **Innovative storm surge and flooding protection measures** from both the ocean and bay sides that mimic or work with natural processes and also do not exacerbate flooding in other parts of the peninsula.
- Programs that encourage **community involvement** in the entire process, from pre-development conceptualization to operations and to be included in the transformation and growth of the region. Such programs could include continual pre-development outreach sessions, job training and placement services at the site's facilities and businesses, and rent-to-own programs.
- A thorough review of **recent traffic and congestion** around the site, potential impacts of these recommendations directly around the site, potential reconfiguration of the intersection of the Rockaway Freeway, Edgemere Avenue, Beach Channel Drive, Beach 35th Street, Beach 34th Street, and Seagirt Blvd.
- Review of **feasible near-term and long-term public transportation options and improvements**, including bus rapid transit service throughout the peninsula and into Manhattan, additional ferry service, and bike-share programs with dedicated bike lanes.
- A thorough **cost/benefit analysis** of each recommendation that includes the costs and benefits to the environment and to the community, as well as the benefits and costs of the linkages between each recommendation.
- **Financing incentive programs** that the Rockaways can take advantage of, particularly Sandy relief funds, and expansion of current empowerment zones and other city-level financing and zoning incentive programs to include the Rockaways.
- Appropriate **building design and placement** that works with the site and has minimal adverse impact to the site's natural resources.
- A **rezoning** study.
- **Evacuation plans** that incorporate the library, hotel, and convention center as staging zones or evacuation centers during storms and transportation routes that efficiently move people to safer housing during storms. Additionally, outreach to inform residents of staging zones and plans is a vital component of an effective evacuation plan.
- A plan to address the **housing** issue: estimate the appropriate number of units that could be supported in the region as well as the mix of market-rate and subsidized housing.
- An in-depth **market analysis** to examine the true spending leakages, appropriate retailers, as well as innovative incentives to attract these retailers to Arverne East, and the appropriate amount of square footage that could be supported in the region.
- Evaluation of redevelopment/repositioning strategies of **complementary zones** within

the peninsula that could be redeveloped/repositioned in conjunction with Arverne East, such as downtown Far Rockaway.

- **Marketing strategies** that can change the perception issues in the Rockaways and reposition the region to increase the tourism industry.

This report provides several case studies and recommendations that can provide starting points for the research process. Innovative strategies can be used to source the appropriate experts to carry out each research plan. With the attention Superstorm Sandy has brought to the region, there is renewed interest from many planning firms, universities, non-profits, engineering firms, and city agencies to study redevelopment opportunities and flood protection in the Rockaways. This may provide an opportunity to seek out grants or other Sandy funds to carry out the necessary research. There may also be interested firms willing to donate time and resources to assist in the research process.

Most importantly, an iterative, collaborative, and clearly managed process of organizing, with both the buy-in from stakeholders and additional research is needed in order to move the process along. The various stakeholders need to be regularly connected to one another throughout the entire process and cannot operate in silos. During Waterfront Solution's outreach efforts, several connections were made between city agency officials, planners, academics, landscape architects, and community members. This process is possible but requires a point person or group that is dedicated and accountable to organizing the research and collaboration efforts required to ensure that a sustainable and appropriate development is carried out. Additionally, this group could be responsible for tracking and monitor where funding is placed and how it is being used. A newly formed community development organization that is rooted in the Rockaways and employed by individuals familiar with or from the community, could be tasked with this responsibility.

STRATEGY FOR INTERIM USES

When large projects such as this are proposed, a certain frustration can arise among those who are most eager for action. After all, a project such as the one proposed in this vision could take years to complete. What is to be done with this land in the interim? One need only look to the community gardens found within vacant lots in all five boroughs or to institutions such as the Socrates Sculpture Park in Long Island City to understand New Yorkers' desire and skill in reclaiming neglected parcels of their city. If given the opportunity, there are certainly community groups, artists, and organizations that would take advantage of Arverne East's sprawling, oceanside environs. Below are possible interim uses of Arverne East land as plans for development remain in their early stages.

Camp Arverne

In 2011, Camp Gateway—located on the former site of New York City's Floyd Bennett Field—expanded its number of campsites from four to 38. The public embrace of Camp Gateway's expansion highlights city residents' desire to experience the outdoors—an activity that can be cost prohibitive for many New Yorkers.

