Strategic Recovery Planning Report
Post Sandy Planning Assistance Grant Program for

Borough of Lavallette, New Jersey

October 2, 2014

O'DONNELL, STANTON & ASSOCIATES, Inc.

ENGINEERS•PLANNERS•SURVEYORS

with

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1.0 INTRODUCTION

The Strategic Recovery Planning Report (SRPR) for The Borough of Lavallette has been prepared in accordance with the Post Sandy Planning Assistance Grant Program, administered through the New Jersey Department of Community Affairs. The Post Sandy Planning Assistance Grant Program supports long-range planning for community redevelopment in the municipalities and counties sustaining damage from Superstorm Sandy. The Borough of Lavallette suffered significant damage and destruction in October 2012 as a result of the post-tropical cyclone Sandy (Superstorm Sandy). SRPR presents a planning strategy for the Borough of Lavallette to move forward from the damage, direct and indirect impacts of the storm, and reviews measures taken by the Borough to manage potential risk associated with the location on a barrier island. This study provides an assessment of existing damage, a discussion of current emergency management/mitigation plans, and an analysis of local regulations as well as a summary of the Borough's recovery efforts to date. Finally, the study provides recommendations of additional actions.

The SPRP provides a summary of actions undertaken to date, including coordination with the State of New Jersey in terms of proactively responding to Superstorm Sandy, both through public actions and through aggressive plans and ordinances put in place to control the rebuilding process in a storm-resilient manner. In addition, a variety of mitigation projects were undertaken in coordination with State and County projects, including the rebuilding of State Highways 35 complete with a new stormwater evacuation system. Lastly, the SPRP addresses both current projects underway and future projects necessary to provide resiliency and sustainability in a Post Sandy environment.

The document has been prepared for the Borough of Lavallette in cooperation between O'Donnell Stanton Associates and Paulus Sokolowski and Sartor, LLC (PS&S). The information presented herein is based upon data obtained directly from the Borough; interviews with Borough Employees; compilation of Geographic Information Systems Data; research of relevant Ocean County, State of New Jersey and federal agency data and reports; and visual reconnaissance conducted throughout the Borough.

2.0 DESCRIPTION OF LAVALLETTE

2.1 Location

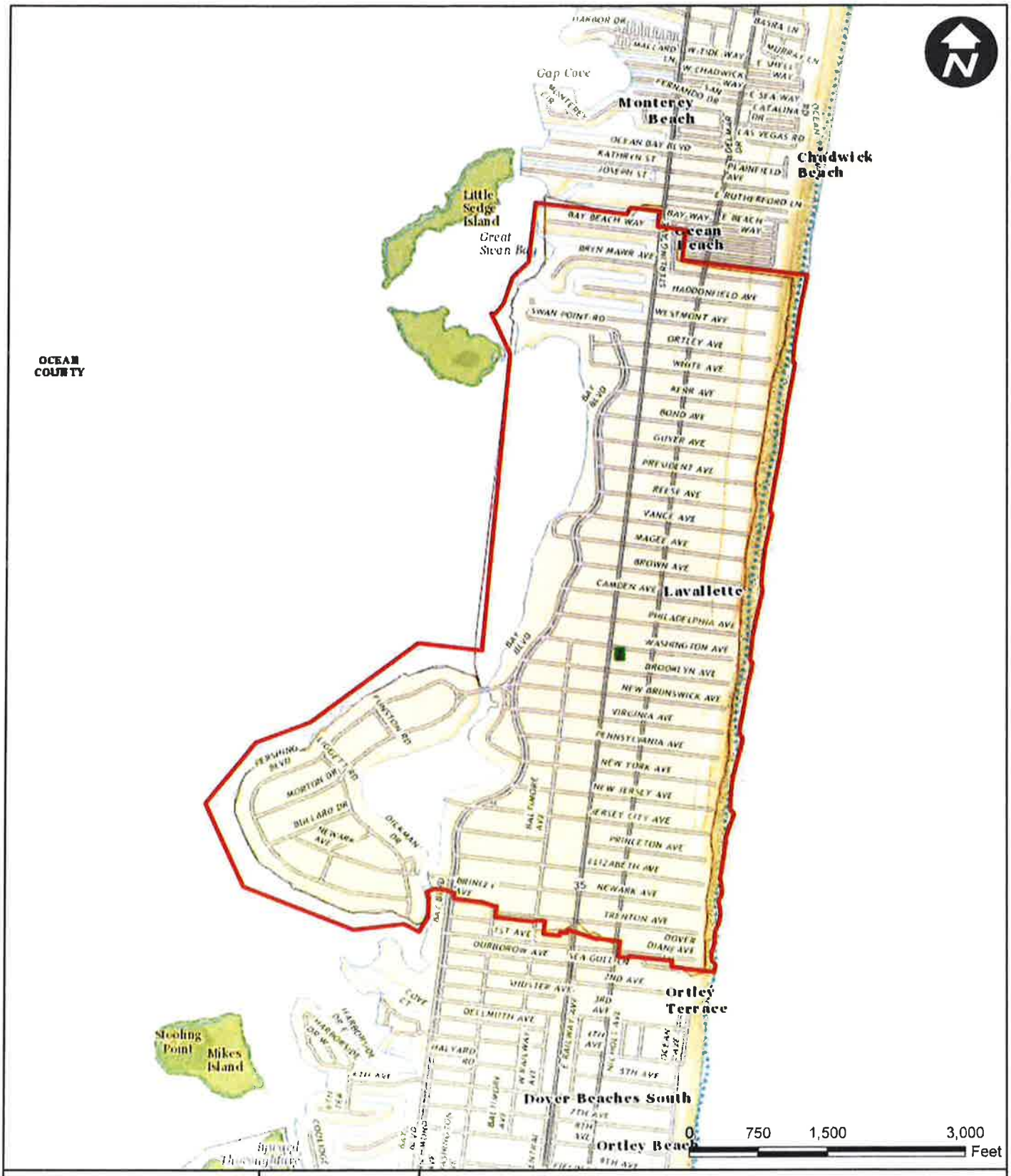
The Borough of Lavallette is located in Ocean County on the Barnegat Peninsula, which separates Barnegat Bay from the Atlantic Ocean. A map of the Borough of Lavallette based upon the United States Geological Service (USGS) topographic map series and that illustrates the Borough's oceanfront location is provided as Figure 1. The Borough is approximately 0.9 square miles and primarily supports a residential population.

2.2 History

The location of Lavallette between Barnegat Bay and the Atlantic Ocean and the access to aquatic resources has encouraged visitation for centuries. Lenni-Lenape are thought to be the first to visit the lands that would become Lavallette, and their visits came in the summer months, harvesting fish and shellfish and leaving the barrier islands and peninsulas in winter. Initial visitation of this area by European colonists followed a similar pattern, with residents of the mainland visiting the peninsula for fishing and shellfish harvesting. Through the 18th and 19th Centuries, access to the Lavallette area was by boat, and visitation was limited. Growth in the area was first spurred by the construction of a rail line crossing of Barnegat Bay, and later by construction of a gravel road from Bay Head and Barnegat Bay bridges for automobiles. Growth in Lavallette was at its highest rate in the years after World War II; this growth was supported by construction of better highways, including the Garden State Parkway, Route 35 improvements, and the Mathis Bridge connecting Toms River to Seaside Heights.

The Master Plan of the Borough of Lavallette (Master Plan) includes this characterization of the borough as a summer resort despite a growing permanent population:

> *The opening of the Garden State Parkway in 1954 brought a torrent of traffic from North Jersey, and the higher and wider Tunney Bridge joined the Mathis Bridge. By this time, Bay Boulevard was completed and the construction (in 1960) of Route 35 South in the old railroad right-of-way added to the increase in growth. This contributed to an almost explosive growth in the late 1940's and the 1950's,*



Legend

Borough Boundary

Sources:
USGS, US Topo, The National Map
Seaside Park, 2014
STATE PLANE COORDINATES
E 611955
N 414120

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USGS SITE LOCATION MAP

Borough of Lavallette
Ocean County, New Jersey

Drawn By: EB	Scale: 1" = 1,500'	Project No. 02424.016
Chk'd By: ML	Date: 8/14/2014	Figure No. 1

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particularly in the southern portion of the town. It was in this period, too, that the trend toward year-round living at the shore began, producing significant increases in Lavallette's population.

Between 1940 and 1960, the number of year-round residents increased by 164% from 315 to 832. Summer crowds escalated almost proportionately. More recently, the rate of growth has slowed. The 1970 census figure of 1,509 reflects primarily the annexation of West Point Island plus some real growth. The 1980 figure of 2,072 included the annexation of the Westmont Shores area (North Lavallette) for the first time.

Through all of this, however, the basic pattern of development was maintained. Commercial uses spread along Grand Central Avenue, but the integrity of the boardwalk, the bayfront, and the more recently accessible space along Route 35 South was protected. Lavallette today is a mature town, with little buildable space available. School facilities were expanded three times between 1955 and 1981.

Despite the growth in permanent population, Lavallette remains primarily a summer resort. The qualities that make it popular – the clean sand beaches (its greatest natural asset) and the fruits of sound planning for more than a century -- need to be protected and nourished for the benefit of the economy as well as for the enjoyment of its residents.

The current population estimate of about 2,471 includes the 2010 annexation of Bay Beach Way, (60 parcels), represents a modest growth of about 400 since 1980[1].

2.3 Current Land Use

The current land use pattern was generally established by the plot plan filed by the Barnegat Land Improvement Company with Ocean County in 1878, and additional land area was later created by filling Barnegat Bay in the area that is now Bay Boulevard.

The following description of land use patterns in Lavallette is reprinted from the Master Plan:

[1] The 2010 United States Census lists the population of Lavallette at 1,875, which did not include the annexed area.

Lavallette's development is quite similar to that found in seashore communities up and down the New Jersey coastline. Typically, most commercial uses are located along the New Jersey Route 35 North (Grand Central Avenue) the original and still principal road in the town. Residential areas are found east and west of the business uses with a few interspersed among the businesses. Recreational facilities are primarily along the bayfront with the exception of the ocean beach. The town is zoned for single-family residential use except for the Business zone that is composed of lots up to 100 feet in depth on either side of Grand Central Avenue (State Route 35 North).

The Master Plan identifies three residential zones, Zone A, Zone B, and Zone C. In addition Zone D was designated for the annexation of Beach Bay Way (from Toms River Township) subsequent to the Master Plan date. These zones are described below.

Zone A - All lands not included in the Business District along Route 35 north to Westmont Avenue.

Zone B – West Point Island.

