

CHANGING THE IMPACT ENHANCING THE FUTURE

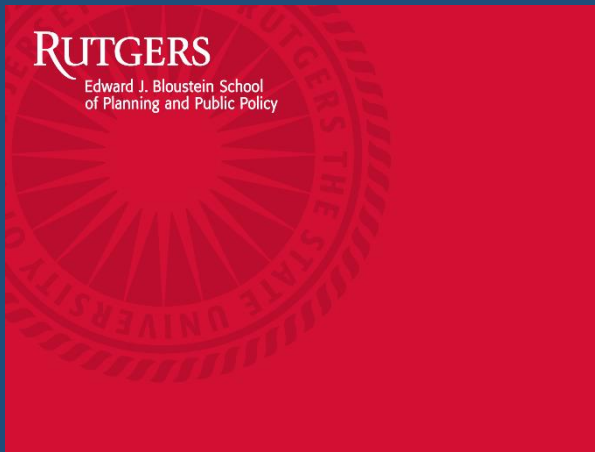
Case Study: SAYREVILLE, NEW JERSEY

OPTIONS WORTH EXPLORING



PRESENTATION TO THE BOROUGH OF SAYREVILLE

INVITATION TO COMMENT AND REVIEW



FIRST PRESENTATION September 3, 2013 Sayreville Environmental Commission

SECOND PRESENTATION December 15, 2013

THIRD PRESENTATION December 17, 2013

FOURTH PRESENTATION January 24, 2013 NJAPA Conference

FIFTH PRESENTATION March 4, 2014 Borough of Sayreville Council and Public

SIXTH PRESENTATION May 12, 2014 Middlesex County Water Resource Association

Funded by the New Jersey Recovery Fund and the Dodge Foundation

CHANGING THE IMPACT ENHANCING THE FUTURE

The Planning and Design Implications of Flooding and Climate Change
on Sayreville and the Raritan River Estuary.

Merisa Gilman MCRP Candidate

Bokyoung Choi MCRP Candidate

Sara Yildirim Landscape Architect Candidate

Rebecca Cook Landscape Architect Candidate

Anton Nelessen, M Arch UD, PP Project Director

With additional support from Juan Ayala [photo simulations] and Sarah for GIS and Lidar mapping

CHANGING THE IMPACT
ENHANCING THE FUTURE

Premise of the Planning and Design Project:

Future flood protection can be provided to large portions of the Borough of Sayreville without cost to the Borough, given limited federal budgets, the projected increase in global warming and ocean level increases.

It is within the power of the Council and Planning Board.

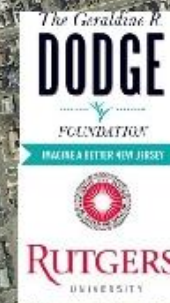
Borough of Sayreville

DERGIE ST STUDY AREA

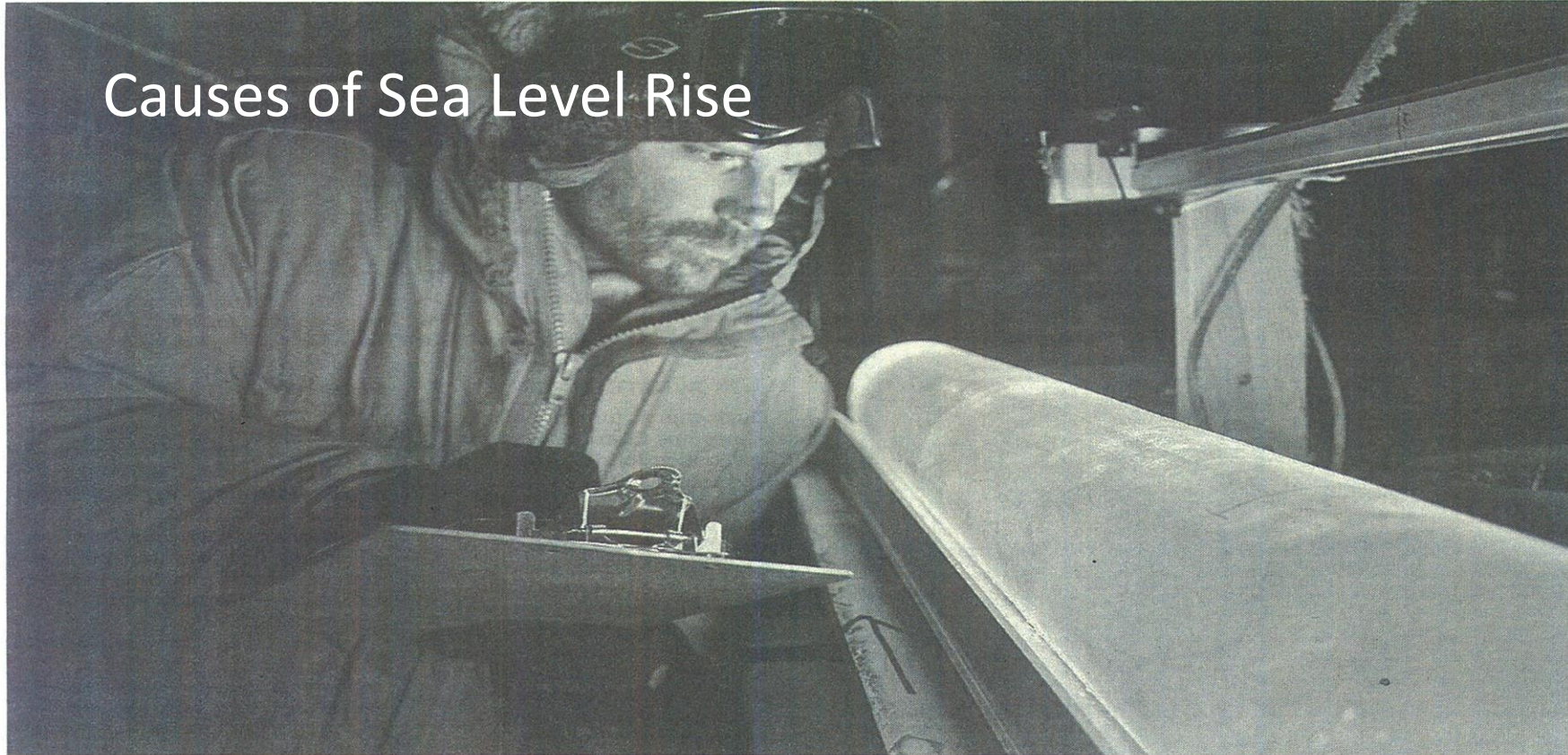


0 0.1 0.2 0.4 Miles

Data Source: 2012 Ortho Imagery, NJGIN
Map By: Rutgers University, 2012



Causes of Sea Level Rise



THOMAS BAUSKA/OREGON STATE UNIVERSITY

Scientists like Brian Bencivengo, above, of the National Ice Core Laboratory examine ice cores to determine past air temperatures at the location from which the core was obtained. Below, a research vessel collected data about past sea surface temperatures.

Global Temperatures Highest in 4,000 Years

Warming Over Longer Period, Study Shows

By JUSTIN GILLIS

Global temperatures are warmer than at any time in at

the distribution of microscopic, temperature-sensitive ocean creatures to determine past cli-





Hudson River Hoboken Ferry Terminal after Sandy



Weber and MacArthur Avenues after Sandy

A satellite image of a hurricane, likely from the NOAA GOES 13 satellite, showing a well-defined eye and spiral cloud bands over the Caribbean Sea. The landmasses of Central and South America are visible in the lower left and bottom center. The text "HURRICANES ARE PROJECTED TO BECOME MORE INTENSE" is overlaid in large white capital letters.

**HURRICANES ARE
PROJECTED TO BECOME
MORE INTENSE**

CHARISM SAYAT/AGENCE FRANCE-PRESSE — GETTY IMAGES

High waves amid strong winds pounded the city of Legaspi on Friday. On Leyte Island, at least 100 people died, an official said.

A Powerful Typhoon Speeds Across the Philippines

By FLOYD WHALEY

MANILA — A powerful typhoon ripped through the Philippines on Friday, killing more than 100 people in a city on Leyte Island, a Civil Aviation Authority official said on Saturday.

Victims' bodies lay in the streets of the city, Tacloban, one of the hardest hit by the storm, Capt. John Andrews, the authority's deputy director general, told The Associated Press. Although the storm had knocked out power and most communications, Captain Andrews said, his staff relayed news of the deaths. "The information is reliable," he told the news service.

By some accounts the typhoon, named Haiyan, ranked among the world's strongest. But because it moved across the country so rapidly, it may not have killed as many people as feared. Experts say that is because it did not linger long enough to deluge the islands with rain that can cause the widespread flooding and mudslides that often lead to very high death tolls. Tacloban, however, was deluged.



CHARLIE SACEDA/REUTERS

Strong winds from the typhoon hit a coastal town in Laguna Province. More than 700,000 evacuated ahead of the storm.

winds among the strongest recorded. But local forecasters later disputed those estimates. "Some of the reports of wind speeds were exaggerated," Mr. Paciente said.

The Philippine weather agency

measured winds on the eastern edge of the country at about 150 m.p.h., he said, with some tracking stations recording speeds as low as 100 m.p.h.

The United States Navy's Joint Typhoon Warning Center used

KEEPING A CLOSE WATCH

Filipinos in the New York area are monitoring the storm and awaiting word from relatives. Page A18.

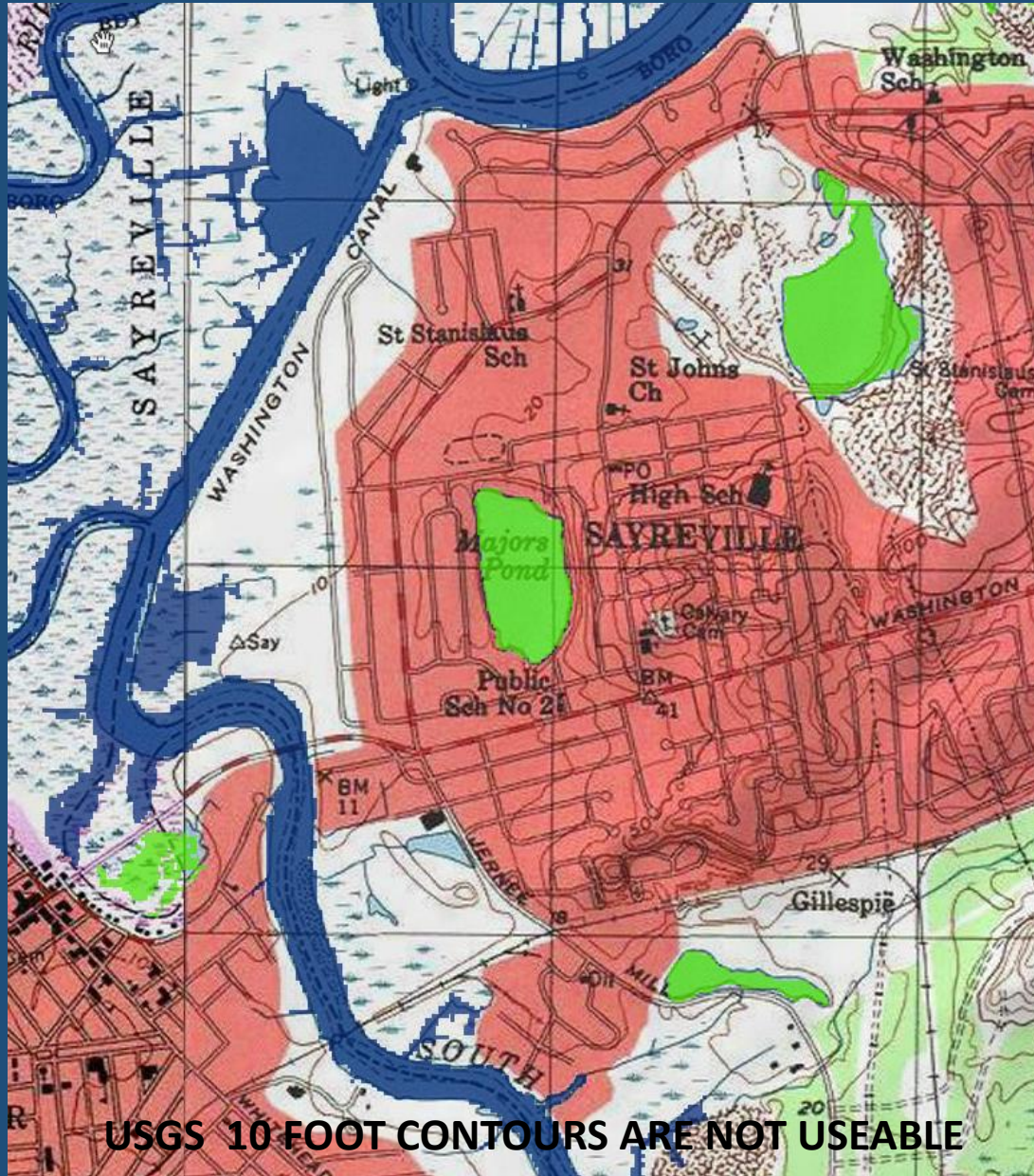
satellite analysis to estimate sustained winds at 195 m.p.h., with gusts up to 235 m.p.h., but that measured the center of the storm when it was over the ocean.