As Arverne East remains vacant, very minimal work would be needed to convert this land into a temporary campground, similar to Camp Gateway. Individuals need not do this alone: countless businesses could use this as an opportunity to sponsor events. Outdoor recreation gear and sporting goods retailer REI, for example, "commits time, money and gear" to volunteerism, grants, workshops, and education initiatives, to ensure "that the outdoors [are] accessible and respected by all." REI Soho, a recent addition to the company's retail locations, features a full calendar of events within the store and elsewhere in the New York City area. Partnership opportunities such as this are mutually beneficial, and REI's desire to showcase new camping gear may be just as strong as New Yorkers' desire to lie under the stars in their own backyard.

Oceanside Canvas

Artists, sculptors, and other creative minds have often selected the serenity of nature to showcase their work. The Storm King Art Center, one hour north of New York City, offers visitors the opportunity to engage with art in a completely natural setting—but this, too, presents certain access issues for many New Yorkers. An outdoor art space, accessible by public transportation, would bring cultural value to the city, and certain institutions are already starting to realize this. As mentioned, the Rockaway Peninsula is hosting the Museum of Modern Art (MoMA), offering temporary art exhibitions, community events, film and performances in its VW Dome 2, as well as artist Agnes Denes. With such an expanse of transit-oriented land in this pre-development phase, Arverne East is an optimal location for such artistic endeavors.

Photo Credit: Ignant.dk

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APPENDIX

6.1 ARVERNE URBAN RENEWAL AREA ENVIRONMENTAL IMPACT STATEMENT

In 2003, an environmental impact statement (EIS) was prepared for the New York City Department of Housing Preservation and Development (HPD) for the Arverne Urban Renewal Area (AURA), in which the study area lies. The EIS identifies natural resources expected to be adversely impacted by development, as well as the required mitigation measures that a developer will need to incorporate into their plan. The AURA is a 308-acre site bounded by the boardwalk to the south and Rockaway Freeway to the north between Beach 32nd Street and Beach 84th Street and incorporates the Arverne by the Sea multi-use development project, as well as Arverne East. The EIS formed the basis for HPD's Request for Proposal (RFP) to develop 47 acres of multi-use development with the incorporation of 35 acres of parkland and a dune preserve that will serve as mitigation measures specified in the EIS.

If development proceeds according to the original RFP drafted by HPD, over 110 acres (Arverne by the Sea and Arverne East) of vegetated area may be cleared throughout and replaced with new impervious surfaces, increasing runoff and erosion into the receiving basins of Jamaica Bay. Construction and the addition of 13,000 new residents to the area could result in significant adverse impacts to open space and recreational facilities, shadows, natural resources, hazardous materials, traffic and transportation, and noise. The park, dune preserve, and employing phased construction are anticipated to mitigate the majority of potential impacts with the exception of traffic and transportation and noise, which will not be mitigated.

The preservation of the dunes is of paramount importance in the project, as they are key to the protection of residents, existing wildlife, and the built environment. Virtually all of the maritime beach and active dunes are being preserved or enhanced, as they are the most sensitive habitats. Within the park area, existing high-quality vegetation and natural habitats will be maintained while unused, man-made infrastructure around Beach 52nd Street and disturbed or poor-quality habitats with non-native, invasive plant species will be restored through the establishment of dunes and the planting of native grassland, shrubland, and wooded areas.

Wetlands provide important flood mitigation services for the study area and the broader peninsula. The RFP calls for at least 0.6 acres of freshwater wetlands to be incorporated into the park, and three small poor quality wetlands will be eliminated.

During the clearing, grading, and construction process in the development, it is expected that wildlife present on the site, particularly ground-bound wildlife, will be adversely impacted. Of the rare, threatened, or endangered species observed on the site, there are two species that are expected to be significantly impacted and will require mitigation measures: piping plover and the checkered white butterfly. In addition to the park and dune preserve, mitigation steps to limit disruption to wildlife include phased construction, housing and commercial clusters, avoidance of construction in and around the dune preserve and beachfront during the piping plover nesting season (March and August), 50-meter buffer zone around piping plover reserve (as defined in the Piping Plover Atlantic Coast Population Recovery Plan of 1996), additional monitoring by Urban Park Rangers, and replanting of the checkered white butterfly food sources (peppergrass and camphorweed).