Zone C - All lots on Westmont, Haddonfield, and Bryn Mawr.

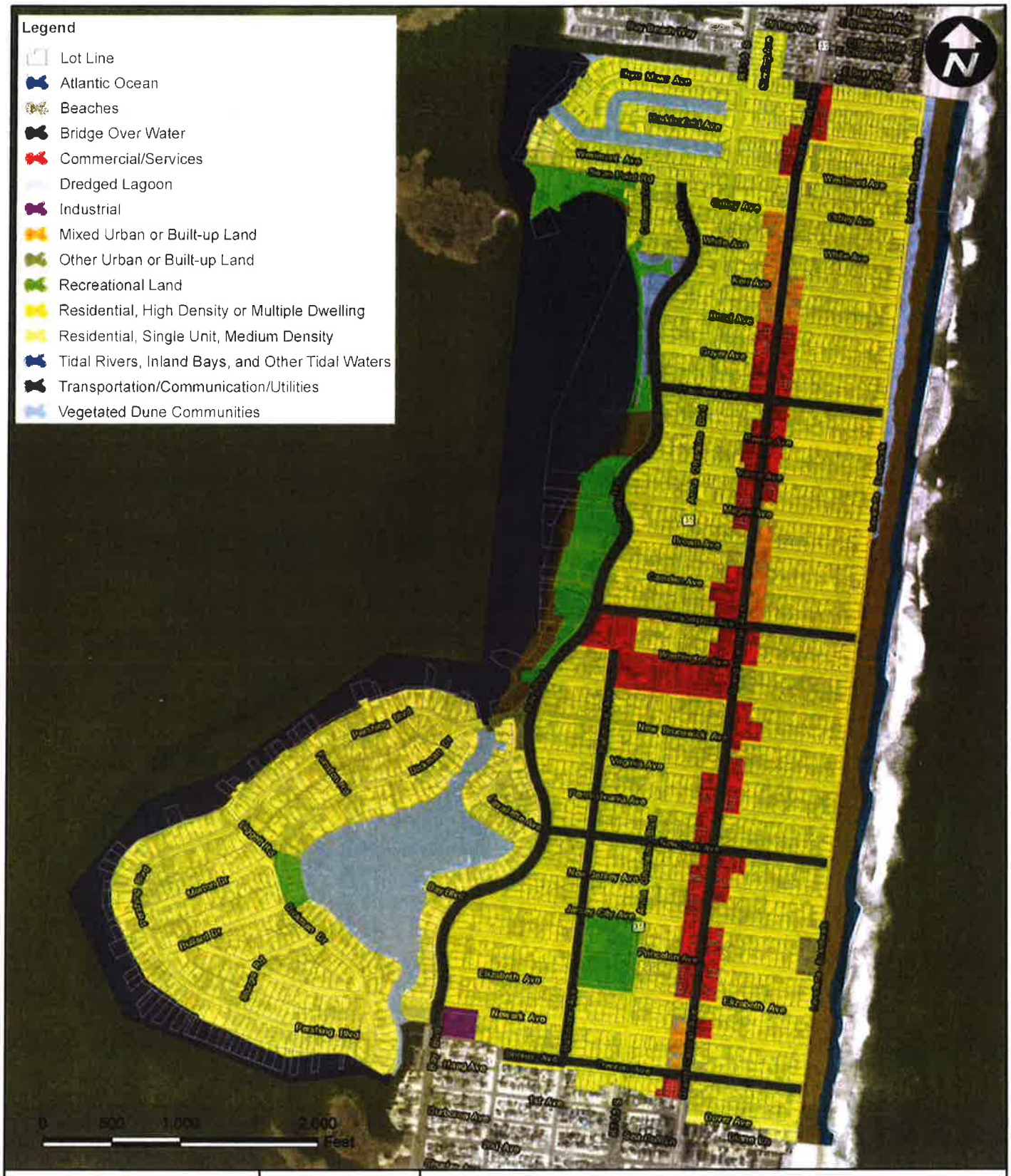
Zone D – All lots on Bay Beach Way

The Master Plan also identifies a Business Zone located along Grand Central Avenue (State Highway 35.

Figure 2, Land Use Map, provides an overview of the developed Borough. Commercial and retail uses, as well as other non-residential uses, are primarily located along Route 35 North (Grand Central Avenue). Recreational uses, including parks and playgrounds, boat launches, fishing docks, as well as basketball and tennis courts are mainly located along the bayside of the island. Along the oceanfront beach, a boardwalk extends from Ortley Avenue to the north of the island to Dover Avenue at the southern boundary of the Borough.

2.4 Population

According to the 2010 Census Data, the population of Lavallette was approximately 1,875 persons with approximately 3,207 housing units; however the annexation of Bay Beach



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LAND USE
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Ocean County, New Jersey

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Sources:
NJDEP 2007 Land use/Land Cover Update
ArcGIS World Imagery Service Layer

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Way increased that estimated population to 2,471. The Borough of Lavallette data (2014 Tax Duplicates) indicating that there are approximately 2,734 building lots within the Borough. As stated in the Borough Master Plan in 2000, "Lavallette today is a mature town, with little buildable space available."

Lavallette experiences an influx of summertime visitors. While data regarding the precise numbers of summertime visitors are not available, the most recent Ocean County Master Plan shows a ratio of seasonal to permanent population of better than 10:1 for the coastal beach communities. Lavallette's summer population is currently estimated at 30,000 based upon data from seasonal variations in use of electricity, water, sewer, and solid waste.

In 2012, Superstorm Sandy severely impacted buildings, infrastructure and the population of Lavallette. The Borough administration and the public have made great strides in overcoming the damage as discussed throughout this SRPR.

3.0 RISK ASSESSMENT

3.1 Risk Assessment Overview

The attributes that led to the residential resort development of Lavallette including proximity to the resources, recreational opportunities and natural beauty of the ocean also expose the community to risks from flooding and coastal storms. Lavallette is located on the Barnegat peninsula, which is also known as the Island Beach peninsula. The Barnegat peninsula is approximately 20 miles long, extending from the Manasquan Inlet to the Barnegat Inlet. The landform of the peninsula is very low-lying, and topographic high points are found in areas of sand dunes adjacent to the Atlantic Ocean beaches. The land slopes generally downward towards the west, diminishing to sea level along the Barnegat Bay shoreline. In Lavallette, elevations range from sea level along water's edge to over 10 feet above sea level in the residential area near the dune line. The location between the Atlantic Ocean and Barnegat Bay, the narrowness of the peninsula, and the low landform combine to exacerbate risks associated with coastal erosion and flooding during storms.

The Borough of Lavallette has participated in the preparation of the Ocean County Multi-jurisdictional All Hazard Mitigation Plan (HMP). This HMP was developed for the purpose of:

- Providing a blueprint for saving lives and reducing property damage from the effects of future natural and man-made disasters in Ocean County;
- Qualifying the County for pre-disaster and post-disaster grant funding;
- Complying with state and federal legislative requirements related to local hazard mitigation planning;
- Demonstrating a firm local commitment to hazard mitigation principles; and
- Improving community resiliency following a disaster event.

The HMP included a process to assess potential risks and create a register of risks that should be addressed in the HMP. Of these, certain risks were identified in the HMP as

having effect on Lavallette, and are also pertinent to this SRPR. These risks are summarized in Section 3.2.

3.2 Risk Factors

3.2.1 Coastal Erosion

Coastal erosion is a process of shoreline recession, which can be from natural causes (storm-generated waves and high velocity currents, large waves associated with earthquakes, or sea level rise), or man-made causes such as structures placed on or near the shore. Erosion risk is nearly always present, given the frequency of coastal storms. Table 4.3.1-1 of the Ocean County HMP identifies 37 properties located within 200 feet of erodible shoreline and beaches in Lavallette, which represents 1.2% of total properties and a total improved value of $6,573,500. Further, a GIS-based New Jersey beach-dune system susceptibility assessment study prepared by The Richard Stockton College of New Jersey (2006) includes an estimate that greater than 90% of the foredune in Lavallette would be compromised during the 100-year storm event. Failure of the dune system subjects the land uses west of the dunes to flooding with wave velocity, and very high potential for severe damage to property and risk to life.

3.2.2 Flooding

Flooding in Lavallette can be associated with tide cycles, rainfall events, and storm surges. Superstorm Sandy provides an example of worst-case scenario when these causes are concurrent. Over 90% of the development parcels in Lavallette and 10 "Critical Facilities" are located in the Special Flood Hazard Area (1% annual flood hazard risk).

3.2.3 Hurricane, Tropical Storm, Nor'Easter

Hurricanes and tropical cyclones are differentiated by wind speed. A tropical storm is a cyclone with maximum sustained winds between 39-74 mph. Tropical

storms are called hurricanes when wind speed exceeds 74 mph. Nor'Easters are very low-pressure storms that form in the Atlantic from interaction of cold air flowing across warmer Atlantic Gulf Stream waters. The tracks of some Atlantic hurricanes and Nor'Easters have occurred on or close to Ocean County, and these events have causes damage to beaches, dune systems, and property and caused a threat to life from extreme wind and flooding.

As noted in the Ocean County HMP, the American Society of Civil Engineers has analyzed storm history data as a basis for design and evaluation of the structural integrity of shelters and critical facilities. Ocean County lies within Zone II, meaning design wind speeds for shelters and critical facilities should be able to withstand a 3-second gust of up to 160 mph, regardless of whether the gust is the result of a tornado, hurricane, tropical storm, or windstorm event. The HMP also identifies Ocean County as being within the Hurricane Susceptibility Region.

3.2.4 Climate Change/Sea Level Rise

The Ocean County HMP included an evaluation of risks associated with climate change. This SRPR incorporates the issue of sea level rise through consideration of risks associated with coastal erosion, flooding and storms. Climate change is characterized through statistical assessment of weather data, and can identify risks such as potential changes in the frequency of droughts, wind storms, tropical cyclones and other weather events. The most significant potential impact attributable to climate change studied in the HMP and that would affect Lavallette is a change in sea level. Data indicates a rise in sea levels has been underway since the beginning of the most recent North American glacial retreat, approximately 20,000 years ago. However, recent data indicates an increase in the rate of this rise over the last century, with the annual rate of global sea level rise accelerating over the last 20 years.

An increase in sea levels would amplify the effects of storms, increase the rate of coastal erosion and flooding, and also can potentially cause permanent inundation of land areas. The HMP includes a map (Figure 4.3.15-13) that

illustrates the potential impact of a 1 foot and a 3 foot increase in sea level. Most of the adverse effects of sea level rise to property would be attributable to inundation from the bay side, although impacts to the beach berm and dunes would also occur. In the 1 foot rise scenario, approximately 5% of the current land area of the Borough of Lavallette would be inundated. In the 3 feet rise scenario, approximately half of the Borough of Lavallette would be inundated including a significant percentage of the land west of Route 35.