"As far as satellite imagery was concerned, it indicated that this was one of the strongest storms on record," said Roger Edson, the science and operations officer at the United States National Weather Service in Guam.

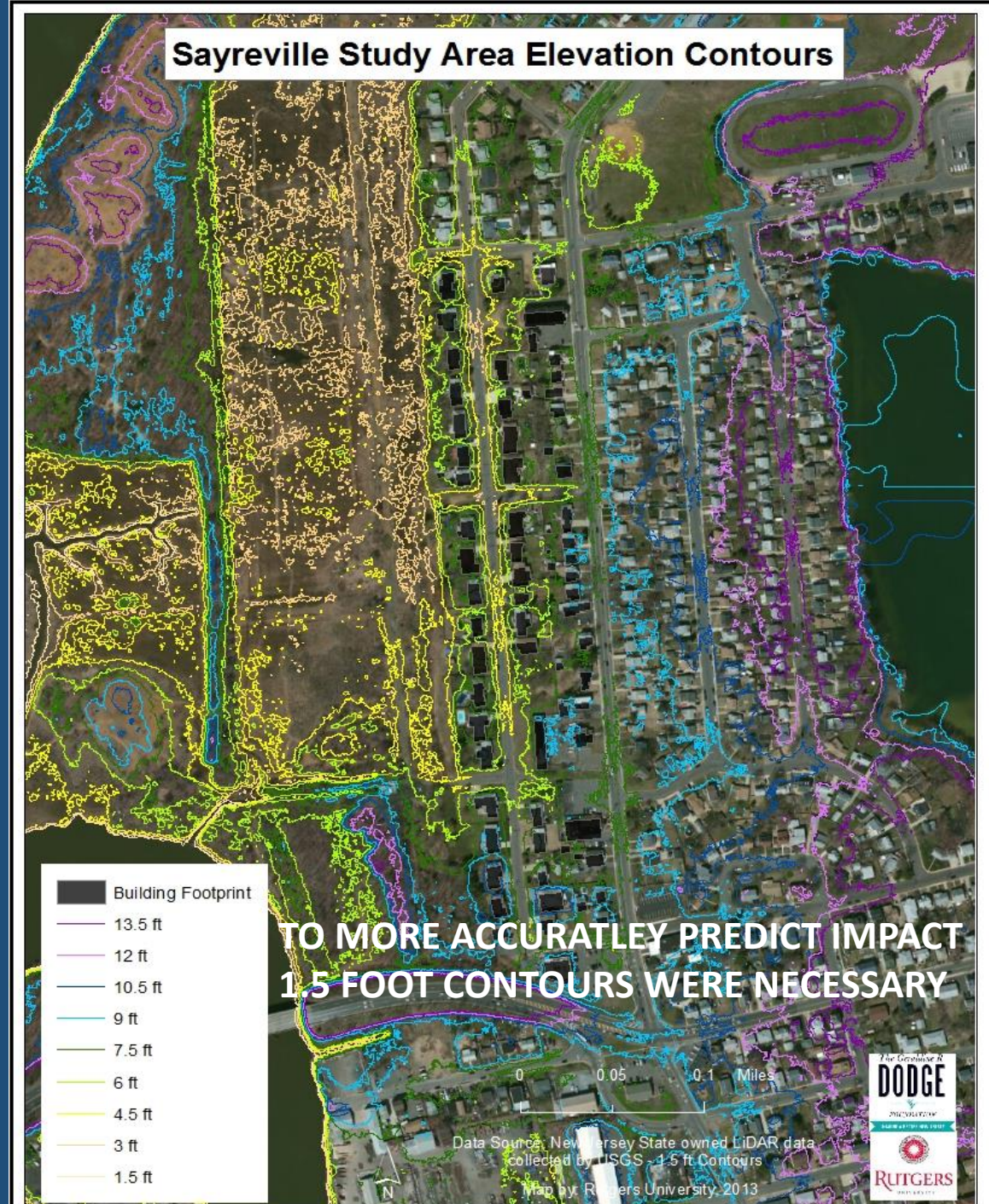
He said 195 m.p.h. winds would put the storm "off the charts," but he acknowledged that satellite estimates require further study on the ground to determine if they were accurate.

By Saturday, the storm had left the Philippines, on a path to Vietnam, according to the Joint Typhoon Warning Center in Honolulu.

CONTOURS DETERMINE
THE HEIGHT OF THE WATER

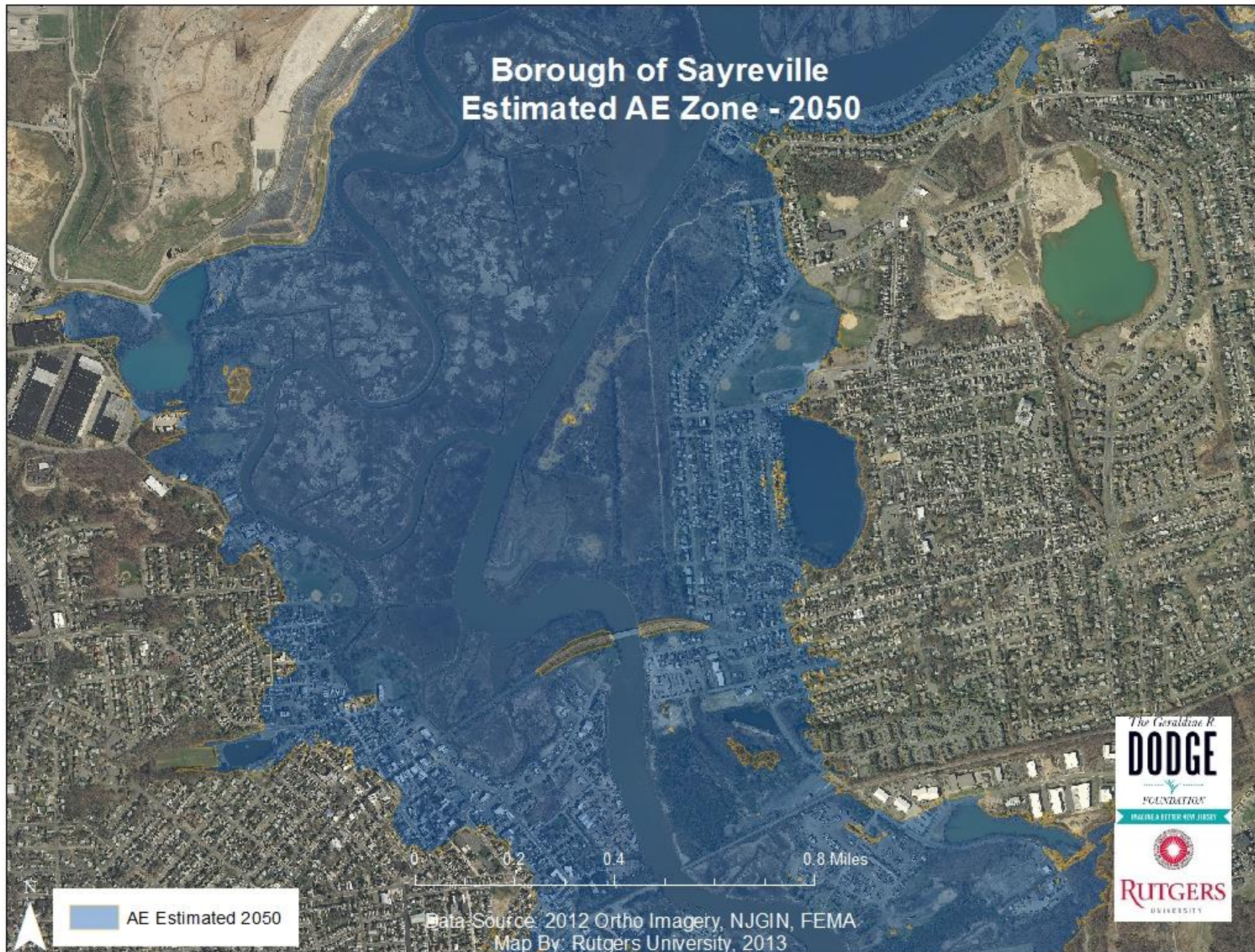


USGS 10 FOOT CONTOURS ARE NOT USEABLE



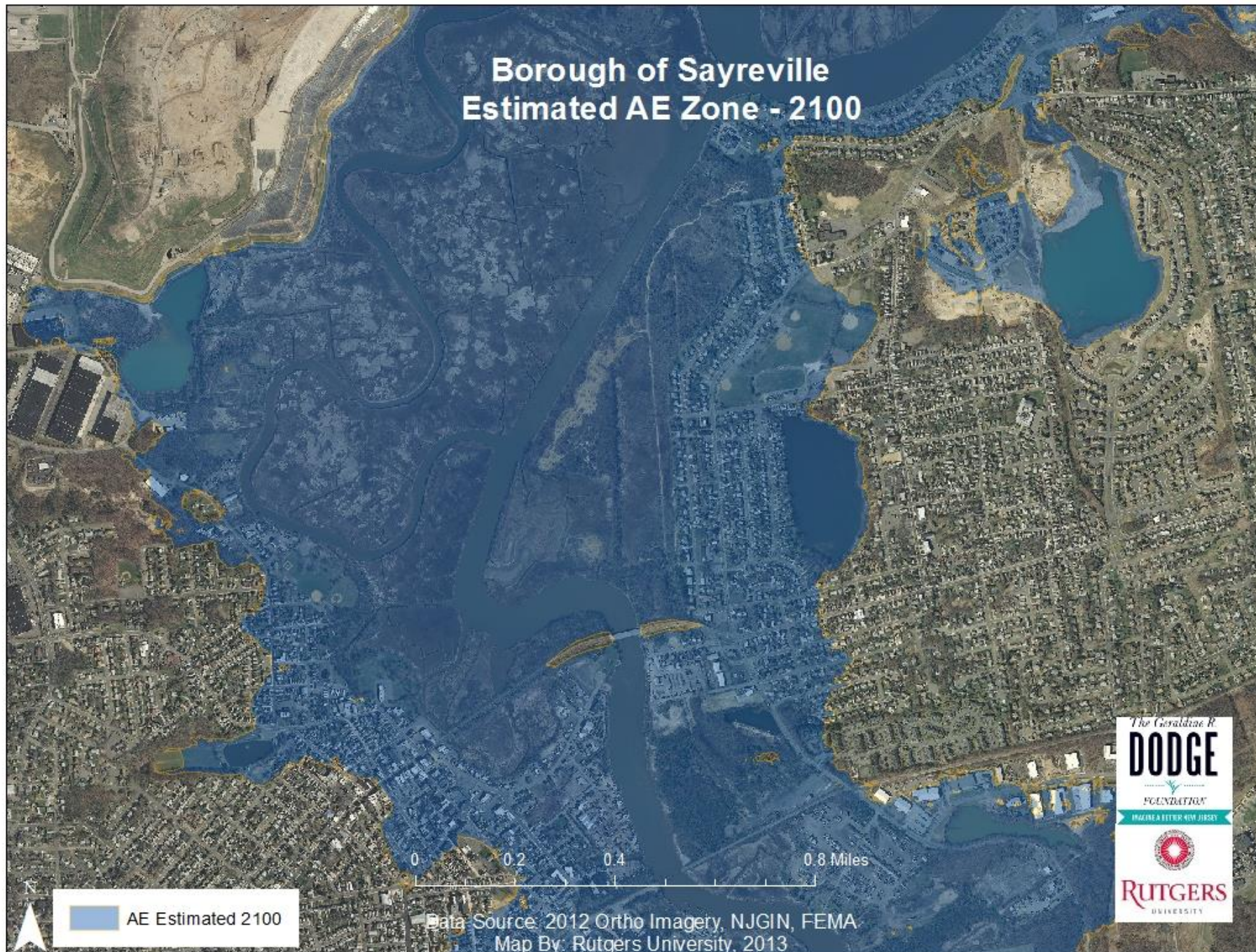
Borough of Sayreville Estimated AE Zone - 2050