The process of clearing, grading, and developing the land will result in the potential for a significant increase in storm water runoff. The clearing and grading process during construction is the largest source for erosion and sedimentation runoff. Over the long-term, the amount of impervious cover causing runoff into drainage basins will most likely increase with development, permanently altering the flow of runoff from the site. The developer will need to obtain the necessary permits from the NYS Department of Environmental Protection and prepare a storm water management program to limit runoff and protect water quality.

6.2 EMPLOYMENT TABLES

Arverne East Residents in Labor Force, as compared to the greater Rockaway Peninsula

	Arverne East		Rockaway	
	Number	Percent	Number	Percent
Total	7043	100%	84276	100.0%
In labor force	3851	54.7%	48329	57.3%
Civilian labor force	3851	54.7%	48296	57.3%
Employed	3336	47.4%	43380	51.5%
Unemployed	515	13.4%	4916	10.2%
Armed Forces	0	0.0%	33	0.0%
Not in labor force	3192	45.3%	35947	42.7%

Arverne East Labor Force, by Age Cohort

	Arverne East			
	Total	In Labor Force	Employment	Unemployment Rate
Population 16 years and over	7043	54.7%	47.4%	13.4%
Age				
16 to 19 years	645	13.6%	9.0%	31.3%
20 to 24 years	799	58.9%	44.5%	21.6%
25 to 44 years	2373	77.0%	67.5%	11.9%
45 to 54 years	1188	78.4%	72.7%	7.1%
55 to 64 years	925	47.9%	40.7%	12.7%
65 to 74 years	499	12.8%	10.8%	13.7%
74 years and over	614	4.2%	4.2%	0.0%

Arverne East Labor Force, by Age and Race

	Arverne East			
	Total	In Labor Force	Employed	Unemployment Rate
Population 16 years and over	7043	54.7%	47.4%	13.4%
Race and Hispanic or Latino Origin				
One race	6899	55.3%	47.9%	13.3%
White	1259	27.4%	26.8%	1.6%
Black or African American	5037	61.7%	52.8%	14.4%
American Indian and Alaska Native	0	0.0%	0.0%	0.0%
Asian	170	68.2%	52.9%	21.7%
Native Hawaiian and Other Pacific Islander	0	0.0%	0.0%	0.0%
Some other race	433	56.6%	50.3%	11.0%
Two or more races	144	27.1%	22.2%	7.6%
Hispanic or Latino origin (of any race)	1522	54.9%	51.7%	5.7%
White alone, not Hispanic or Latino	754	14.4%	14.4%	0.0%

Arverne East Labor Force, by Age and Gender

	Arverne East			
	Total	In Labor Force	Employed	Unemployment Rate
Population 20 to 64 years	5285	69.5%	60.5%	12.9%
Sex				
Male	2131	75.8%	63.1%	17.6%
Female	3154	65.2%	58.8%	10.4%
With own children under 6 years	587	59.3%	54.5%	13.5%

6.2 EMPLOYMENT TABLES (CONTINUED)

Arverne East Residents in Labor Force, by Educational Attainment

	Arverne East			
	Total	In Labor Force	Employed	Unemployment Rate
Educational Attainment				
Population 25 to 64 years	4486	71.4%	63.4%	11.1%
Less than high school graduate	1068	57.5%	49.8%	14.0%
High school graduate (includes equivalency)	1767	69.7%	60.0%	13.8%
Some college or associate's degree	1139	81.5%	74.6%	8.6%
Bachelor's degree or higher	512	83.4%	78.1%	6.0%

6.3 MIGRATION TABLES

Residents in Study Area, Residence 1 Year Ago, as compared to the greater Rockaway Peninsula

	Study Area		Rockaway	
Population 1 year and over	9,258	100%	109,027	100%
Same house	8,054	87.0%	96,255	88.3%
Different house in the U.S.	1,173	12.7%	11,618	10.7%
Same county	654	7.1%	7,348	6.7%
Different county	519	5.6%	4,270	3.9%
Same state	485	5.2%	3,478	3.2%
Different state	34	0.4%	792	0.7%
Abroad	31	0.3%	1,154	1.1%

Residents in Study Area, Place of Birth, as compared to the greater Rockaway Peninsula