3.3 Risk to Land Use and Critical Infrastructure

All of the land area of Lavallette is either in a flood hazard area, or in close proximity to oceanfront dunes that are subject to storm forces. Over 90 percent of the buildings lots and 10 separately-identified critical municipal facilities are in a mapped 100-year flood hazard zone. The locations of Critical Facilities are illustrated on Figure 17. The areas of lower elevation along the bayfront are subject to more frequent flooding from Barnegat Bay, and residential properties adjacent to the ocean are dependent on the continued maintenance and integrity of the dune system.

4.0 EVALUATION OF THE EFFECTS OF SUPERSTORM SANDY

On October 29, 2012, Superstorm Sandy made landfall just south of Atlantic City, New Jersey with wind speeds ranging from 50 to 64 knots (about 60 to 75 miles per hour). Sandy was out of the range of traditional hurricane storm planning in New Jersey, as most hurricane preparedness envisions a storm that travels in a northerly direction running along the coast. What made Sandy unusual is that it was the storm that headed north and then made a "hard left" entrance into the coast, at the time of a full moon's high tide. The impacts were first felt days in advance of the storm with each rising tide cycle filling up Barnegat Bay. Lavallette is located to the north of the storm's eyewall landfall, and the tidal surge that came ashore overwashed many areas of the island, particularly in Lavallette's southern end proximate to Ortley Beach. In addition, sand dunes were breached and the beach area literally washed down streets and through residential structures. Once the eyewall passed, a massive reverse tidal surge occurred from the back bay, with the waters of Barnegat Bay massively overrunning Lavallette up through the ocean block in many areas. Damage throughout the barrier island and particularly in Lavallette was widespread and catastrophic, to both public facilities and private property. The Borough lost many of its important facilities and residential structures to the massive damage caused by the flood waters.

4.1 Summary of Overall Damage

Immediately following Superstorm Sandy in 2012, Borough officials prepared a preliminary damage assessment via a walk of each street and photo logs of the exterior of each building. Borough evaluations concluded that buildings and infrastructure were impacted by flood waters that were an average of approximately 4 feet in depth. Figures 3 through 15, on the following pages, provide a "before and after" picture of the Borough.

On the Oceanside of the Island, the majority of the boardwalk and other beach structures were destroyed with many of the streets and most sidewalks being severely damaged and much of the asphalt was literally washed away. As can be seen on Figures 3 through 14, large amounts of sand and debris were deposited halfway down each ocean block street and on adjacent properties. Damage to homes on the Oceanside was concentrated toward the southern portion of the town with many areas of

Legend

Borough Boundary

Sources:
1. NJ 2012 Orthophotography, 2012
2. NOAA Hurricane Sandy: Rapid Response Imagery of the Surrounding Regions, 2012
3. New Jersey Office of Information Technology (NJOIT), Office of Geographic Information Systems (OGIS), 2014
4. Esri StreetMap USA, 2012

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PROJECT TITLE

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BEFORE AND AFTER STORM AERIAL IMAGERY

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FIGURE NO. 3

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Borough Boundary

Sources:
1. NJ 2012 Orthophotography, 2012
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FIGURE NO. 4

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Borough Boundary

Sources:
1. NJ 2012 Orthophotography, 2012
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FIGURE NO. 5

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Borough Boundary

Sources:
1. NJ 2012 Orthophotography, 2012
2. NOAA Hurricane Sandy: Rapid Response Imagery of the Surrounding Regions, 2012
3. New Jersey Office of Information Technology (NJOIT), Office of Geographic Information Systems (OGIS), 2014
4. Esri StreetMap USA, 2012

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FIGURE NO. 6

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Borough Boundary

Sources:
1. NJ 2012 Orthophotography, 2012
2. NOAA Hurricane Sandy: Rapid Response Imagery of the Surrounding Regions, 2012
3. New Jersey Office of Information Technology (NJOIT), Office of Geographic Information Systems (OGIS), 2014
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FIGURE NO. 7

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Borough Boundary

Sources:
1. NJ 2012 Orthophotography, 2012
2. NOAA Hurricane Sandy: Rapid Response Imagery of the Surrounding Regions, 2012
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FIGURE NO. 8

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Borough Boundary

Sources:
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FIGURE NO. 9

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Borough Boundary

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FIGURE NO. 10

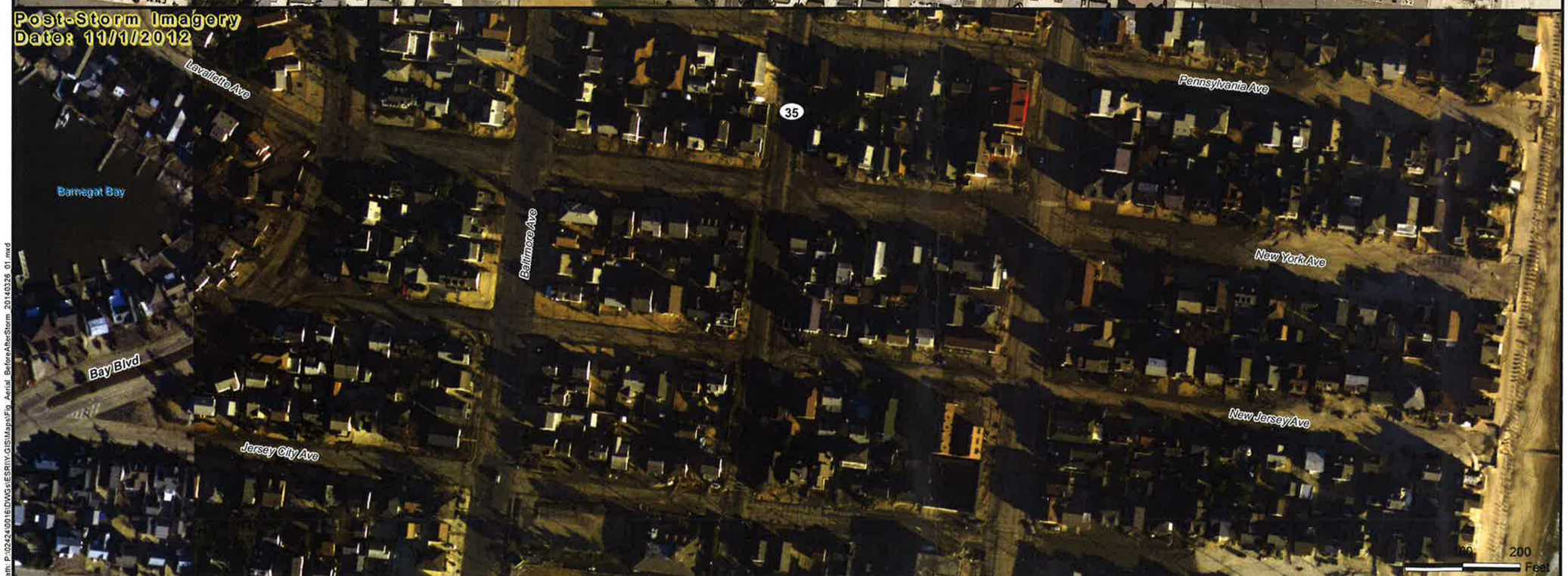

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FIGURE NO. 11

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FIGURE NO. 12

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1. NJ 2012 Orthophotography, 2012
2. NOAA Hurricane Sandy: Rapid Response Imagery of the Surrounding Regions, 2012
3. New Jersey Office of Information Technology (NJOIT), Office of Geographic Information Systems (OGIS), 2014
4. Esri StreetMap USA, 2012

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PHONE: (732) 560-9700

PROJECT TITLE

Borough of Lavallette
Ocean County
New Jersey

SHEET TITLE

BEFORE AND AFTER STORM AERIAL IMAGERY

PROJ. NO. **02424.016**

DATE	8/27/2014
DRN. BY	EB
CHK. BY	DM/ML
SCALE	1" = 200'

FIGURE NO. 13

Path: P:\02424\0016\DWGs\ESRI\V-GIS\Maps\Fig_Aerial_BeforeAfterStorm_20140326_01.mxd

Legend

Borough Boundary

Sources:
1. NJ 2012 Orthophotography, 2012
2. NOAA Hurricane Sandy: Rapid Response Imagery of the Surrounding Regions, 2012
3. New Jersey Office of Information Technology (NJOIT), Office of Geographic Information Systems (OGIS), 2014
4. Esri StreetMap USA, 2012

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SHEET TITLE

BEFORE AND AFTER STORM AERIAL IMAGERY

PROJ. NO.	**02424.016**
DATE	8/27/2014
DRN. BY	EB
CHK. BY	DM/ML
SCALE	1" = 200'

FIGURE NO. 14

Path: P:\02424\0016\DWG\ESRI\V-GIS\Maps\Fig_Aerial_BeforeAfterStorm_20140326_01.mxd

Legend

Borough Boundary

Sources:
1. NJ 2012 Orthophotography, 2012
2. NOAA Hurricane Sandy: Rapid Response Imagery of the Surrounding Regions, 2012
3. New Jersey Office of Information Technology (NJOIT), Office of Geographic Information Systems (OGIS), 2014
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PROJECT TITLE

Borough of Lavallette
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BEFORE AND AFTER STORM AERIAL IMAGERY

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SCALE	1" = 200'

FIGURE NO. 15

severe damage. All buildings that were completely destroyed were located south of Virginia Avenue.

Most of the bayside of Lavallette was substantially impacted by flooding from Barnegat Bay, with some of the areas of greatest damage occurring along the southern blocks and West Point Island. Not only were these properties subject to flooding, but there is much evidence of large and heavy debris being dispersed by the floodwaters. Motor vehicles as well as boats and other watercraft were strewn throughout these properties. Borough officials noted that damage to bayside buildings was more severe on many corner properties due to debris carried down the streets during the storm and as floodwaters receded, particularly in areas of high wave velocity impacts. Scour erosion and damaged infrastructure caused by storm water runoff to the bay was also more prevalent at road intersections, particularly areas near the bayfront.

Although the damage to the municipality was significant and widespread, a precise tally of homes that experienced some degree of damage can only be inferred by reported data sources. Not all property owners maintained flood insurance or filed claims, and only those structures that were "substantially damaged" (i.e. more than 51% damage exceeding the value of the improvement) were recorded by municipal protocol. Figure 16 maps the location of the reported Substantially Damaged Structures, which are shown to be distributed throughout much of the Borough.