100YEAR FLOOD ZONE
2050 SEA LEVEL RISE



**Borough of Sayreville
Estimated AE Zone - 2100**

100YEAR FLOOD ZONE
2100 SEA LEVEL RISE



Borough of Sayreville

Sayreville Prelim FIRM Floodzone

- AE Current
- AE Estimated 2050
- AE Estimated 2100

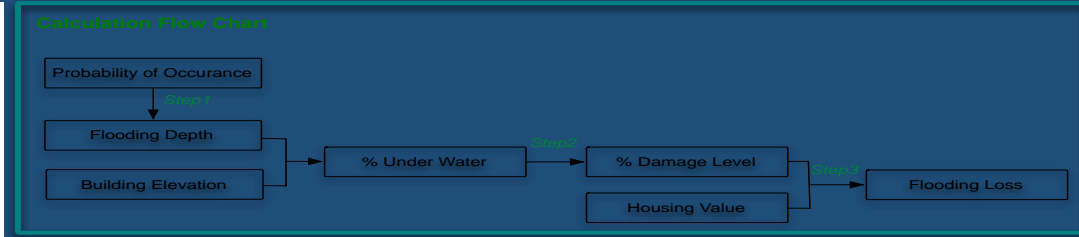
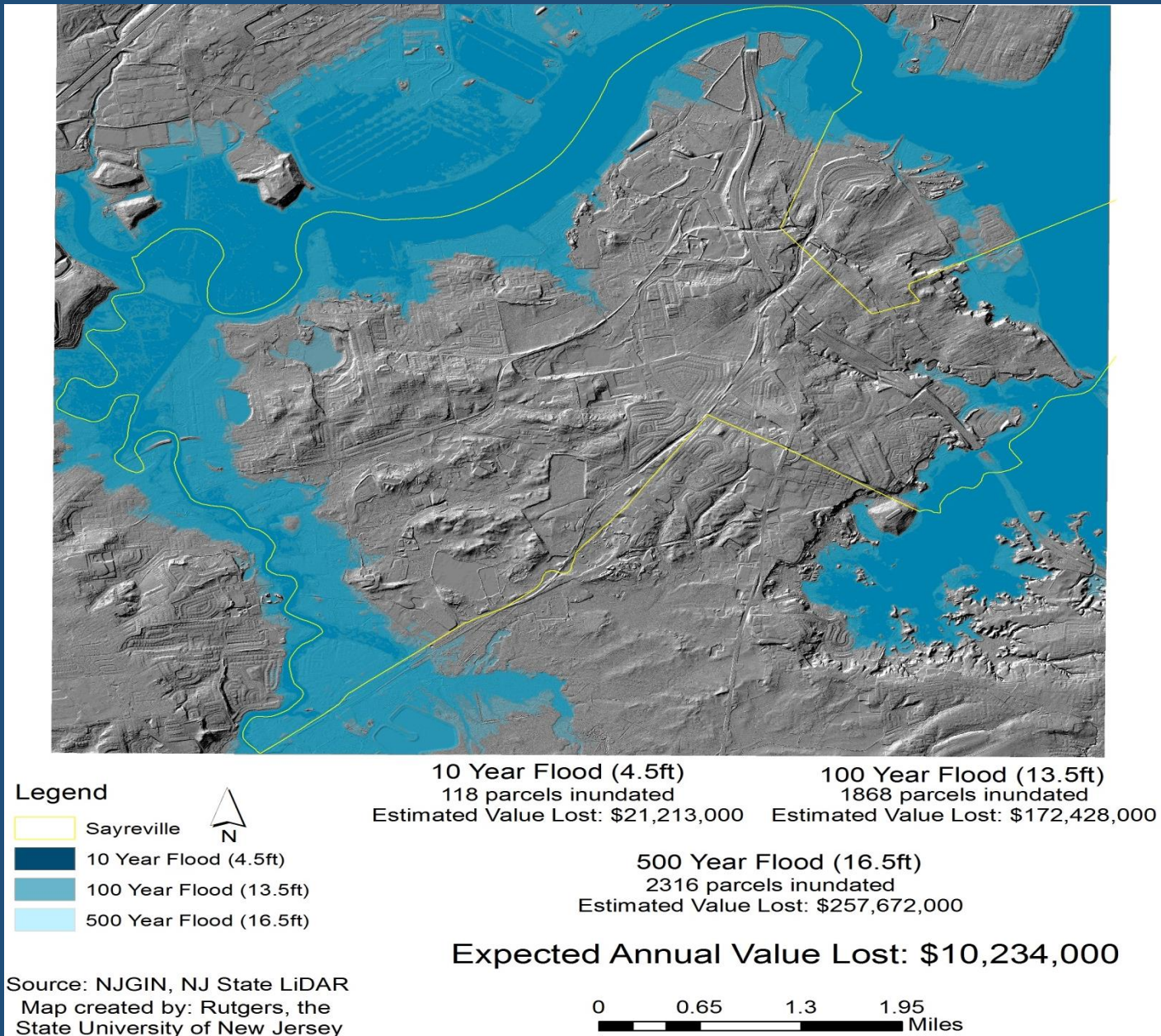
0 0.2 0.4 0.8 Miles

Data Source: 2012 Ortho Imagery, NJGIN, FEMA
Map By: Rutgers University, 2013



100YEAR FLOOD ZONE
WITH SEA LEVEL RISE

How much flood mitigation for Sayreville NJ?



- Expected damage to housing over the long term is \$10 M per year, much of it from smaller (+/- 10-yr) flood events.
- 2,316 parcels inundated
- It is worth investing up to that amount per year to reduce flood damage to residences in Sayreville.



Area that will repeatedly flood in the future to the
16.5 foot contour line 100 year flood area – NIC Projected sea level rise

1399 residential structures *

198 Non-residential structures*

2,316 Parcels ** All Sayreville

Flooding
Impact within
study area

• *US Corp of Engineers South River, Raritan River Basin Impact Study 2002

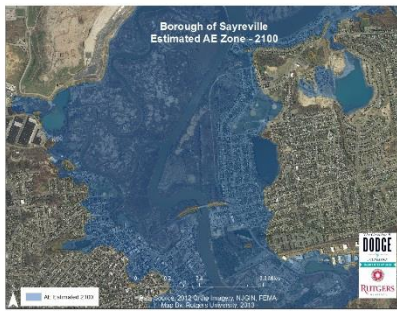
• **Rutgers 2013

Five Flood Reduction Scenarios for Sayreville

- 1) Buyout around 1,600+ structures over a period of time and return to Nature.
- 2) Some structures are removed, some are elevated, while others remain as is until the next flood.
- 3) Build a storm reduction barrier at 21+ feet high preserving more than 1,500 structures.
- 4) Design the flood barrier in a curvilinear form to accommodate those units bought out as well as those elevated.
- 5) Pay for the storm reduction barrier through create financing and new infill development on available lands with limited or no cost to Sayreville
- 6) Create an extensive estuary park flood zone



Projected
Flood Height
2050



Natural Succession with buy out



Cost for Buy Out within Study Area

Assume 1,200 structures out of the 1,500 are bought out

Assuming \$275,000 per lot and structure

\$330,000,000 not including loss of taxes, purchasing power
with the emotional and psychological damage

RETURN TO NATURE SCENARIO – NATURAL SUCCESSION



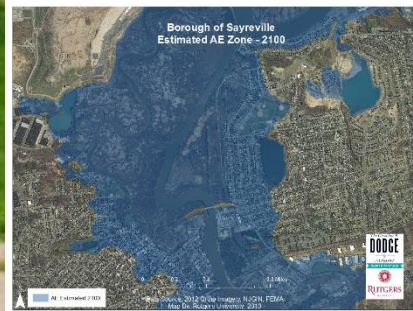


Scenario 2

CHANGING THE IMPACT
ENHANCING THE FUTURE



Projected
Flood Height
2050



Scenario 3

CHANGING THE IMPACT
ENHANCING THE FUTURE



0 1,250 2,500 5,000 Feet

South River Levee Alignment



BUILDING STRONG®



US Corp of
Engineers



Estimated Cost of Flood Protection Measures

Protects all remaining structures

Constructed to elevation +21

Estimated approximate costs: \$61.1 million to protect Sayreville & South River

Average annual costs of \$4.2 million

Source: US Corp of Engineers Integrated Feasibility Report and Environmental Impact Statement 2002