	Study Area		Rockaway	
Total population	9,369	100%	110,592	100%
Native	6,660	71.1%	80,765	73.0%
Born in United States	6,454	68.9%	78,191	70.7%
State of residence	5,716	61.0%	69,853	63.2%
Different state	738	7.9%	8,338	7.5%
Born in Puerto Rico, U.S. Island areas, or born abroad to American parent(s)	206	2.2%	2,574	2.3%
Foreign born	2,709	28.9%	29,827	27.0%

6.3 MIGRATION TABLES (CONTINUED)

U.S. Citizenship Status of Foreign-Born Population, as compared to the greater Rockaway Peninsula

	Study Area		Rockaway	
Foreign-born population	2,709	100%	29,827	100%
Naturalized U.S. citizen	1,261	46.5%	16,064	53.9%
Not a U.S. citizen	1,448	53.5%	13,763	46.1%

Residents in Study Area, Year of Entry, as compared to the greater Rockaway Peninsula

	Study Area		Rockaway	
Population born outside the United States	2,915	100%	32,401	100%
Native	206	7.1%	2,574	7.9%
Entered 2000 or later	94	3.2%	535	1.7%
Entered before 2000	112	3.8%	2,039	6.3%
		0.0%		0.0%
Foreign born	2,709	92.9%	29,827	92.1%
Entered 2000 or later	672	23.1%	7,355	22.7%
Entered before 2000	2,037	69.9%	22,472	69.4%

Residents in Study Area, World Region of Birth of Foreign-Born Population, as compared to the greater Rockaway Peninsula

	Study Area		Rockaway	
Foreign-born population, excluding population born at sea	2,709	100%	29,827	100%
Europe	282	10.4%	5,155	17.3%
Asia	239	8.8%	2,175	7.3%
Africa	336	12.4%	2,052	6.9%
Oceania	0	0.0%	46	0.2%
Latin America	1,851	68.3%	20,344	68.2%
Northern America	1	0.0%	55	0.2%

6.4 HOUSING CHARACTERISTICS TABLES

Housing Occupancy in Study Area, as compared to the greater Rockaway Peninsula

	Study Area		Rockaway	
Total housing units	3,652	100.0%	44,325	100.0%
Occupied housing units	3,153	86.3%	38,593	87.1%
Vacant housing units	499	13.7%	5,732	12.9%

Number of Housing Units in Structure in Study Area, as compared to the greater Rockaway Peninsula

	Study Area		Rockaway	
Total housing units	3,652	100.0%	44,325	100.0%
1-unit, detached	68	1.9%	9,906	22.3%
1-unit, attached	210	5.8%	2,501	5.6%
2 units	624	17.1%	7,653	17.3%
3 or 4 units	359	9.8%	3,017	6.8%
5 to 9 units	231	6.3%	1,618	3.7%
10 to 19 units	153	4.2%	1,109	2.5%
20 or more units	2,007	55.0%	18,473	41.7%
Mobile home	0	0.0%	16	0.0%
Boat, RV, van, etc.	0	0.0%	32	0.1%

Year Structure Built in Study Area, as compared to the greater Rockaway Peninsula

	Study Area		Rockaway	
Total housing units	3,652	100.0%	44,325	100.0%
Built 2005 or later	295	8.1%	1,895	4.3%
Built 2000 to 2004	300	8.2%	2,719	6.1%
Built 1990 to 1999	77	2.1%	2,181	4.9%
Built 1980 to 1989	142	3.9%	1,549	3.5%
Built 1970 to 1979	840	23.0%	5,748	13.0%
Built 1960 to 1969	942	25.8%	10,078	22.7%
Built 1950 to 1959	278	7.6%	7,117	16.1%
Built 1940 to 1949	183	5.0%	3,889	8.8%
Built 1939 or earlier	595	16.3%	9,149	20.6%

Housing Tenure in Study Area, as compared to the greater Rockaway Peninsula

	Study Area		Rockaway	
Occupied housing units	3,153	100.0%	38,593	100.0%
Owner-occupied	766	24.3%	14,659	38.0%
Renter-occupied	2,387	75.7%	23,934	62.0%
Average household size of owner-occupied unit	2.93		2.99	
Average household size of renter-occupied unit	2.66		2.56	

6.4 HOUSING CHARACTERISTICS TABLES (CONTINUED)

Number of Rooms in Structure in Study Area, as compared to the greater Rockaway Peninsula