Figure 16 shows that a significant number of homes classified as substantially damaged are located on West Point Island. Another cluster of substantially damaged structures are located in the lagoon communities along Bay Beach Way, Byrn Mawr Avenue and Haddonfield Avenue. A band of substantially damaged structures also extends along the entire central corridor between the bayfront and Grand Central Avenue. These areas were subject primarily from flooding attributable to Barnegat Bay.

Figure 16 also illustrates a band of substantially damaged structures in the southern area of the Borough that extends from the oceanfront to the bayfront. This area experienced significant damage from the Atlantic Ocean tidal surge, after storm waves overcame the dune system. In addition to flooding and wave action, damage to structures occurred from debris that was driven by the storm surge. Additional structures

Legend

- Homes With Substantial Damage
- Borough Boundary

Note:
Substantially damaged (more than 51% of home value).

Sources:
Substantial Damage Data, Borough of Lavallette, 2014
Ocean County Parcels, State of New Jersey
Composite of Parcels Data, 2014
ArcGIS World Imagery Service Layer

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SUBSTANTIALLY DAMAGED STRUCTURES
Borough of Lavallette
Ocean County, New Jersey

Drawn By: ML	Scale: 1" = 1,000'	Project No. 02424.016
Chk'd By: DM	Date: 9/30/2014	Figure No. 16

Path: P:\02424\0016\DWGs\ESRI\Y-GIS\Maps\Fig16_SubstantiallyDamagedStructures_Lavallette_20140930_00.mxd

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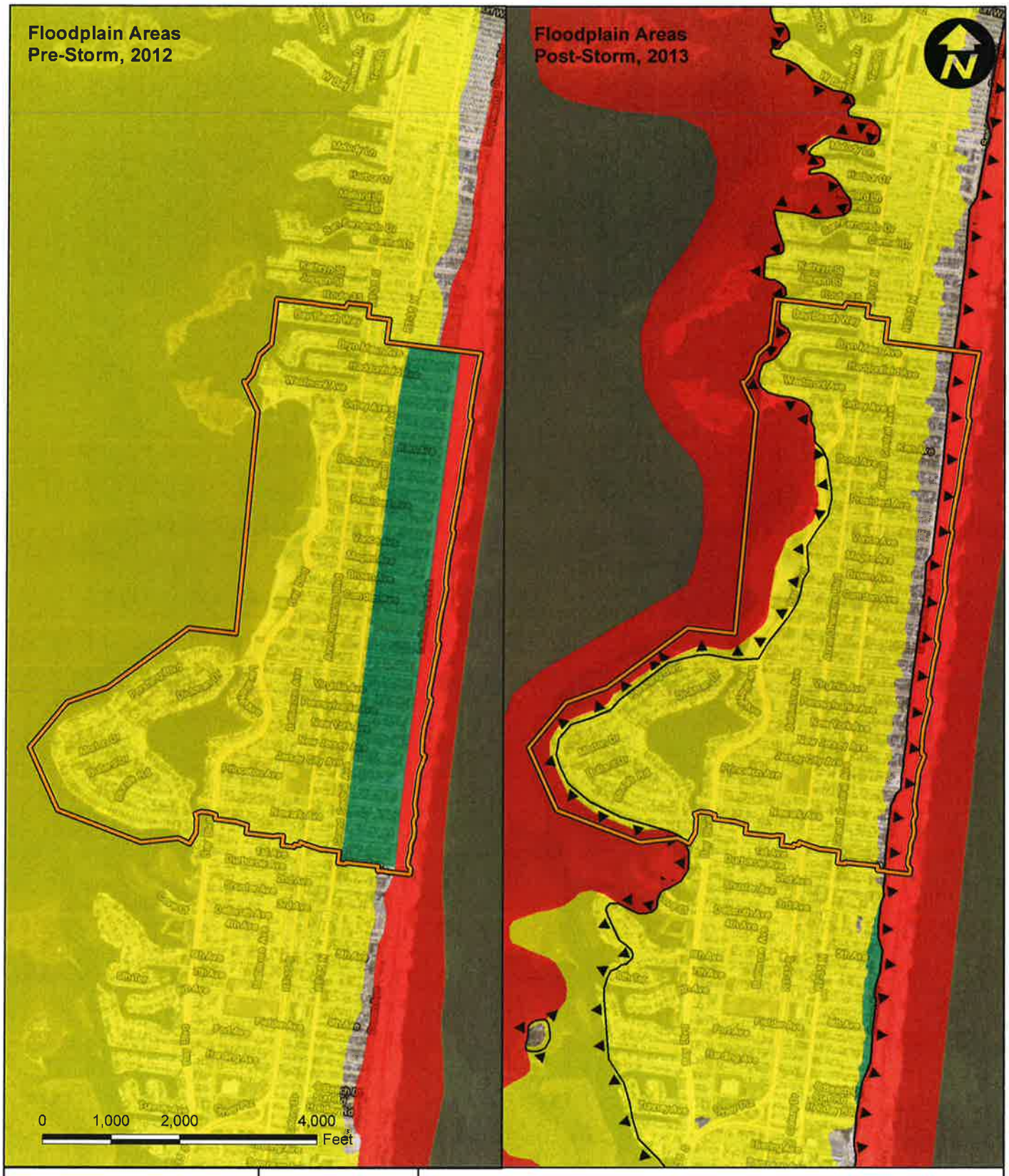
MUNICIPAL FACILITY MAP
Borough of Lavallette
Ocean County, New Jersey

Sources:
Ocean County Department of Planning, 2014
New Jersey Office of Information Technology (NJOIT), Office of Geographic Information Systems (OGIS), 2014.
ArcGIS World Imagery Service Layer

Drawn By: EB	Scale: 1" = 1,000'	Project No. 02424.016
Chk'd By: DM	Date: 9/30/2014	Figure No. 17

Path: P:\02424\0016\DWGs\ESRI\Y-GIS\Maps\Fig17_MunicipalFacility_20140410_00.mxd



Legend

- Borough Boundary
- Limit of Moderate Wave Action
- Flood Zone AE
- Flood Zone AO
- Flood Zone VE

Sources:
The National Flood Hazard Layer (NFHL), 2012
Preliminary Work Map Data, 2013
(NJOIT), Office of Geographic Information Systems (OGIS), 2014
ArcGIS World Imagery Service Layer

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FLOOD HAZARD AREAS
Borough of Lavallette
Ocean County, New Jersey

Drawn By: EB	Scale: 1" = 2,000'	Project No. 02424.016
Chk'd By: DM	Date: 9/30/2014	Figure No. 18

Path: P:\02424\0016\DWGs\ESRI\Y-GIS\Maps\Fig18_FEMA_20140331_00.mxd

that experienced substantial damage were located on the oceanfront behind dunes that eroded during the storm and allowed impact by storm surge, or were near public access breaks in the dune.

The area with lowest density of damaged properties consists of the eastern half of the blocks north of Brown Avenue (the approximate north-south mid-point of the Borough) and east of Grand Central Avenue. This area of the Borough has relatively higher ground elevation, and was sheltered by dunes that, although substantially eroded, remained intact throughout the storm. The higher elevation reduced the potential for bayside flooding, and the dune system mitigated the effect of ocean tidal surges and wave action.

Another tabulation of damage in the Borough is contained in the Ocean County 2014 All Hazard Mitigation Plan, which includes the following statistics for Lavallette (through July 31, 2013):

TABLE 1- LAVALLETTE STORM LOSS DATA	
Policies in Force:	2,154
Number of Closed Paid Losses:	1,742
Amount of Closed Paid Losses:	$104,026,720
Total number of Repetitive Loss Events:	139
Total Repetitive Loss Payments:	$5,351,318
(Source: Ocean County Hazard Mitigation Plan Table 4.3.5-3 Summary of NFIP Policies, losses and repetitive loss properties through July 31, 2013 Lavallette Borough)	

4.2 Damage to Municipal and Public Facilities

Superstorm Sandy damaged and destroyed multiple public facilities and buildings that the Borough will repair and rebuild. Among the damaged structures were the police station/municipal complex and the lifeguard headquarters that were subsequently demolished. The municipal complex is currently under construction and the Borough is making plans to reconstruct the lifeguard headquarters on the same lot at Philadelphia

Avenue. On the bayside, there has been significant damage to parks, accessory park buildings, playground equipment, athletic fields/courts, fishing docks, and boat launches. Additionally, although privately owned, the Lavallette Yacht Club on Swan Point sustained considerable damage and much of the watercraft was dispersed throughout the area causing damage to surrounding properties and structures. Although cleanup has occurred and some repairs have been made, there is still much repair and reconstruction to improve these recreational areas. The location of municipal facilities is identified on Figure 17.

In addition to municipal facilities and buildings, infrastructure was damaged or destroyed. State Highway Route 35 was severely undermined by flood waters, and severe impacts occurred to such infrastructure as gas mains and distribution lines, and water and sewer lines as well as damage to stormwater systems. Electrical distribution lines were also impacted by the storm. Electrical power was turned off and crews from throughout the country came to New Jersey to help restore the electrical grid and distribution systems. Gas service was turned off at the meter, until necessary repairs were made to ensure the integrity of the system. New Jersey Natural Gas company has replaced or is currently replacing its main gas distribution system throughout the barrier island in concert with the totally reconstruction of State Highway 35 (Grand Central Avenue through Lavallette). The JCPL Electrical Substation is located in an area that was affected by the storm, but FEMA data does not indicate the Substation was damaged.

It should be noted that Lavallette was placed under a mandatory evacuation order prior to the storm, and remaining residents were evacuated after the storm, with access to Lavallette restricted to those who obtained permits to enter the Borough during specified time periods. This emergency order was in place for the months of November and December 2012. Once residential access was allowed, electrical, gas and water service was restored at each residential property only once it was deemed safe to do so.