HISTORIC PRECEDENTS



NEW BEDFORD MASSACHUSETTS

NO FLOOD IMPACT
SINCE 1963

NO ONE PAYS
FLOOD INSURANCE



New Bedford

Flood gates close
before storm,
Reopen at low
tide after storm



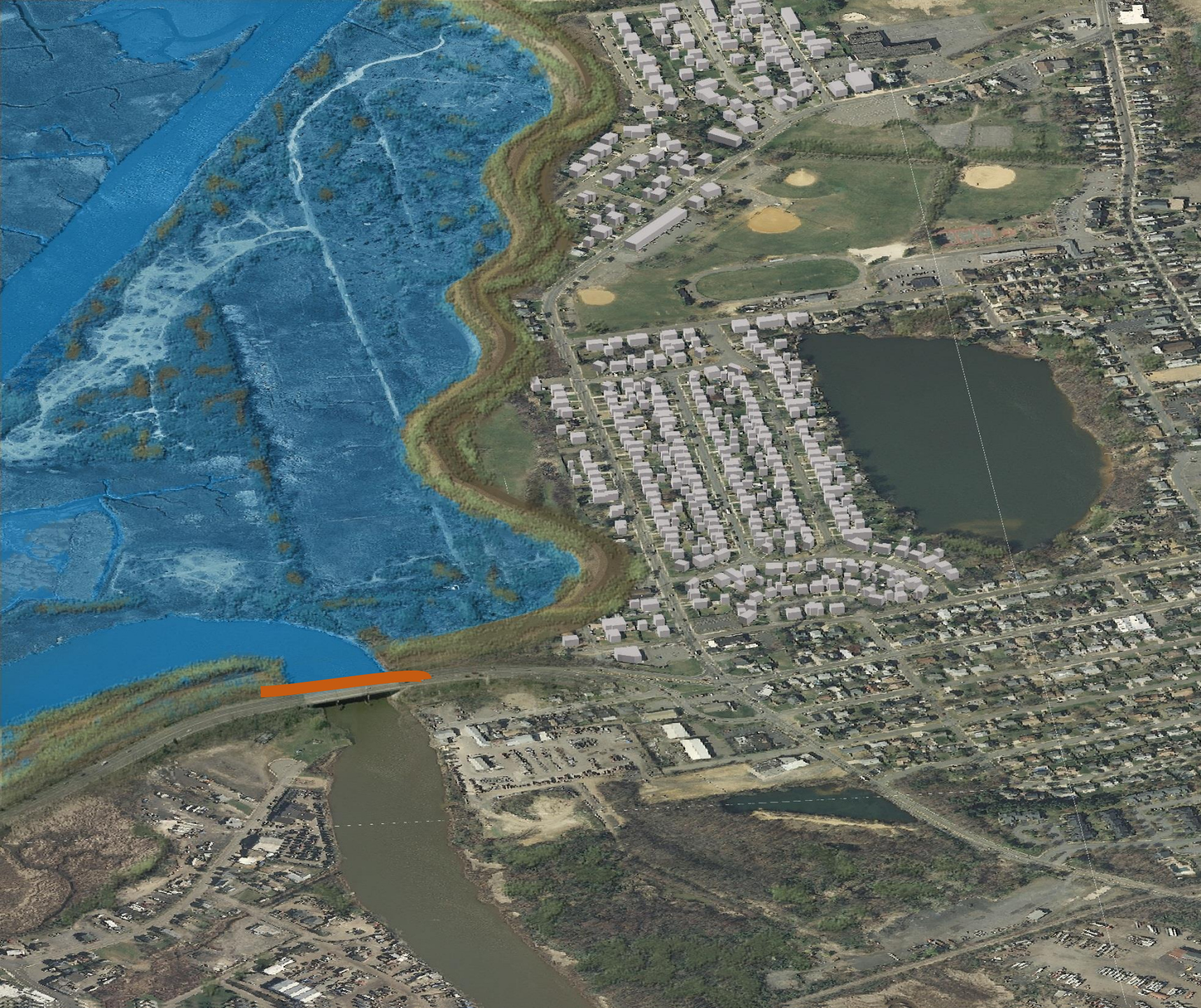
2050
Flood line

Berm on
One side of
Weber



RECOMMENDED CURVED MORE NATURAL BERM LOCATION

81 UNITS TO BE BOUGHT OUT



Flooding at 3 feet

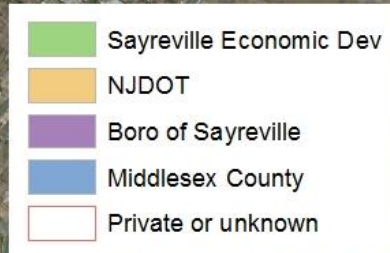
Flooding at 4.5 feet

Flooding at 19.5 feet

Flood Prevention Scenarios for Sayreville

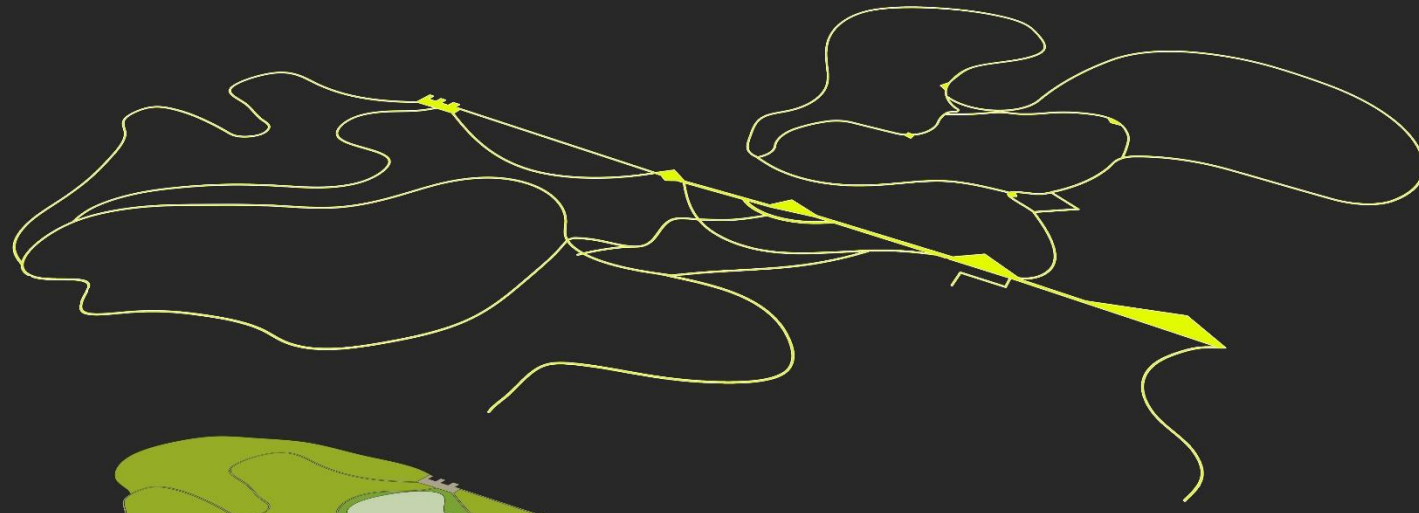
- 1) Relocate and redesign the flood barrier (levee) in a curvilinear form to accommodate those units bought out as well as those elevated.
- 2) Reduce or eliminate the cost of the flood prevention barrier through create financing and new infill development with little or no cost to Sayreville.
- 3) Flood prevention barrier creates option for tripling the park space and creating and new estuary nature preserve.
- 4) New mixed and multiple-use neighborhood district provides opportunity for growth, local relocation and a town center.
- 5) Provides opportunity to **finance the flood prevention berm without reliance on federal money which has other priorities.**

Sayreville Parcel Ownership



Data Sources: NJDEP, NJGIN, Middlesex County Mod IV
Map by Rutgers University, 2013

Flood prevention barrier creates option for tripling the park space and creating a new estuary nature preserve.



pedestrian circulation



vegetative zones with
Vehicular access



park layout with vehicular
access

THE NEW SAYREVILLE COMMUNITY PARK



Berm

Weber Ave.

NATURE WALK ALONG BERM



WINTER USE ALONG BERM



THE NEW SAYREVILLE COMMUNITY PARK



Weber Ave.

COMMUNITY GARDEN



THE NEW SAYREVILLE COMMUNITY PARK



Weber Ave.

ADVENTURE CLAYGROUND



THE NEW SAYREVILLE COMMUNITY PARK



Forest

Weber Ave.

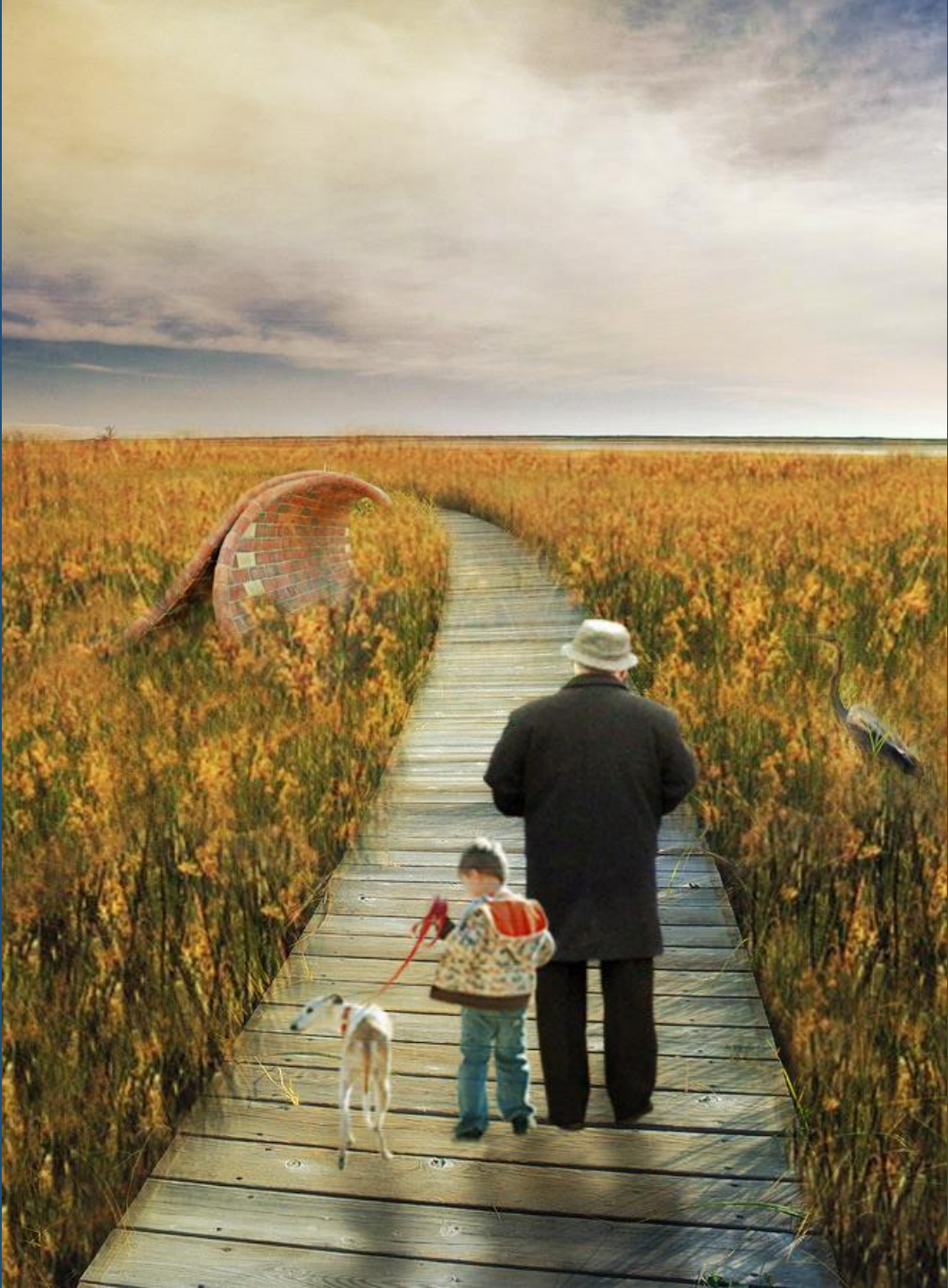


BRICK SCULPTURE WITHIN FOREST

THE NEW SAYREVILLE COMMUNITY PARK



ESTUARY WALK



THE NEW SAYREVILLE COMMUNITY PARK



Waterfront Promenade

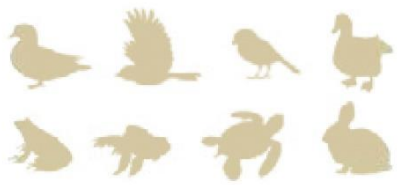
Weber Ave.

VIEW FROM RESTAURANT



THE NEW SAYREVILLE COMMUNITY PARK





WILDLIFE

BIRDS, FISH, FROGS, SMALL
MAMMALS, INSECTS



CAMPERS

SUMMER CAMP GOERS— KIDS PLAYING SPORTS +
EXPLORING THE FORESTS AND FIELDS



ATHLETES

BOATERS, CROSS-COUNTRY SKIERS, BIKERS, SLEDDERS,
FOOTBALL, BASEBALL, BASKETBALL, + TENNIS PLAYERS



SAYREVILLE CITIZENS

DOG WALKING, WALKING DURING A LUNCH BREAK, FAMILY PICNICS,
BRINGING KIDS TO PLAY, REFLECTING UPON NATURE, JOGGERS, PEOPLE
FISHING, COMMUNITY GARDENING



MIDDLESEX CITIZENS

DOG WALKING, FAMILY PICNICS, BRINGING KIDS TO PLAY,
REFLECTING UPON NATURE, JOGGERS, PEOPLE FISHING, BIRD-
WATCHERS, NATIVE PLANT ENTHUSIASTS, SCHOOL FIELD TRIPS



230 TOTAL ACRES
OF NEW PARK

An aerial photograph of a park area with a river and surrounding urban development. Three specific regions are highlighted with colored overlays and blue outlines. The largest region, colored olive green, is labeled '155 ACRES'. A smaller region, colored a darker green, is labeled '75 ACRES'. A third region, colored a lighter green, is labeled '39.3 ACRES'. The total area of these three regions is indicated as '230 TOTAL ACRES OF NEW PARK' at the top of the image.