	Study Area		Rockaway	
Total housing units	3,652	100.0%	44,325	100.0%
1 room	151	4.1%	2,759	6.2%
2 rooms	198	5.4%	2,401	5.4%
3 rooms	1,008	27.6%	8,621	19.4%
4 rooms	1,294	35.4%	10,411	23.5%
5 rooms	588	16.1%	8,349	18.8%
6 rooms	174	4.8%	4,419	10.0%
7 rooms	108	3.0%	2,411	5.4%
8 rooms	35	1.0%	2,021	4.6%
9 rooms or more	96	2.6%	2,933	6.6%

Occupants Per Room in Study Area, as compared to the greater Rockaway Peninsula

	Study Area		Rockaway	
Occupied housing units	3,153	100.0%	38,593	100.0%
1.00 or less	2,818	89.4%	35,824	92.8%
1.01 to 1.50	278	8.8%	1,960	5.1%
1.51 or more	57	1.8%	809	2.1%

Number of Bedrooms in Structure in Study Area, as compared to the greater Rockaway Peninsula

	Study Area		Rockaway	
Total housing units	3,652	100.0%	44,325	100.0%
No bedroom	161	4.4%	3,225	7.3%
1 bedroom	1,137	31.1%	10,633	24.0%
2 bedrooms	1,321	36.2%	13,285	30.0%
3 bedrooms	839	23.0%	11,532	26.0%
4 bedrooms	63	1.7%	3,470	7.8%
5 or more bedrooms	131	3.6%	2,180	4.9%

Year Householder Moved into Unit in Study Area, as compared to the greater Rockaway Peninsula

	Study Area		Rockaway	
Occupied housing units	3,153	100.0%	38,593	100.0%
Moved in 2005 or later	1,312	41.6%	15,078	39.1%
Moved in 2000 to 2004	787	25.0%	7,901	20.5%
Moved in 1990 to 1999	580	18.4%	7,836	20.3%
Moved in 1980 to 1989	240	7.6%	3,397	8.8%
Moved in 1970 to 1979	167	5.3%	2,835	7.3%
Moved in 1969 or earlier	67	2.1%	1,546	4.0%

6.4 HOUSING CHARACTERISTICS TABLES (CONTINUED)

Vehicle(s) Available Per Housing Unit in Study Area, as compared to the greater Rockaway Peninsula

	Study Area		Rockaway	
Occupied housing units	3,153	100.0%	38,593	100.0%
No vehicles available	1,889	59.9%	15,820	41.0%
1 vehicle available	894	28.4%	13,772	35.7%
2 vehicles available	338	10.7%	7,117	18.4%
3 or more vehicles available	32	1.0%	1,884	4.9%

Substandard Occupied Housing Units in Study Area, as compared to the greater Rockaway Peninsula

	Study Area		Rockaway	
Occupied housing units	3,153	100.0%	38,593	100.0%
Lacking complete plumbing facilities	17	0.5%	323	0.8%
Lacking complete kitchen facilities	0	0.0%	293	0.8%
No telephone service available	455	14.4%	2,932	7.6%

House Heating Fuel in Study Area, as compared to the greater Rockaway Peninsula

	Study Area		Rockaway	
Occupied housing units	3,153	100.0%	38,593	100.0%
Utility gas	2,099	66.6%	25,746	66.7%
Bottled, tank, or LP gas	31	1.0%	466	1.2%
Electricity	305	9.7%	2,575	6.7%
Fuel oil, kerosene, etc.	597	18.9%	8,650	22.4%
Coal or coke	0	0.0%	39	0.1%
Wood	0	0.0%	32	0.1%
Solar energy	8	0.3%	44	0.1%
Other fuel	38	1.2%	323	0.8%
No fuel used	75	2.4%	718	1.9%

Mortgage Status in Study Area, as compared to the greater Rockaway Peninsula

	Study Area		Rockaway	
Owner-occupied units	766	100.0%	14,659	100.0%
Housing units with a mortgage	558	72.8%	9,010	61.5%
Housing units without a mortgage	208	27.2%	5,649	38.5%

6.4 HOUSING CHARACTERISTICS TABLES (CONTINUED)

Monthly Owner Costs in Study Area by Mortgage Status, as compared to the greater Rockaway Peninsula