The following statistics were published in the Ocean County Hazard Mitigation Plan for Lavallette:

TABLE 2-STATISTICS FOR DAMAGE TO PUBLIC FACILITIES	
Parcels in Special Flood Hazard Area:	2,722
Total Parcels in Municipality:	2,982
Percentage in Special Flood Hazard Areas:	91.28%
Value of Improvements in Special Flood Hazard Areas:	$439,897,610
Total number of critical facility in Special Flood Hazard Area:	10 (most in Ocean County)
(Source: Ocean County, HMP Table 4.3.5-7 Number of Parcels and Critical Facilities in Special Flood Hazard Area)	

4.3 Damage to the Beach and Dunes

The dune system and beach berms are the only defense against storm-driven ocean waves in Lavallette, and therefore maintenance of the dunes is important to protect the land uses located west of the dunes. Along the oceanfront, the municipality had constructed over the years a substantial primary and secondary dune system. Dunes have two functions: one to keep beach sand in place, and secondly to provide some level of protection to the upland area behind the dune areas from ocean flooding. The degree to which the dunes were an effective barrier to coastal flooding varied, and was largely dependent upon the elevation of the adjacent land areas. Existing dune heights vary, with the top of dunes between the beach berm and the developed area of Lavallette having generally the highest topographic elevations in the Borough. Storm-related damage areas are generally associated with wave and wind impacts. In some areas, the foredune was eroded, however the dune did not totally fail and the homes to the west of the dunes did not suffer catastrophic damage. In other areas including locations where the dune heights were lower or in the vicinity of beach access points at street ends, the ocean waves were able to breach or overtop the dunes, leading to very significant damage to structures. At some street ends, significant scouring behind the dunes in the wave overwash area was noted, and pavement and sand was carried away

by wave action, substantially lowering elevations and exposing sub-structures and pile foundations of buildings. Significant damage to structures also occurred in areas where the wave action carried pieces of the boardwalk and other debris into the residential area, and the boardwalk debris impacted residential structures.

4.3 Photo-documentation of Damages

In the days immediately following Superstorm Sandy, employees of the Borough of Lavallette conducted visual assessments and photo-documentation of damages to properties and municipal facilities across the entire borough. Photographs that are representative of damages to general areas of the borough are provided in Appendix A.

5.0 RULES AND POLICIES GOVERNING LAVALLETTE'S LAND USE AND DEVELOPMENT

Lavallette is located on a barrier island bounded by the Atlantic Ocean and Barnegat Bay. Given its location, the Borough has many layers of regulatory jurisdiction over its land usage ranging from Federal Flood Programs to the State's Coastal Zone Management Program and Policies, including Coastal High Hazard and beach and water policies, to Ocean County's oversight of its county road system, and lastly, to Lavallette's own Master Plan and Land Use Ordinances.

5.1 Federal Policies

The federal Coastal Zone Management policy is administered by New Jersey Department of Environmental Protection through its Coastal Area Facility Review Act (CAFRA), Flood Hazard Area, and Waterfront Development permitting programs. The Federal Emergency Management Agency (FEMA), although not a regulatory entity, greatly influences all development through its flood insurance program. As part of this program, FEMA publishes FIRM (Flood Insurance Rate Maps) that identify flood risk in the municipality, designating areas subject to 100 year and 500 year statistical flood probabilities. Generally used as the benchmark for design, the 100 year flood area is defined as the area that will be inundated by a flood event having a 1-percent chance of being equaled or exceeded in any given year. This 1-percent annual chance flood is also referred to as the base flood. FEMA further breaks down special flood hazard areas into zones based upon the type and severity of flooding for the area. This study discusses the A-zone which is the area that would be covered by floodwaters from the base flood and the V-zone which is the area along coasts that are subject to inundation by the base flood with additional hazards associated with storm-induced waves. Properties located in the special flood hazard areas can mitigate their risk of flood damage through the purchase of federally-backed flood insurance, with rates determined by specific design and building standards that minimize flooding impacts. The flood insurance rates are also influenced as to whether a municipality meets the Community Rating System requirements, which is determined through how stringently flood reduction and enforcement measures are applied, particularly through the community's Land Use approval process, and adherence to flood prevention building code enforcement.

Lavallette participates in the Community Rating System program, and residents are eligible for reduced rates because of this adherence.

5.1.1 Post Sandy Federal Flood Mapping

Prior to Superstorm Sandy, the developed portion of the Borough was mapped within Zone A with only the beach and some Ocean front properties included in the V-Zone. The FEMA FIRM maps for New Jersey were already in the process of being re-evaluated prior to the landfall of Superstorm Sandy. Although actual impacts from Sandy did not figure per se into the updated model used for forecasting storm impact, programmatically FEMA re-evaluated their analyses and mapping and determined that hazards from wave action potentially exist in all tidal areas, and expanded areas that potentially could experience a breaking wave impact of 3 feet or greater into the back bay areas of the Barnegat Bay. The current FEMA Preliminary Flood Insurance Maps, which should be noted are not yet final, now indicate that the bayside portion of the island is located in a V-Zone and provide a limit of moderate wave action along the bayside beach and land areas. Additionally, the V-Zone on the Oceanside of the borough has been slightly increased and a limit of moderate wave action has been indicated. Further, the mapping includes an area along the Ocean block for the entire length of the Borough that is not in a flood hazard area. See Figure 18 for a comparison of the Pre-Sandy and Post-Sandy flood hazard area mapping.

5.2 State of New Jersey

The New Jersey Department of Environmental Protection overlays land use authority through various permits and programs, including Coastal Area Facility Review Act (CAFRA) permits, Flood Hazard Area permits, and Waterfront Development Permits. Although CAFRA and Waterfront Development apply only to certain public and private structures, Flood Hazard regulations apply to all structures located within a designated Flood Hazard Area. The State adopted FEMA's current working FIRM map as the best available data to fix flood elevations, and has also adopted a standard of +1 foot above FEMA's minimum floor elevation as its standard. New Jersey Department of Community

Affairs adopted NJDEP's Flood Hazard elevation within its building requirements. In addition UCC code mandates various flood prevention construction standards to which Lavallette adheres.

CAFRA also has policies, if applicable, that minimize impacts to such sensitive areas as beaches, dunes, water areas, wetlands, and does not allow the placement of new structures in Coastal High Hazard areas (i.e. V zones). State policy allows for the replacement in kind of structures that have been destroyed or removed. If a structure is rebuilt, adherence to minimum floor elevations must be followed, regardless of its prior elevation.

5.3 Ocean County

5.3.1 Master Plan

Although Ocean County does not have direct land use regulatory authority outside of impacts to its County Roads and drainage structures, Ocean County nonetheless adopted a master plan in 2011 that outlines its vision for the overall development of the County. This Master Plan is reflective of the resources and land uses issues of regional concern.

While the Ocean County Master Plan does not indicate specific development projects within Lavallette, it does include the following strategies that would be consistent with Post Sandy Planning:

- **Protection of natural resources and environmentally sensitive areas. These areas include protection of wetlands, floodplains, aquifer recharge areas, and lands directly adjacent to bays and estuaries. The plan includes strategies for government agencies to purchase and protect such areas, as well as intent to establish standards that avoid development within such areas.**

The intent to preserve and protect environmental resources, especially those that provide for drainage and for flood storage, would be consistent with Post-Sandy Planning.

- **Specific discussions of storms and flood impacts reference the New Jersey Flood Hazard Area Control Act Rules**

  Given the Post-Sandy revisions made to the Flood Hazard Area Control Act Rules, this SRPR concludes that this portion of the Master Plans is consistent with Post-Sandy Planning.

- **Stormwater Management Strategies that include restoration of County stormwater basins, encouraging decreases in impervious surfaces, supporting State Low Impact Design Techniques, and educating the public about the importance of stormwater management, floodplains, and wetlands**

  The County's measures for stormwater management would be expected to help in reducing some flooding and flood impacts and in protecting areas that store flood waters. As such, these measures would be consistent with Post Sand Planning.

5.3.2 Ocean County Multi-jurisdictional All Hazard Mitigation Plan

The County has drafted a comprehensive Multi-jurisdictional All Hazard Mitigation Plan in accordance with FEMA Standards reflecting Lavallette plan for All Hazard Mitigation Within this Plan, Lavallette has either completed or is in the process of implementing the following specific community actions:

- Beach Replenishment in conjunction with Army Corp of Engineers
- Implementation and Enforcement of new Building Codes
- Participation in National Flood Insurance Program
- Elevation of Community Buildings and Infrastructure

- Work toward Increasing ratings under the Community Rating System
- Increased public participation, education and awareness

The above is an overview of the plans and their consistency with planning for future storm and flooding events.

5.4 Borough of Lavallette

5.4.1 Master Plan and Master Plan Re-Examination

This Study included review of "Master Plan for the New Millennium 2000", adopted November 22, 1999 (prepared by O'Donnell, Stanton and Associates, Inc., Toms River, New Jersey) and the "Master Plan Reexamination for the Borough of Lavallette", adopted December 13, 2006.

Following is a list of Goals and Objectives from these Plans and a discussion of their potential effects on Post-Sandy Planning efforts:

- **Preservation of natural attributes by protecting ocean-side and bayside beachfronts from despoliation; including consideration of construction of bulkheads to protect all oceanfront properties**

  Preservation of natural attributes and construction of bulkheads or other protection structures would be consistent with goals to reduce the impacts of storm damage, especially that of flooding. This SRPR notes that current plans for construction of a significant dune and beach berm system by the U.S. Army Corps of Engineers obviates the consideration of bulkheading for oceanfront structures.

- **Preservation and development the bayside beach and recreation area to maximize its full potential including development of aerobic exercise path and construction of a boardwalk along the bayfront once the beach is stabilized**

It should be noted that this goal was listed in the Master Plan, but removed during the 2006 re-examination that now indicates that preservation of these areas in a more natural condition is a desired effect. Given the level of flooding and damage that occurred in the bay area, avoidance of additional development and or structures that would be subject to damage along the bayfront is consistent with Post-Sandy Planning goals.

- **Encourage, at all levels of municipal, county, state and federal government, the enhancement of our beaches through beach renourishment programs**

  This item is consistent with Post-Sandy Planning efforts and will be effectuated by the Army Corps of Engineers Beach Replenishment Program.

- **Prepare and adopt new Land Use and Zoning Ordinances that include provisions for site plan review, streamlined procedures for modernizing nonconforming buildings, and more precise, less ambiguous terms; uniformly enforce all codes. Prepare and adopt an *Official Map***

  Requirements for site plan review and enforcement of codes will help the Borough to ensure that land uses and structures are placed and maintained in a way to minimize damage from future storms. It should be noted that, subsequent to adoption of the Master Plan, the Official Map was adopted.

- **Develop standards for impervious lot coverage that include prohibiting sheet plastic in lawns, gardens, etc. to aid percolation in all areas and zones of the Borough.**

  Limiting lot coverage and impervious surfaces would be consistent with goals of allowing for as much ground infiltration as possible, thereby limiting runoff. The Borough has since adopted a lot coverage ordinance.

- **Avoid commercialization of boardwalk , bayfront and recreation areas**

  This goal would limit the ability to construct additional structures and other infrastructure that would be damaged during storm events.