75 ACRES

39.3 ACRES

155 ACRES



ACRES: 39.3

NET VALUE:
\$3,339,100

**LAST RECEIVED GREEN
ACRES FUNDING:**
October 28, 2009

**ALLOWED
DEVELOPMENT:**

- Outdoor recreation or conservation facilities
- Structures that support outdoor recreation (restrooms, maintenance sheds or concession stands)

GREEN ACRES DIVERSION OF PARKLAND STEPS

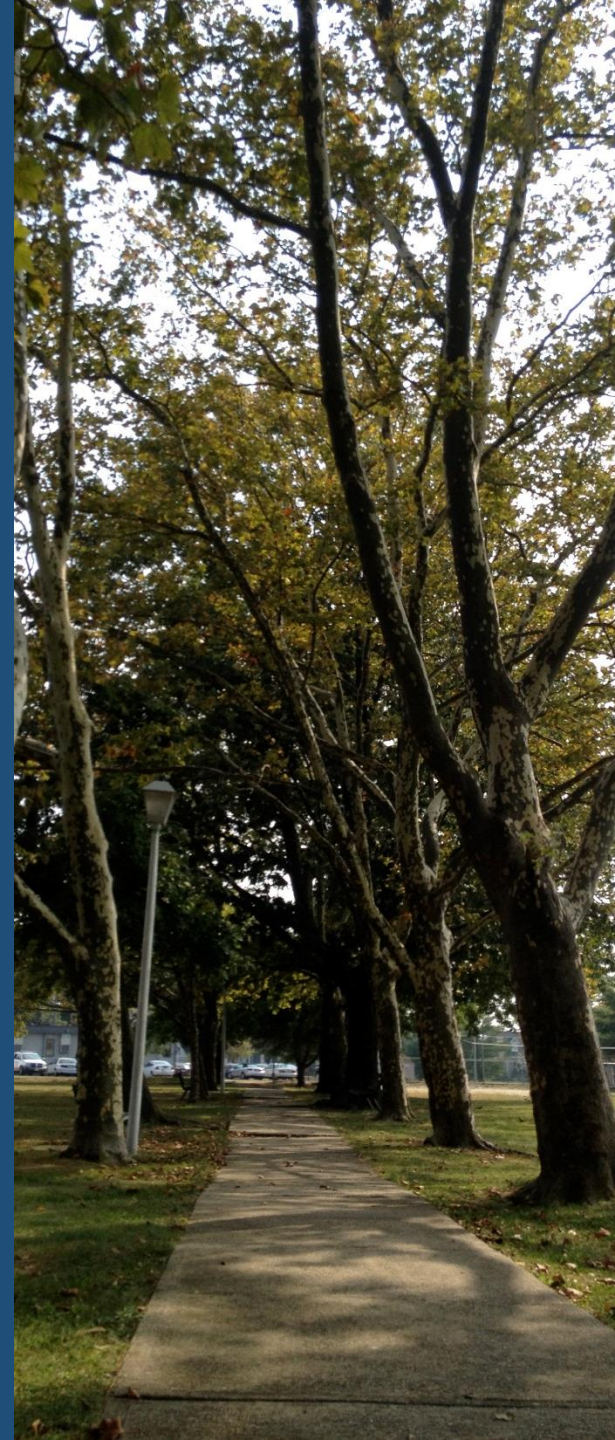
1. SCOPING HEARING

2. PRE-APPLICATION

- Key Components
 - How the diversion will yield a significant public benefit (*prevent flooding*)
 - Draft lease or use agreement and statement of total compensation proposed to be received
 - Set of plans and specifications for the proposed construction
 - Detailed analysis of each alternative that could be taken to fulfill the public need/benefit (*this is the only alternative*)
 - Environmental Assessment Report
 - Land Valuation Forms
 - Replacement Parcels (*230.5 acre new park*)
 - Maps

3. FINAL APPLICATION

4. PUBLIC HEARING





Based on an optimum development program,
The construction of a new neighborhood community
on the existing park site could generate

between \$66,000,000 to \$126,400,000
In land value based on the selected
development program



BERM COST: \$61 million + \$4.1 million annually for
maintenance

(US Army Corp of Engineers 2002 Study)

PARK COST: \$11 - \$12 million

DEVELOPED LAND VALUE: \$66 million - \$126 million
dependent on approved FAR and uses

(Robert Burchell, Fiscal Impact)

FLOOD COST TO SAYREVILLE: \$10 million per year

(Rutgers Study)



Sycamore Lane
Sayreville, New Jersey

CHANGING THE IMPACT ENHANCING THE FUTURE



5 MIN WALK

GREEN ACRES LAND

**POTENTIAL
COMMUNITY
NEIGHBOHOOD
FOCUS AREA**

**Area with 5 minute
walk: 162 Acres**

**Existing Units within
5 minute walk:
440 hundred -est.**

40 acres of new development

600 to 1,200 new residential units – For Sale with limited rental,
% age restricted to active adults 55 and above

80,000 square feet of new convenience retail – town center for Sayreville

Flexible local office space for civic and commercial use

New library and cultural center

Accessible neighborhood parks & fantastic pedestrian plazas

Extensive landscaping including over 350 new trees
(Robert Burchell, Fiscal Impact)

\$5.3 million
annual net tax revenue
for Sayreville at the
optimum FAR

Common Features of Proposed Plans

1. PRESERVE AND EXTEND SYCAMORE WALKWAY TO THE PROPOSED NEW PARK
2. RETAIN EXISTING CITY HALL, FIRE STATION, AMERICAN LEGION
3. CREATE NEW STREET NETWORK THAT CONNECTS TO EXISTING STREETS TO CREATE DEVELOPABLE BLOCKS & BEAUTIFUL GREEN PEDESTRAIN PLAZAS
4. CREATE NEW TOWN CENTER FOR SAYREVILLE
5. CREATE A DEVERSITY OF HOUSING TYPES