	Study Area		Rockaway	
Housing units with a mortgage	558	100.0%	9,010	100.0%
Less than $300	0	0.0%	20	0.2%
$300 to $499	0	0.0%	23	0.3%
$500 to $699	0	0.0%	61	0.7%
$700 to $999	17	3.0%	156	1.7%
$1,000 to $1,499	142	25.4%	777	8.6%
$1,500 to $1,999	99	17.7%	1,590	17.6%
$2,000 or more	300	53.8%	6,383	70.8%
Housing units without a mortgage	208	100.0%	5,649	100.0%
Less than $100	69	33.2%	882	15.6%
$100 to $199	11	5.3%	89	1.6%
$200 to $299	22	10.6%	292	5.2%
$300 to $399	18	8.7%	300	5.3%
$400 or more	88	42.3%	4,086	72.3%

Selected Monthly Owner Costs as a Percentage of Household Income (SMOCAPI), as compared to the greater Rockaway Peninsula

	Study Area		Rockaway	
Housing units with a mortgage (excluding units where SMOCAPI cannot be computed)	526	100.0%	8,953	100.0%
Less than 20.0 percent	139	26.4%	2,263	25.3%
20.0 to 24.9 percent	134	25.5%	1,176	13.1%
25.0 to 29.9 percent	28	5.3%	780	8.7%
30.0 to 34.9 percent	61	11.6%	832	9.3%
35.0 percent or more	164	31.2%	3,902	43.6%
Not computed	32		57	
Housing unit without a mortgage (excluding units where SMOCAPI cannot be computed)	208	100.0%	5,627	100.0%
Less than 10.0 percent	92	44.2%	2,477	44.0%
10.0 to 14.9 percent	43	20.7%	795	14.1%
15.0 to 19.9 percent	22	10.6%	584	10.4%
20.0 to 24.9 percent	0	0.0%	315	5.6%
25.0 to 29.9 percent	0	0.0%	271	4.8%
30.0 to 34.9 percent	0	0.0%	159	2.8%
35.0 percent or more	51	24.5%	1,026	18.2%
Not computed	0		22	

6.4 HOUSING CHARACTERISTICS TABLES (CONTINUED)

Gross Rent in Study Area,
as compared to the greater Rockaway Peninsula

	Study Area		**Rockaway**	
Occupied units paying rent	2,387	100%	23,446	100.0%
Less than $200	46	2%	687	2.9%
$200 to $299	196	8%	2,256	9.6%
$300 to $499	214	9%	2,296	9.8%
$500 to $749	524	22%	3,619	15.4%
$750 to $999	535	22%	4,030	17.2%
$1,000 to $1,499	728	30%	7,386	31.5%
$1,500 or more	144	6%	3,172	13.5%
Median (dollars)	2,531		21,601	
No rent paid	0		488	

Gross Rent in Study Area as a Percentage of Household Income (GRAPI), as compared to the greater Rockaway Peninsula

	Study Area		Rockaway	
Occupied units paying rent (excluding units where GRAPI cannot be computed)	2,328	100.0%	22,736	100.0%
Less than 15.0 percent	337	14.5%	3,713	16.3%
15.0 to 19.9 percent	261	11.2%	2,241	9.9%
20.0 to 24.9 percent	75	3.2%	1,983	8.7%
25.0 to 29.9 percent	243	10.4%	2,934	12.9%
30.0 to 34.9 percent	227	9.8%	2,494	11.0%
35.0 percent or more	1,185	50.9%	9,371	41.2%
Not computed	59		1,198	

6.4 HOUSING CHARACTERISTICS TABLES (CONTINUED)

Home Value in Study Area,
as compared to the greater Rockaway Peninsula

	Study Area		Rockaway	
Owner-occupied units	766	100.0%	14,659	100.0%
Less than $50,000	160	20.9%	1,146	7.8%
$50,000 to $99,999	0	0.0%	68	0.5%
$100,000 to $149,999	8	1.0%	142	1.0%
$150,000 to $199,999	0	0.0%	292	2.0%
$200,000 to $299,999	105	13.7%	1,038	7.1%
$300,000 to $499,999	441	57.6%	4,909	33.5%
$500,000 to $999,999	52	6.8%	6,326	43.2%
$1,000,000 or more	0	0.0%	738	5.0%
Median (dollars)	$680,700		$10,444,300