Given the limited amount of developable land and the "mature nature of the Borough", the Master Plan does not propose any large scale development or redevelopment that could be impacted by or could impact storm event flooding. Overall, any discussions of flood hazard areas locations and elevations and any mapping indicating such data, will need to be revised to reflect Post-Sandy flood hazard V-Zones and A-Zones and corresponding elevations.

5.4.2 Land Use Ordinances and Building Codes

Subsequent to Superstorm Sandy, the Borough of Lavallette reviewed Land Development Ordinances and made several revisions to ensure that Ordinances provide for a higher level of protection for future storm events. The following is a summary of some of the Borough's Ordinances that were put in place post-Sandy to help toward flood prevention and flood mitigation as the municipality rebuilds its public and private structures and facilities:

Ordinance 1117 Flood Hazard ABFE - Revised February 2013

This Ordinance was revised to include Advisory Base Flood Elevations and indicates that new construction and substantial improvements must be elevated one foot above the base flood elevation or ABFE, whichever is more restrictive. It further includes provisions for non-residential structures to resist hydrostatic pressures and effects of buoyancy and to flood proof structures. The Ordinance also includes provisions that require anchoring of structures, use of flood damage resistant materials, measures to avoid/minimize utility damage by flood waters, limitations for use of enclosed areas beneath the flood hazard elevation including

the use of breakaway walls and the requirement to provide for entry and flow of floodwaters.

This Ordinance includes language expressly prohibiting alteration of sand dunes within Zones VE and V on the community's DFIRM.

Ordinance No. 2013-03 (1118) Amending the Zoning Code regarding certain Provisions for Bulk Requirements for Height and Lot Coverage in Flood Hazard Zones

This Ordinance was one of the first major responses addressing overall development in Flood Hazard Zones. This ordinance helped establish a uniform way of reconstruction in light of the new NJDEP Flood Hazard regulations and New Jersey Department of Community Affairs construction codes. It redefined base flood elevations in terms of the best available data being released by FEMA as part of their new flood mapping initiatives, and also clearly defined new structural elevations and flood proofing/prevention measures.

Ordinance No.2013-08 (1123) Flood Hazard Areas

This Ordinance is a companion to Ordinance No 2013-03 (1118) in that it clearly defines and adopts the model ordinance that was put forth by the NJDEP for construction in Flood Hazard Areas and Special Flood Hazard Areas. Specifically, it requires compliance with the applicable requirements of the Uniform Construction Code (NJAC 5:23) in regards to:

- Anchoring of structure;
- Construction materials and methods
- Utilities, including their placement;
- Subdivision proposals; and
- Enclosure openings.

This ordinance also sets forward specific special flood hazard standards including a requirement that the lowest floor of any new residential construction be at least one foot above the required FIRM map flood elevation, and that new nonresidential construction also be elevated in a similar manner or be flood proofed. This ordinance also addresses construction in Coastal High Hazard Areas (V or VE Zones) that are subject to wave impacts or tidal surges with high velocity waves.

Ordinance No. 2013 - 7 (1122) Fences at Oceanfront – Revised February 2013

This ordinance establishes that fences on oceanfront properties, other than snow fencing, shall be no higher than 48 inches and shall have specific sized openings of no less than 1.5 inches.

Ordinance No. 2013 - 03 (1118) – Building Height – Revised February 2013

This ordinance revises the method for measuring building height and includes provisions specific to the elevation above the ABFE of existing structures, and also revises lot coverage areas that may be necessary to accommodate elevation of buildings and related improvements for ingress/egress.

Ordinance No 2014 - 01 (1126) - February 2014

This ordinance repeals all existing ordinances relating to construction on Oceanfront properties.

Ordinance 2013-09 (1124) – Attached Garages and areas Above Garages

This ordinance establishes that attached garages may not be used as living space and limits wall height and area below a gable, hip, or gambrel roof.

Ordinance No. 2013 - 05 (1120) – Building Relocation – May 2013

Language was added to the Ordinance to provide specific methodology and direction relating to moving or relocating a building, and also indicates specific procedures for the Borough to review and approve all such activities.

6.0 SUMMARY OF POST-SANDY RECOVERY AND PLANNING RESPONSES

Planning Integration and Cross-agency Coordination

The Borough of Lavallette has proactively examined its Land Use Ordinance in light of a post-Sandy reality. The Borough has updated its Land Use Ordinance, and has incorporated the higher standards put forth by the NJDEP through its Flood Hazard Permit, Coastal Area Facility Review Act (CAFRA) permitting standards, and Waterfront Development Permit requirements. In particular, the Borough has adopted the higher elevation standards, and has embraced the newest best available data in its construction standards for rebuilding. The Borough has also adopted a policy of using the most restrictive FEMA mapping designations until the final flood hazard area maps are published.

In addition, the building department in the issuance of construction permits has adopted the more stringent building code standards put forth by the NJ Department of Community Affairs, both for public and private construction projects in the Borough

Mitigation project identification and funding

One of the greatest threats post Sandy remains in the threat of flooding from coastal storms. One of the major projects that the Borough has signed on to is the Army Corps of Engineers Beach Replenishment Program. Details of the plan are still being developed, but will include beach replenishment and dune construction to safeguard the entire Borough from coastal storms. The work is being funded by the Army Corps of Engineers and the State of New Jersey. The Borough website maintains an active internet link to provide maximum public input and information regarding the Program. The survival of properties located behind dunes that were not overcome by Sandy tidal surges and waves indicates the efficacy of a substantial dune system in mitigating storm damage.

Another major project underway in the Borough is the reconstruction of State Highway 35, which was severely damaged by Superstorm Sandy. As part of this project, major utility lines are being replaced and are being reconstructed in a more resilient manner. In addition, to mitigate against stormwater flooding, major pump stations are being constructed along the Barrier Island

that will not only remove floodwaters, but will also cleanse this water before discharge into the Barnegat Bay.

Health effects mitigation

The greatest threat to human health post Sandy was the threat to swimmers, boaters and structures from water borne debris. In response, the Borough agreed immediately after Sandy to participate in the State contract for debris removal throughout the Borough that resulted from flooding of private structures. This immediate response minimized the amount of uncontrolled debris from homes that could have been left to fester and cause human health effects. This effort was coordinated by the State and funded by FEMA as it was deemed an immediate threat to life, public health and safety. It has been deemed as complete.

Hazard Mitigation Plan (HMP) Evaluation, Measures/Teams

The Hazard Mitigation Program of most significance to the Borough is FEMA's Hazard Mitigation Assistance Program. Lavallette had submitted a Notice of Intent to participate in this program on 2/5/13. To facilitate this participation, Lavallette passed Flood Prevention Ordinance and adopted construction standards to allow homeowner to apply to mitigation dollars from FEMA.

Preparedness Initiatives

The Borough has aggressively engaged in the roll out of a Community Notification System including a reverse 911 notification system to its residents. The Borough has expanded its informational content of its website in an effort to increase public awareness and to provide the most current information to its citizens, updating its website daily if necessary. In addition, the Borough has provided links to appropriate County, State and Federal entities to assist its residents in accessing information and if available, funding to prepare against the next disaster.

Prevention of water-borne Debris damage

The Borough in immediate response to Sandy worked with the NJDEP to engage the State Contractor in removal of water-borne debris, including vehicles, boats, structures and other materials that had washed into Barnegat Bay and lagoon areas as a result of the storm. The Borough also aggressively removed material that had the potential to wash either into the Atlantic Ocean or Barnegat Bay. This activity commenced immediately after the storm and was completed over a 10 month period and was funded by FEMA. The debris and sediment that was removed was strictly related to Sandy impacts as per FEMA requirements.

Electrical system damage mitigation/fire-prevention

The Borough has adopted ordinances with the goal of prevention of flood hazards through elevation and other flood prevention measures. Prevention of inundation of electrical systems will also lessen the potential for fires resulting from said inundation.

Shoreline Protection

Lavallette is bounded to the east by the Atlantic Ocean and to the west by the Barnegat Bay and other tidal areas. Along the oceanfront, the municipality had constructed over the years a substantial primary and secondary dune system. Dunes have two functions: one to keep beach sand in place, and secondly to provide some level of protection to the upland area behind the dune areas from ocean flooding. The degree to which the dunes were an effective barrier to coastal flooding varied, and was largely dependent upon the elevation of the adjacent land areas. Existing dune heights vary, with the top of dunes between the beach berm and the developed area of Lavallette having generally the highest topographic elevations in the Borough. Storm-related damage areas are generally associated with wave and wind impacts. The USGS performed pre and post Sandy evaluations along the New Jersey coastline of both the beach and dune areas. Like most of the barrier island upon which Lavallette is situated, dunes structures were impacted and beach was lost. This loss is being mitigated through the Army Corps of Engineers Beach Replenishment Program, which will also include the construction of dune structures adjacent to Lavallette's beach systems. In addition, the relatively quiet winters and lack of subsequent tropical systems have allowed the re-

establishment of beach areas. The State recovered sand debris, filtered it with debris removal apparatus, and returned recovered sand to the beach. Lavallette also implements a yearly dune maintenance and reestablishment program, and welcomes volunteer groups who also help "replant" the dunes for stabilization.

Beach Access Openings

Post storm evaluations indicated that some flooding and sand deposits were more prevalent on Oceanside streets where public access was provided through the dunes. In rebuilding the dunes, the Borough has indicated that the number of accesses through the dune has been minimized and that all accesses have been angled to minimized direct storm surge through the access areas and onto adjacent streets. It should be noted that many of the beach access openings at the northern end of the municipality are higher in base elevation than those in the southern end. The proposed Army Corps of Engineers Beach Replenishment Program will raise the beach and dune elevations, and beach access walks will be constructed consistent with the new beach and dune profiles.

Beach dimensions and scalloping

The relatively mild winters and lack of severe ocean storms has allowed for a certain amount of natural beach replenishment through natural systems. In addition, sand that had blown off the beach was manually placed back through the aggressive program of recapture implemented immediately post Sandy in concert with the NJDEP. The USGS has documented previously that a substantial amount of sand was lost due to the storm, but will be replaced through the below identified Army Corps of Engineers Beach Replenishment Program.

Army Corps of Engineers Beach Replenishment Program

The US Army Corp of Engineers, in partnership with the NJDEP, has developed the Manasquan Inlet to Barnegat Inlet Beach Replenishment Project that includes the oceanfront beaches in Lavallette. The intent of this project is to rebuild beaches in accordance with a current USACOE plan and to provide a three year maintenance cycle to ensure beaches continue to meet the dimensions indicated in the plan. The plan also calls for the construction of a significant dune

system throughout the project area. The Borough is actively engaged with the NJDEP Coastal Engineering group who is coordinating the implementation of this project along with the Army Corps of Engineers. The comment period for this project and its design is open until October 30, 2014. It is anticipated that this project will be constructed in an orderly fashion from the Manasquan Inlet south to Lavallette and beyond, with a 2015 construction start.