TWO DISTINCT URBAN DESIGN PLANS WHILE INCORPORATING THE COMMON FEATURES

DESIGN OPTION ONE



DESIGN OPTION TWO

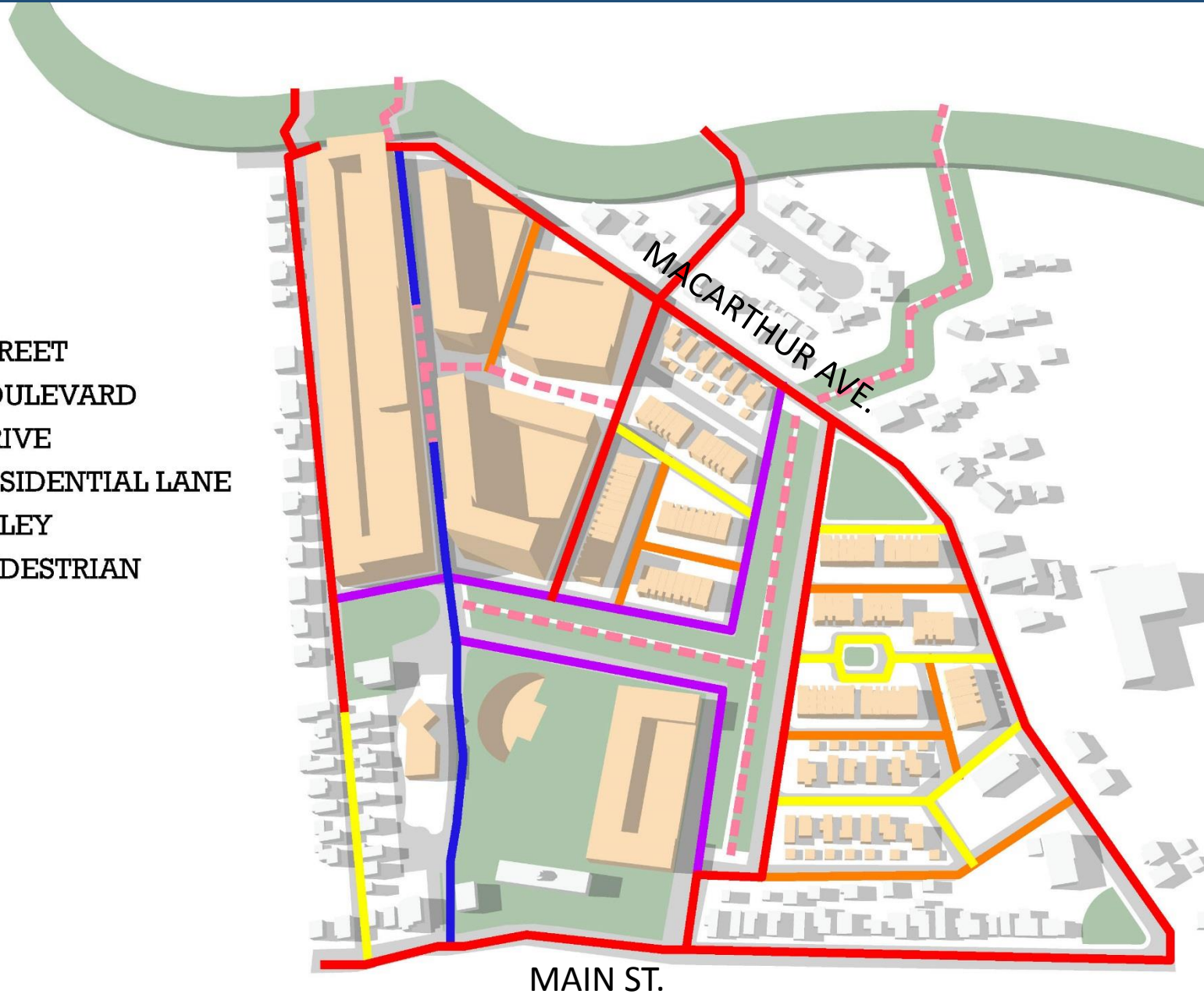


DESIGN OPTION

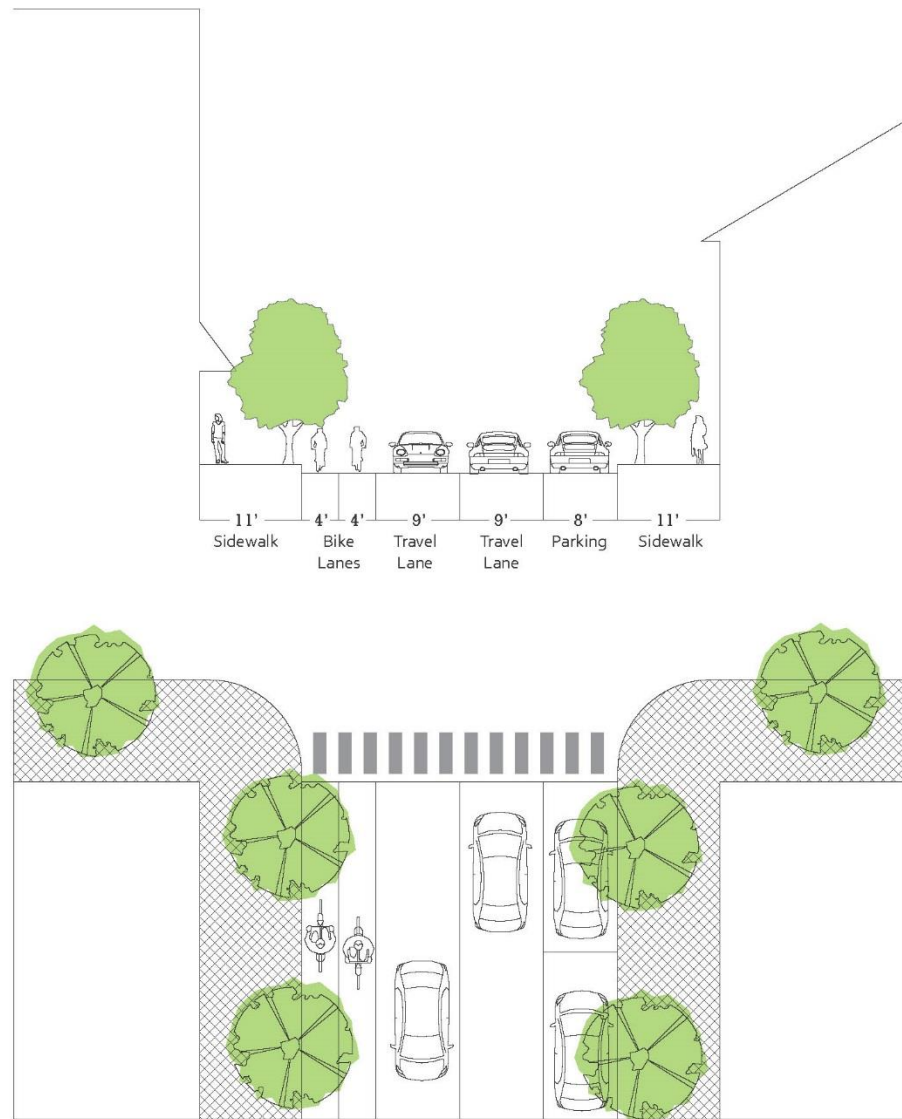
ONE

CIRCULATION

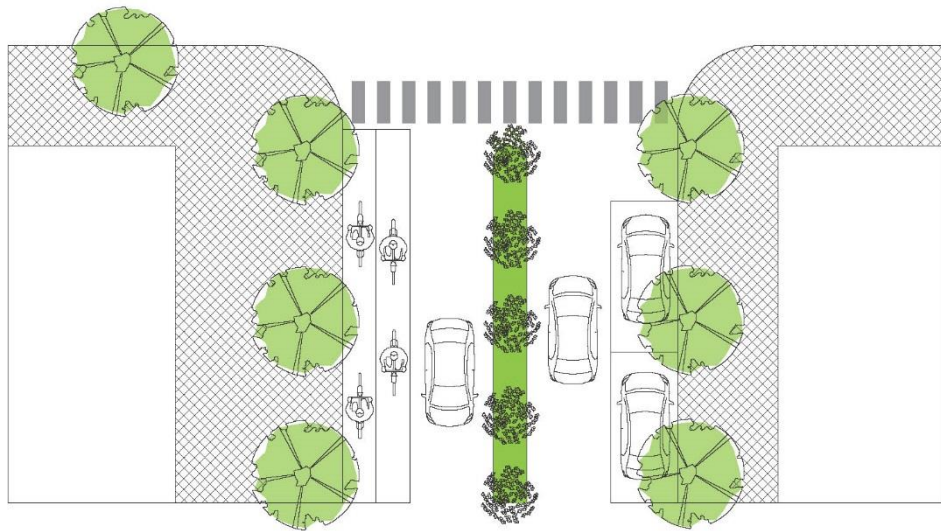
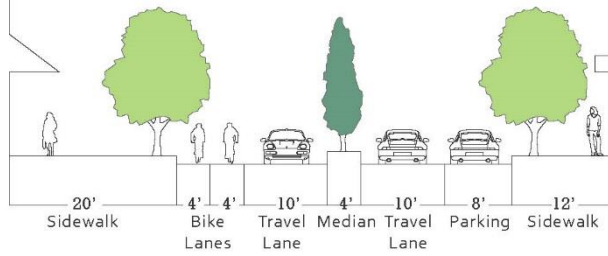
- STREET
- BOULEVARD
- DRIVE
- RESIDENTIAL LANE
- ALLEY
- PEDESTRIAN



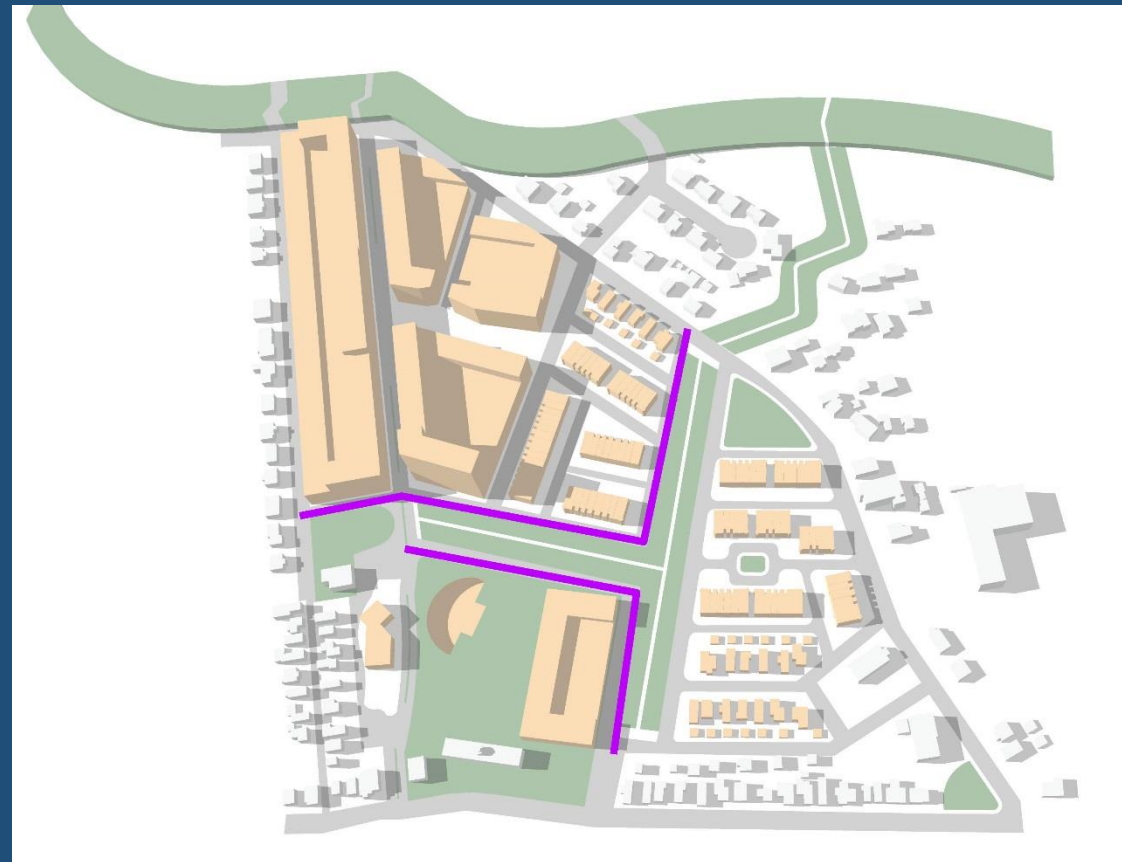
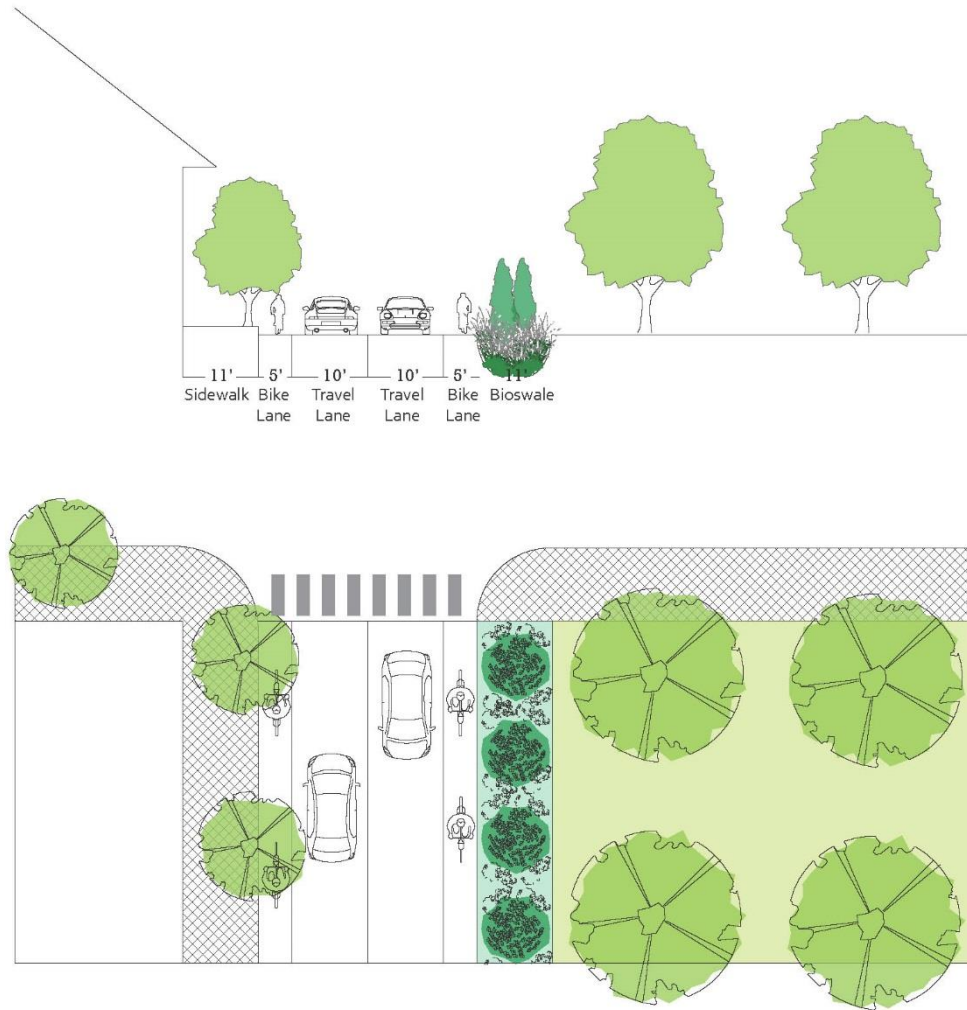
STREET



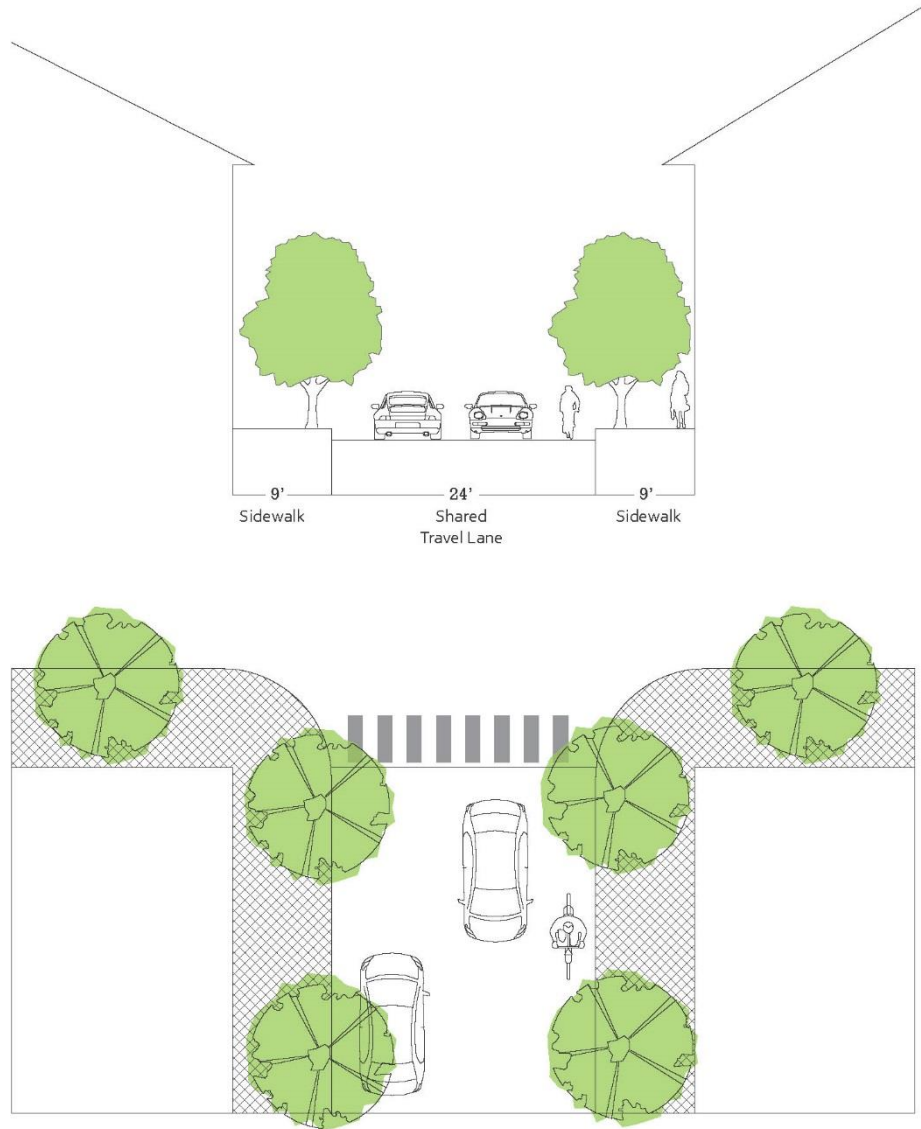
BOULEVARD



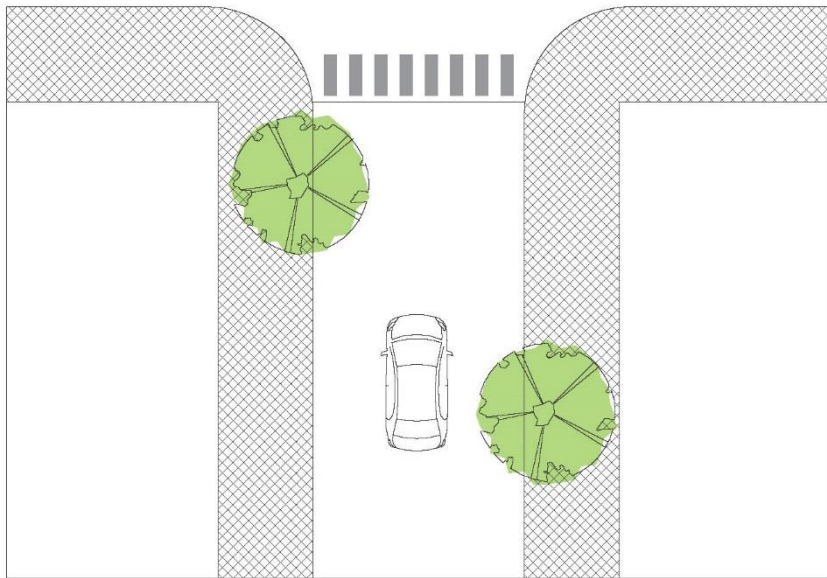
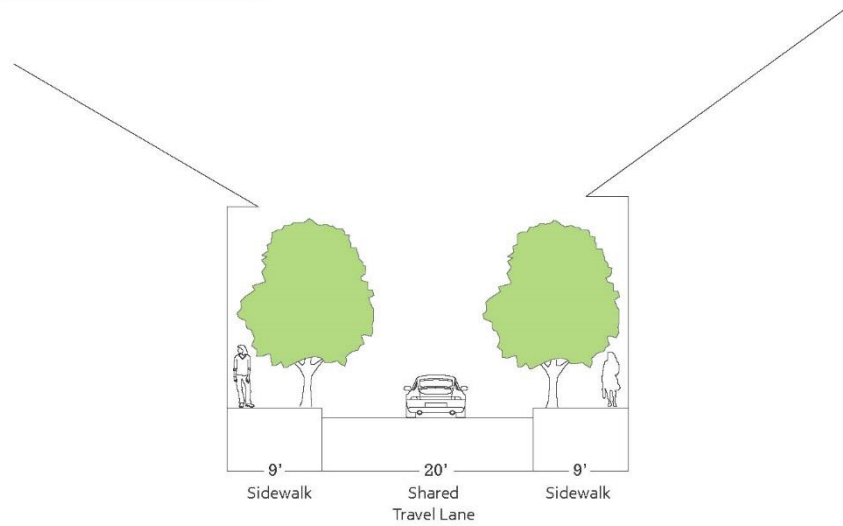
DRIVE



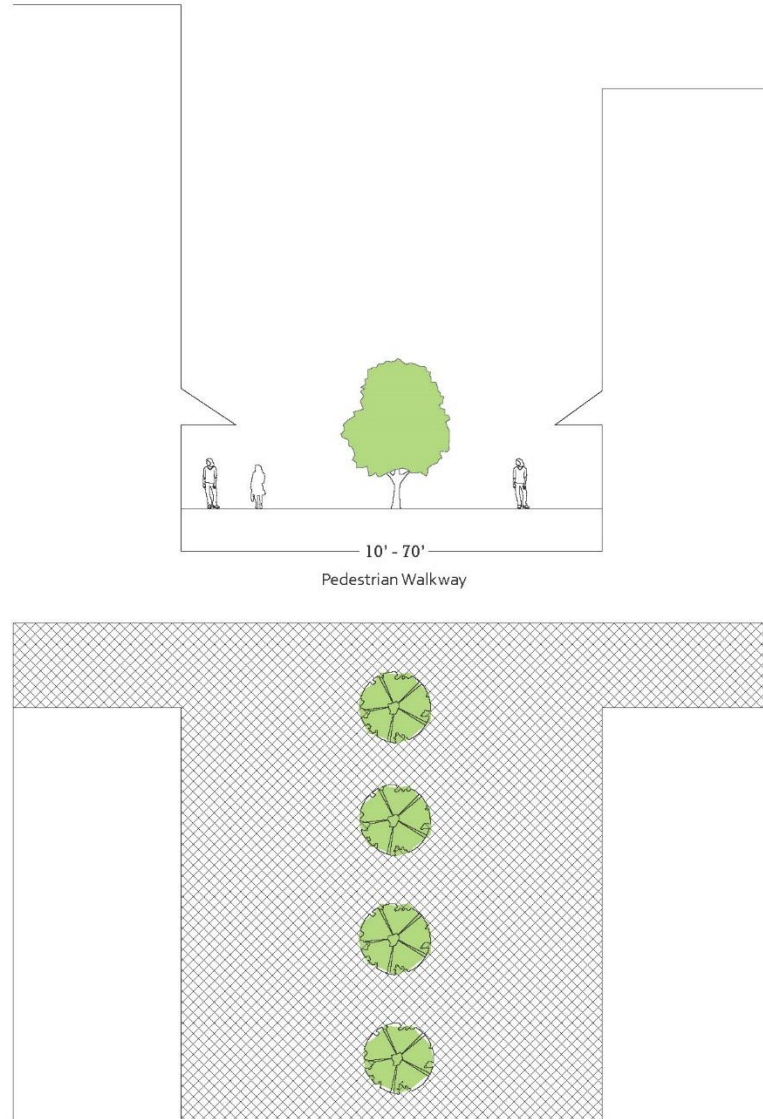
RESIDENTIAL LANE



ALLEY



PEDESTRIAN STREET



USES

-  SINGLE FAMILY
-  TOWNHOUSE
-  MIXED USE
-  CIVIC
-  OFFICE



SINGLE FAMILY HOMES & TOWNHOUSES



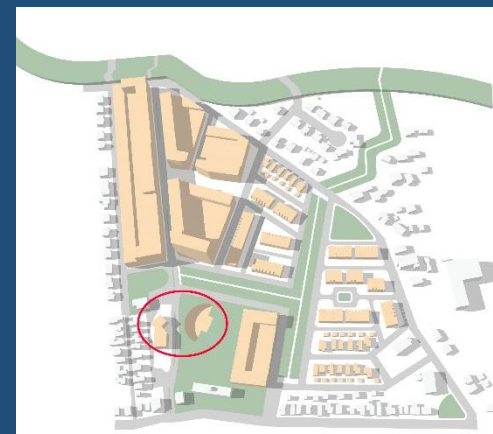
RAIN GARDENS & NEIGHBORHOOD PARKS



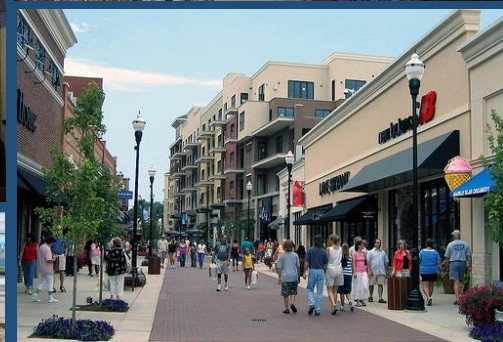
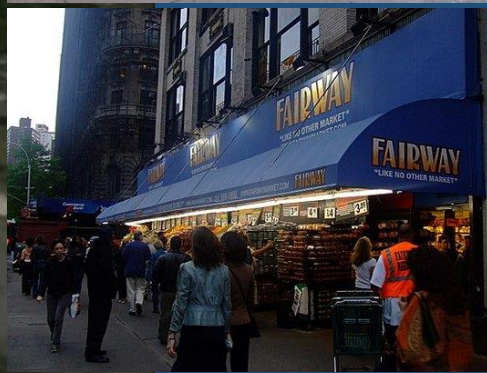
SCENE 1: SPRING DAY @ NEIGHBORHOOD PARK



COMMUNITY CENTER & AMPITHEATER



GROCERY STORE, MIXED-USE & PEDESTRIAN PLAZA



SCENE 1: WINTER NIGHT @ PEDESTRIAN PLAZA



PHASE 1



Single Family Homes

13

Townhouses

42

New Green Space

187,000
sq. ft.

FEATURES:

- Extended sycamore walkway
- New neighborhood park
- Townhouses & single family homes

PHASE 2



Single Family Homes

19

Townhouses

86

New Green Space

236,000
sq. ft.

FEATURES:

- Additional townhouses & single family homes

PHASE 3



Single Family Homes

19

Townhouses

86

New Green Space

448,000
sq. ft.

Office Space

107,000
sq. ft.

Civic Space

17,000
sq. ft.

FEATURES:

- Civic green
- Local office space
- Community center

PHASE 4



Single Family Homes	19
Townhouses	86
Condo Units	525
New Green Space	470,000 sq. ft.
Office Space	107,000 sq. ft.
Civic Space	17,000 sq. ft.
Convenience Retail	30,000 sq. ft.

FEATURES:

- Mixed-use buildings with condos and convenience retail
- New boulevard & pedestrian plaza

PHASE 5



Single Family Homes

19

Townhouses

86

Condo Units

1095

New Green Space

490,000 sq. ft.

Office Space

107,000 sq. ft.

Community Center

17,000 sq. ft.

Convenience Retail

80,000 sq. ft.

FEATURES:

- Neighborhood grocery store
- Additional mixed use building with condos and convenience retail
- Public amphitheater

TRANSIT CONNECTION



TRANSIT STOP
FIVE MINUTE WALK

On-demand transit
Shuttle bus connection



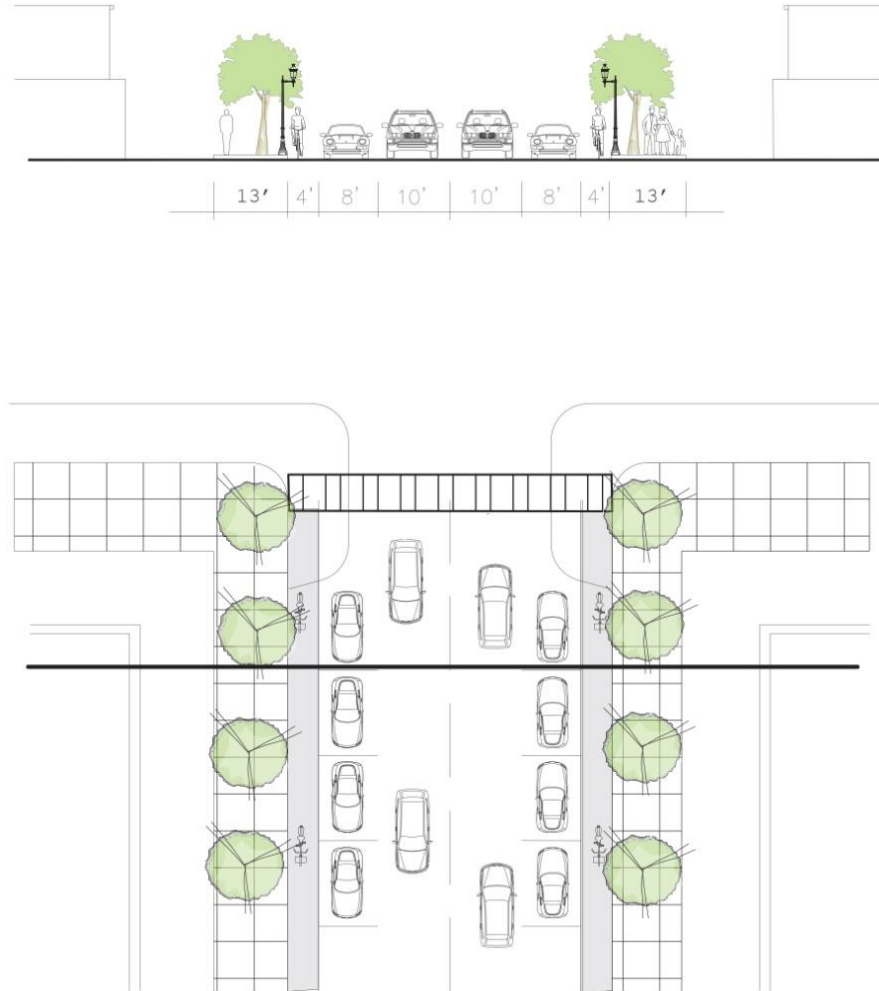
- EXISTING BUILDING
- PROPOSED BUILDING
- GREEN ROOF
- PLAZA
- RAIN GARDEN/BIOSWALE
- BIKE LANE