ROUTE 35 (Grand Central Avenue) Reconstruction

One of the largest public projects currently underway in Lavallette addressing post Sandy conditions in the Borough is the total reconstruction of State Highway 35. This roadway is split into two distinct roadways, with two lanes with associated shoulders and parking northbound and two lanes with shoulders southbound. As part of the reconstruction on Route 35 and replacement of underground utilities, including gas mains, and water/stormwater systems, project will include "Complete Street" components including bicycle and pedestrian accommodations. Eighty percent of the project is being funded by the federal government with Sandy emergency relief funds, with the balance being paid by the State of New Jersey. In addition to the new underground utilities, including new gas lines being installed by New Jersey Natural Gas Company and new surface pavement, water quality treatment systems are being constructed in Lavallette to filter and purify stormwater prior to discharge into Barnegat Bay.

7.0 RECOMMENDATIONS AND PRIORITIES FOR ADDITIONAL ACTIONS

As documented in this report, the Borough sustained considerable damage to residences and public infrastructure/facilities. Although the Borough has made considerable progress in restoring and rebuilding, there are still many projects to be undertaken and much work to be done. In order to proceed with the required efforts, it is likely the Borough will require additional assistance, including funding sources, to complete the process and provide mitigation for future storm events.

The Borough has also placed much effort in planning for and mitigating the effects of future storms. However, subsequent to Superstorm Sandy, such planning efforts are a work in progress as studies of the storm and analyses of the damage caused by the storm progress. The Borough has implemented substantial administrative and structural measures to mitigate future storm damage, but this study reveals there are additional projects and mitigation measures that should be analyzed and funding to be sought to protect the Borough in future storm events. For this report, the recommendations and priorities are organized into three categories:

- Actions described in the Ocean County Multi-jurisdictional All Hazard Mitigation Plan
- Borough of Lavallette Master Plan, Land Use Element and Application Processes, and
- Post Sandy Planning and Capital Improvement Grant Opportunities.

The Priority for implementing each of the items described below is characterized as high due to the requirement to manage risk and the finite timeframe associated with grant opportunities; no low priority items have been identified. A timeframe for implementing each item is also described, ranging from 1 to 5 years.

Actions described in the Ocean County Multi-jurisdictional All Hazard Mitigation Plan

The Borough has participated in the Ocean County Multi-jurisdictional All Hazard Mitigation Plan (HMP). As described in Section 3.0, Risk Assessment, the Borough is vulnerable to oceanfront coastal erosion and flooding from Barnegat Bay, and significant storms, including tropical cyclones and Nor'easters, will amplify the negative effects to the land uses and critical infrastructure. The Borough of Lavallette has identified 8 actions for inclusion in the HMP.

Copies of the Action Item descriptive tables are provided in Appendix B, and a summary of each action item is presented below:

- **Action 6.4.21-1: Elevation project for 663 homes in Lavallette Borough**
  - Elevation project for 663 homes to build to higher standards and elevation that will mitigate impact of flood related hazards while maintaining residents in community
  - Funding sources: HMGP, RFC, and FMA. For 25% local match, in-kind services, Community Development Block Grant (CDBG) and NFIP Increased Cost of Compliance (ICC)
  - Priority: High
  - Timeline: 1 year

- **Action 6.4.21-2: Elevation project for municipal buildings housing essential Services**
  - Elevation project for municipal buildings housing essential services to mitigate flood related hazards
  - Funding sources: Lavallette Borough administration; HMGP, RFC, and FMA. For 25% local match, in-kind services, Community Development Block Grant (CDBG) and NFIP Increased Cost of Compliance (ICC)
  - Priority: High
  - Timeline: 1 year

- **Action 6.4.21-3: Continue to participate in the NFIP**
  - Continue to participate in the NFIP to support pro-active floodplain management that will protect property from flood related hazards, clearly inform property owners about the risks of being in and near the SFHA, and promote flood insurance
  - Funding sources: Homeowners
  - Priority: High
  - Timeline: 5 year

- **Action 6.4.21-4: Continue to enforce building codes**
    - Continue to enforce building codes to require building, renovations, and re-building meets or exceeds the Uniform Construction Code thus protecting homes from risk related to hazards including flooding, fire, wind, earthquake, and winter storm
    - Funding sources: Not applicable
    - Priority: High
    - Timeline: 5 years

- **Action 6.4.21-5: Continue to coordinate with USACE and surrounding towns on beach replenishment issues**
    - Continue to coordinate with USACE and surrounding towns on beach replenishment issues to protect a natural resource that also protects property and is a community and economic resource
    - Funding sources: U.S. Army Corps of Engineers
    - Priority: High
    - Timeline: 5 years

- **Action 6.4.21-6: Adopted Army Corps plan for beach replenishment project**
    - Adopted Army Corps plan for beach replenishment project to protect a natural resource that also protects property and is a community and economic resource
    - Funding sources: U.S. Army Corps of Engineers
    - Priority: High
    - Timeline: 5 years

- **Action 6.4.21-7: Continued participation in CRS Program**
    - Continue participation in CRS program and consider upgrading to the next class level to complete pro-active floodplain management and assist residents with flood insurance costs
    - Funding sources: Lavallette Borough, HMGP, FEMA
    - Priority: High
    - Timeline: 5 years

- **Action 6.4.21-8: Continue distribution of newsletter to Lavallette Borough residents**
    - Maintain, improve, and expand education and awareness programs to provide effective and relevant information to community members
    - Funding sources: Lavallette Borough
    - Priority: High
    - Timeline: 5 years

Review and update of Borough of Lavallette Master Plan, Land Use Element and Application Processes

The "Master Plan for the New Millennium 2000", was adopted November 22, 1999 (prepared by O'Donnell, Stanton and Associates, Inc., Toms River, New Jersey) and the "Master Plan Reexamination for the Borough of Lavallette", was adopted December 13, 2006. The Borough has also enacted numerous new ordinances subsequent to Superstorm Sandy to ensure that these ordinances provide for a higher level of protection for future storm events. The new and revised ordinances included measures for compliance with the applicable requirements of the Uniform Construction Code for various aspects of construction in flood hazard areas; modified land use standards including revision of the method for measuring building height for raising structures above flood hazard elevation; and additional provisions for construction in oceanfront areas and coastal high hazard flood areas (V-zones). A summary of these new ordinances that respond to post-Sandy issues are described in Section 5.4 of this SRPR.

The Borough of Lavallette Master Plan, Land Use Element and Application Processes are subject to further re-examination to reflect updated flood hazard area elevations, and identify recommendations that enhance flood resiliency of residences and businesses. Updates can include current mapping of land uses and municipal facilities. The Master Plan re-examination can also reflect current flood hazard delineation for v-zones and elevation, and reinforce specific planning measures and zoning standards for flood areas and coastal high hazard areas. In addition, while the borough has already enacted measures to facilitate rebuilding of flood-damaged properties, the building permit application processes can be reviewed to identify additional areas for management of permit review, control and enforcement, including use of

computer applications and devices for management and retrieval of permits and relevant information.

The numerous measures implemented by the Borough of Lavallette to enable reconstruction of damaged properties and update land use controls to address revised flood maps and coastal hazards were immediate, high priority actions. The measures described above are defined as near-term (1 year) and high priority due to the current requirement to complete the 6-year re-examination of the Master Plan.

Post Sandy Planning and Capital Improvement Grant Opportunities

Much of the initial focus of the first and second tranches of Post-Sandy related planning and capital improvement grants have focused on direct aid to impacted structures and primary homeowners. It is recommended that a planning study be conducted for resiliency and capital improvement projects that specifically could be eligible under State and Federal Programs. In addition, the Borough should continue to work to identify projects that may be eligible for funding under the federal Community Development Block Grant Program (CDGD) and other programs administered both by New Jersey Department of Community Affairs and Ocean County.

In addition, the Borough Capital Improvements Plan can be updated to identify projects and actions to mitigate flood risk, increase resiliency, and alleviate storm-related impacts. The identification of grant opportunities is high priority, due to the timing of grant programs and availability of funding. The timeline for the identification of grant opportunities is near-term (1 year).

APPENDIX A

Site Photographs

BOROUGH OF LAVALLETTE BEACHFRONT AFTER SANDY

BOROUGH OF LAVALLETTE BEACHFRONT AFTER SANDY

BOROUGH OF LAVALLETTE DAMAGED STRUCTURES ROUTE 35 CORRIDOR

Northern Section – Route 35 North and President Avenue

Central Section – Route 35 South and Washington Avenue

BOROUGH OF LAVALLETTE DAMAGED STRUCTURES ROUTE 35 CORRIDOR

Southern Section – Route 35 North and Newark Avenue

BOROUGH OF LAVALLETTE DAMAGED STRUCTURES
OCEANFRONT

Oceanfront Northern Section

Oceanfront Central Section

BOROUGH OF LAVALLETTE DAMAGED STRUCTURES
OCEANFRONT

Oceanfront Southern Section

BOROUGH OF LAVALLETTE BAYSIDE DAMAGE

Northern Section – Bond Avenue

Central Section – Dickman Drive

BOROUGH OF LAVALLETTE BAYSIDE DAMAGE

Central Section – Lavallette Avenue

Southern Section – Dover Avenue

APPENDIX B

Action Item Describe Tables

6.4.21. Lavallette Borough

Action 6.4.21-1: Elevation project for 663 homes in Lavallette Borough	
Assessing the Risk	
Hazard(s) addressed	Coastal Erosion; Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter; Climate Change
Risk finding	Community is susceptible to both bay flooding and coastal flooding
Describing the Action	
Action category	Structure/Infrastructure Project (Property Protection)
Action type	Elevation
Action description	Elevation project for 663 homes to build to higher standards and elevation that will mitigate impact of flood related hazards while maintaining residents in community
Existing, future &/or NA	Elevates the existing structure to remove it from the floodplain
Evaluating the Action	
Losses avoided (i.e., benefits)	
Cost estimate	$56,809,920
Cost effectiveness (i.e., benefit/cost)	
Technical	Technically feasible.
Political	No adverse political ramifications are expected
Legal	Homes must be elevated in compliance with the new FEMA flood maps once they are finalized.
Environmental	Positively impacts the environment by increasing the permeable surface for each homeowner property.
Social	Does not adversely affect any particular social group. Perceived by the public to be beneficial because of repetitive nature of flooding in the project area.
Administrative capability	Borough has sufficient capacity and experience to administer this action
Local champion	Local champion is the emergency management office that has taken the lead on coordinating the letters of interest for the community.
Other community objectives	
Implementing the Action	
Priority	High
Local planning mechanism	Hazard Mitigation Plan
Responsible party	Lavallette Borough (Emergency Services)
Potential funding sources	HMGP, RFC, and FMA. For 25% local match, in-kind services, Community Development Block Grant (CDBG) and NFIP Increased Cost of Compliance (ICC).
Time line	1 year

Action 6.4.21-2: Elevation project for municipal buildings housing essential services.	
Assessing the Risk	
Hazard(s) addressed	Coastal Erosion; Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter; Climate Change
Risk finding	Community is susceptible to both bay flooding and coastal flooding
Describing the Action	
Action category	Structure/Infrastructure Project (Property Protection)
Action type	Elevation
Action description	Elevation project for municipal buildings housing essential services to mitigate flood related hazards
Existing, future &/or NA	Elevates the existing structures to remove them from the floodplain
Evaluating the Action	
Losses avoided (i.e., benefits)	
Cost estimate	$
Cost effectiveness (i.e., benefit/cost)	
Technical	Technically feasible.
Political	No adverse political ramifications are expected
Legal	Buildings must be elevated in compliance with the new FEMA flood maps once they are finalized.
Environmental	Positively impacts the environment by increasing the permeable surface for each property.
Social	Does not adversely affect any particular social group. Perceived by the public to be beneficial because of repetitive nature of flooding in the project area.
Administrative capability	Borough has sufficient capacity and experience to administer this action
Local champion	Local champion is the emergency management office that has taken the lead on coordinating mitigation projects.
Other community objectives	
Implementing the Action	
Priority	High
Local planning mechanism	Hazard Mitigation Plan
Responsible party	Lavallette Borough (Emergency Services)
Potential funding sources	Lavallette Borough administration; HMGP, RFC, and FMA. For 25% local match, in-kind services, Community Development Block Grant (CDBG) and NFIP Increased Cost of Compliance (ICC).
Time line	1 year

Action 6.4.21-3: Continue to participate in the NFIP	
Assessing the Risk	
Hazard(s) addressed	Coastal Erosion; Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter; Climate Change
Risk finding	Community is susceptible to flooding
Describing the Action	
Action category	Local Plans and Regulations
Action type	Planning Mechanism/Prevention
Action description	Continue to participate in the NFIP to support pro-active floodplain management that will protect property from flood related hazards, clearly inform property owners about the risks of being in and near the SFHA, and promote flood insurance
Existing, future &/or NA	Existing participation in the NFIP
Evaluating the Action	
Losses avoided (i.e., benefits)	
Cost estimate	N/A
Cost effectiveness (i.e., benefit/cost)	
Technical	
Political	Purchase of flood insurance is encouraged in order to support the funding base for claims and reduce overall impact to communities post-flood.
Legal	Flood insurance is mandatory for homes located within zone A, AE, AR, A99, AH, or AO.
Environmental	Does not adversely affect the environment.
Social	Does not adversely affect any particular social group. Perceived by the public to be a good thing because it reduces risk for individual homeowners.
Administrative capability	Township has sufficient capacity and experience to administer this action
Local champion	Local champion is the township departments that help share information about NFIP
Other community objectives	
Implementing the Action	
Priority	High
Local planning mechanism	Municipal codes
Responsible party	Lavallette Borough and borough residents.
Potential funding sources	Homeowners
Time line	5 years

Action 6.4.21-4: Continue to enforce building codes	
Assessing the Risk	
Hazard(s) addressed	Coastal Erosion; Earthquake; Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter; Tornado, Wind Storm; Wildfire; Winter Storm; Urban Fire and Explosion
Risk finding	Ocean County residents are at risk for both natural and man-made hazards to impact their homes.
Describing the Action	
Action category	Local Plans and Regulations
Action type	Planning Mechanism/Prevention
Action description	Continue to enforce building codes to require building, renovations, and re-building meets or exceeds the Uniform Construction Code thus protecting homes from risk related to hazards including flooding, fire, wind, earthquake, and winter storm
Existing, future &/or NA	Existing compliance with National and local building code standards
Evaluating the Action	
Losses avoided (i.e., benefits)	
Cost estimate	N/A
Cost effectiveness (i.e., benefit/cost)	
Technical	N/A
Political	Compliance with building codes is encouraged politically in order to reduce overall impact of natural and man-made disasters on homes and residents.
Legal	Compliance with building codes is mandated legally.
Environmental	Does not adversely affect the environment.
Social	Does not adversely affect any particular social group. Perceived by the public to be a good thing because it reduces risk for individual homeowners.
Administrative capability	Borough has sufficient capacity and experience to administer this action
Local champion	Local champion is the borough that enforces the building codes
Other community objectives	
Implementing the Action	
Priority	High
Local planning mechanism	Hazard Mitigation Plan
Responsible party	Lavallette Borough.
Potential funding sources	N/A
Time line	5 years

Action 6.4.21-5: Continue to coordinate with USACE and surrounding towns on beach replenishment issues	
Assessing the Risk	
Hazard(s) addressed	Coastal Erosion; Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter; Climate Change, Coastal Erosion
Risk finding	Flood risk in community
Describing the Action	
Action category	Local Plans and Regulations
Action type	Planning Mechanism/Prevention
Action description	Continue to coordinate with USACE and surrounding towns on beach replenishment issues to protect a natural resource that also protects property and is a community and economic resource
Existing, future &/or NA	Maintain existing coordination
Evaluating the Action	
Losses avoided (i.e., benefits)	
Cost estimate	N/A
Cost effectiveness (i.e., benefit/cost)	
Technical	Technically feasible.
Political	There is pressure from top government officials such as Governor Chris Christie for homeowners to cooperate with the USACE program and sign the easement for the dunes in order to better protect all the homeowners on the barrier islands.
Legal	Pending lawsuits are expected due to controversy over the easement.
Environmental	No adverse environmental effects from dunes.
Social	Adversely impacts view of many beachfront property owners; private beachfront owners fear that their beaches will become **public** beaches
Administrative capability	Borough has sufficient capacity and experience to administer this action
Local champion	Local champion is the borough emergency management coordinator that has taken the lead on coordinating mitigation within the community.
Other community objectives	
Implementing the Action	
Priority	High
Local planning mechanism	Hazard Mitigation Plan
Responsible party	Lavallette Borough; USACE
Potential funding sources	USACE
Time line	5 years

Action 6.4.21-6:	Adopted Army Corps plan for beach replenishment project
Assessing the Risk	
Hazard(s) addressed	Coastal Erosion; Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter; Climate Change
Risk finding	Flood risk in community
Describing the Action	
Action category	Natural Systems Protection
Action type	Natural Resource Protection
Action description	Adopted Army Corps plan for beach replenishment project to protect a natural resource that also protects property and is a community and economic resource
Existing, future &/or NA	Existing program adopted by the community
Evaluating the Action	
Losses avoided (i.e., benefits)	
Cost estimate	N/A
Cost effectiveness (i.e., benefit/cost)	
Technical	Technically feasible.
Political	There is pressure from top government officials such as Governor Chris Christie for homeowners to cooperate and sign the easement in order to better protect all the homeowners on the barrier islands.
Legal	Pending lawsuits are expected due to controversy over the easement.
Environmental	No adverse environmental effects from dunes and beach replenishment.
Social	Dunes adversely impact view of many beachfront property owners; private beachfront owners fear that their beaches will become public beaches
Administrative capability	Borough has sufficient capacity and experience to administer this action
Local champion	Local champions are the USACE and the borough emergency management coordinator that has taken the lead on coordinating mitigation within the community.
Other community objectives	
Implementing the Action	
Priority	High
Local planning mechanism	Hazard Mitigation Plan
Responsible party	USACE and Lavallette Borough
Potential funding sources	USACE
Time line	5 years

Action 6.4.21-7: Continued participation in CRS Program	
Assessing the Risk	
Hazard(s) addressed	Coastal Erosion; Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter; Climate Change
Risk finding	Flood risk in community
Describing the Action	
Action category	Education and Awareness Program
Action type	Education and Awareness Program
Action description	Continue participation in CRS program and consider upgrading to the next class level to complete pro-active floodplain management and assist residents with flood insurance costs
Existing, future &/or NA	Existing program to continue in the future
Evaluating the Action	
Losses avoided (i.e., benefits)	
Cost estimate	N/A
Cost effectiveness (i.e., benefit/cost)	
Technical	Technically feasible.
Political	Politically acceptable and encouraged in order to reduce flood insurance premiums for residents.
Legal	No legal issues anticipated.
Environmental	No adverse environmental effects from participation in CRS
Social	Does not adversely affect any particular social group. Perceived by the public to be a good thing because the participation provides a reduction in insurance premiums.
Administrative capability	Borough has sufficient capacity and experience to administer this action
Local champion	Local champion is the borough and especially the CRS coordinator.
Other community objectives	
Implementing the Action	
Priority	High
Local planning mechanism	Hazard Mitigation Plan
Responsible party	Lavallette Borough
Potential funding sources	Lavallette Borough, HMGP, FEMA.
Time line	5 years

Action 6.4.21-8: Continue distribution of newsletter to Lavallette Borough residents	
Assessing the Risk	
Hazard(s) addressed	All
Risk finding	Ocean County residents are at risk for both natural and man-made hazards to impact their homes.
Describing the Action	
Action category	Education and Awareness Program
Action type	Education and Awareness Program
Action description	Maintain, improve, and expand education and awareness programs to provide effective and relevant information to community members
Existing, future &/or NA	Existing outreach program to continue in the future
Evaluating the Action	
Losses avoided (i.e., benefits)	
Cost estimate	Staff time
Cost effectiveness (i.e., benefit/cost)	
Technical	Technically feasible.
Political	Politically acceptable and encouraged in order to reach all residents with crucial information.
Legal	No legal issues anticipated.
Environmental	No adverse environmental effects from the outreach program.
Social	Does not adversely affect any particular social group. Perceived by the public to be beneficial because the newsletter helps to keep residents alert and informed.
Administrative capability	Borough has sufficient capacity and experience to administer this action
Local champion	Local champion is Lavallette Borough who develops the newsletter.
Other community objectives	
Implementing the Action	
Priority	High
Local planning mechanism	Hazard Mitigation Plan
Responsible party	Lavallette Borough
Potential funding sources	Lavallette Borough
Time line	5 years