DESIGN OPTION

TWO

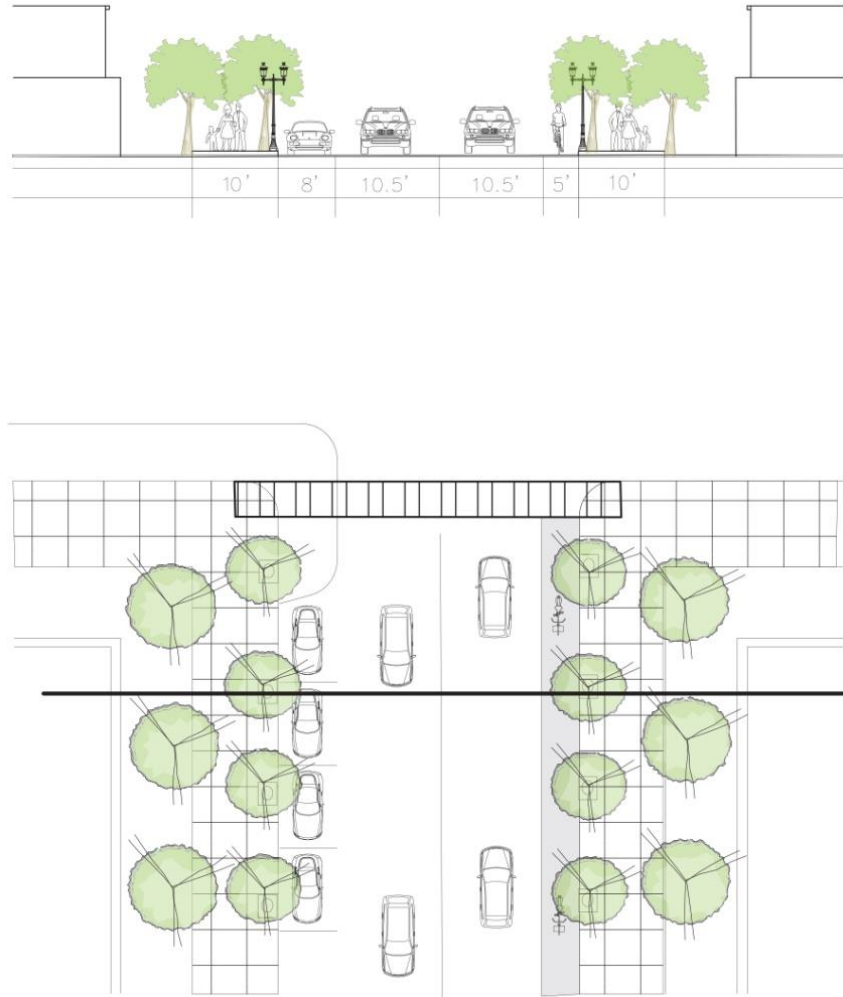
STREET TYPOLOGY: STREET 1

TYPE1. 70:44



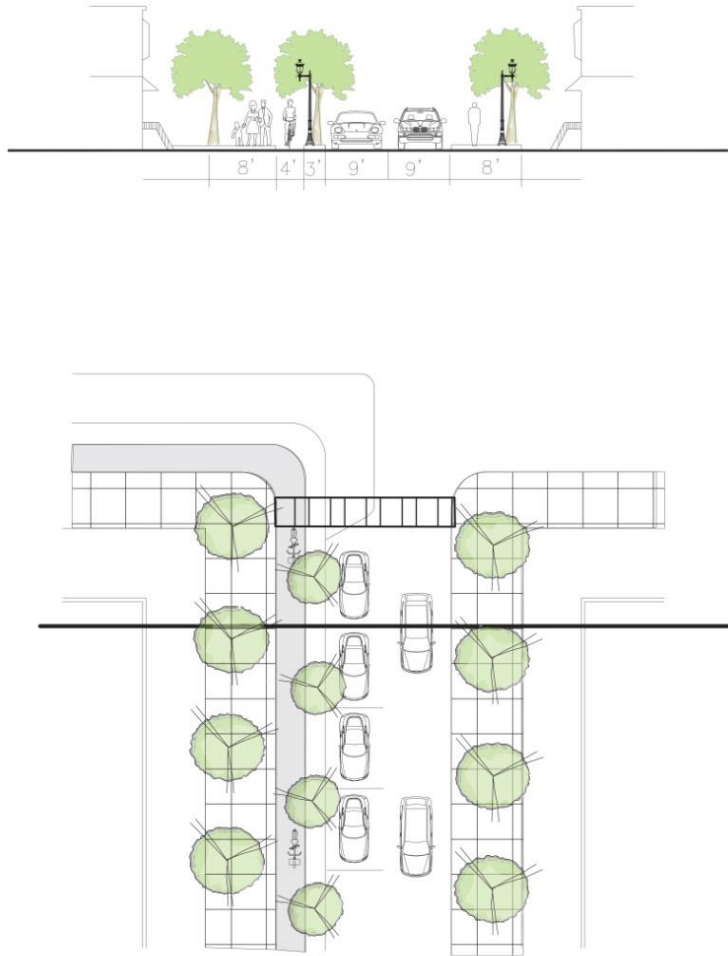
STREET TYPOLOGY: STREET 2

TYPE2. 54:34



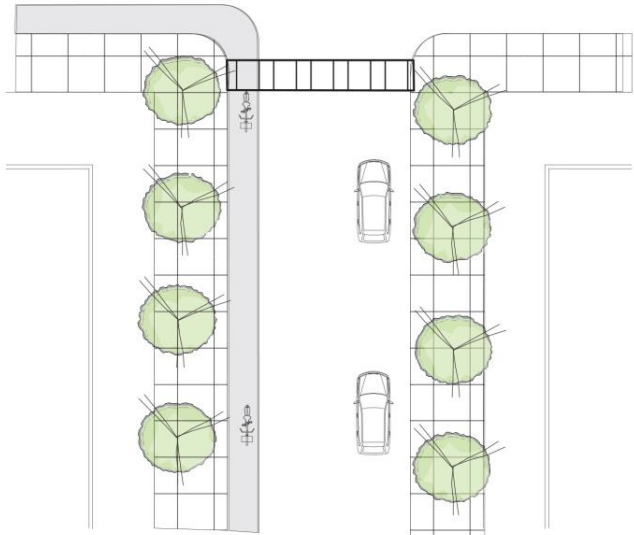
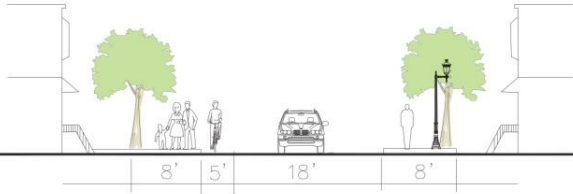
STREET TYPOLOGY: DRIVE

TYPE3. 41:25



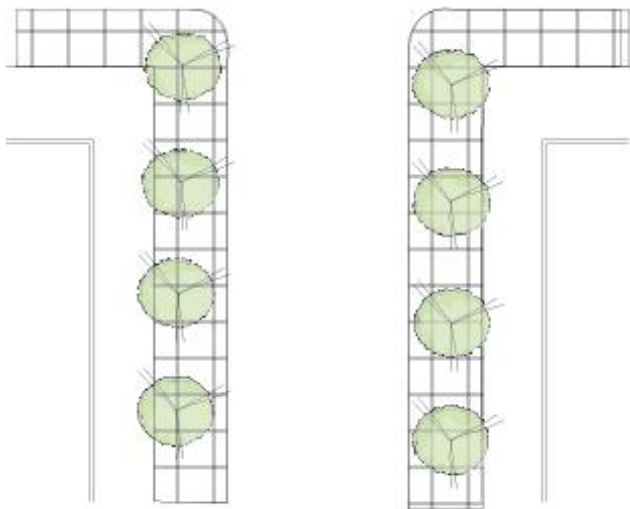
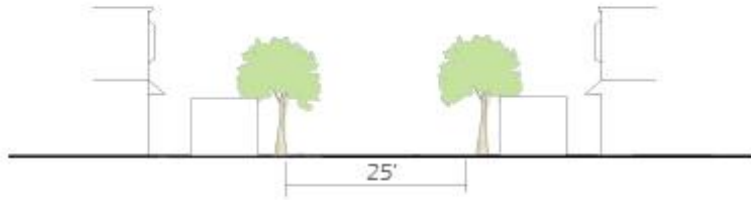
STREET TYPOLOGY: RESIDENTIAL LANE

TYPE4. 39:23



STREET TYPOLOGY: ALLEY

TYPE 5.25



LEGEND

- Residential
- Mixed-Use
- Public
- Retail Corridor



PHASE 1

Create berm between park and community

Build new single family and town houses

Extend park, pedestrian path and streets to park

Residential

192,000 sq.ft.

New Green Space

151,000 sq.ft.



PHASE 2

Establish new retail corridor and pedestrian plaza
Build community center, new mixed-use buildings along the retail corridor
Create green rooftops and rainwater recycling systems

Retail & Mixed-Use
545,600 sq.ft.

Public Building
54,000 sq.ft.

Plaza
20,350 sq.ft.

New Green Space
14,100 sq.ft.



PHASE 3

Develop public office sector including shared office spaces
Build additional mixed-use buildings

Shared office
& Mixed-Use
335,000 sq.ft.

Public Building
54,000 sq.ft.



ZOOM IN: RESIDENTIAL BLOCKS AND PUBLIC FACILITY



SCENE 1: SUMMER TIME @ COMMUNITY CENTER PARK



ZOOM IN: SHARED OFFICE AND MIXED-USE



ZOOM IN: RETAIL CORRIDOR, INDOOR MARKETPLACE, & MIXED-USE



SCENE 2: WINTER NIGHT @RETAIL CORRIDOR



ZOOM IN: PUBLIC SPACES





TRANSIT STOP
FIVE MINUTE WALK

On-demand transit
Shuttle bus connection

LEGEND

- Existing Building
- Proposed Building
- Green Roof
- Plaza
- Bike Lane



LOWER DENSITY ALTERNATIVES

All development 5 stories or less

DESIGN OPTION THREE



DESIGN OPTION FOUR



Reduced to 600 residential units, land value reduced to \$66 million

DESIGN
VOCABULARY
PROVIDES
IMAGES OF
ARCHITECTURAL
FORM, SCALE
AND CHARACTER
FOR THE NEW
SAYREVILLE
NEIGHBORHOOD

CHANGING THE IMPACT



CHANGING THE IMPACT ENHANCING THE FUTURE



CHANGING THE IMPACT ENHANCING THE FUTURE

Estimate to buy out units in future flooded study area with no levee **\$330,000,000 to \$600,000,000**

Estimated value **loss per year** with out flood mitigation [Rutgers] **\$10,243,000 per year or \$330,000,000 over the next 30 years**

Estimated cost for the berm and flood gate [US Corp of Engineers] **\$61,000,000 [2004 Estimate]**

Yearly operating and maintenance costs **\$4,000,000 per year**

Cost for design and construction of new park (Estimated Nelessen Group) **\$11,000,000**

Yearly operating and maintenance costs (Estimated Nelessen Group) **\$1,000,000**

Cost for berm and park **\$77,000,000**

Estimated sale value of land for development @ 1,200 units

with 80,000 sq ft of local retail and services **\$124,000,000**

Net tax revenue to Sayreville per year from new development **\$5,300,000**

CHANGING THE IMPACT ENHANCING THE FUTURE

Case Study: SAYREVILLE, NEW JERSEY

OPTIONS WORTH EXPLORING



Express your Visual Preferences for Post Sandy Reconstruction

Go to:

[www:RutgersPostSandySurvey.org](http://www.RutgersPostSandySurvey.org)