



**Quantified[®]
Ventures**

VA Coastal Resilience Master Plan Finance Subcommittee

**Environmental Impact Bonds
Catastrophe Bonds
Resilience Bonds**

Eric Letsinger, CEO

April 2021

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- Environmental Impact Bonds
- Catastrophe Bonds
- Resilience Bonds



Quantified Ventures develops projects, partnerships, and innovative financial transactions to drive transformational health, social, and environmental impact.



Our Practice Areas



**Forestry and
Land Use**



**Urban and Coastal
Resilience**



Agriculture



**Health and
Human Services**

List of example activities to develop an outcomes-based solution

- Work with city stakeholders to **define objectives and community priorities** to include in the program (e.g., workforce development, green space access in underserved neighborhoods)
- Partner with city stakeholders and engineering firms to **develop detailed cost model** (including development and maintenance)
- **Define potential co-benefits** (e.g., including a workforce development program) and beneficiaries beyond the city
- Engage with the city stakeholders to **determine repayment structure** that meets their needs and budget restrictions (e.g., define the price per outcome)
- **Determine the outcome metrics** to track and verify and the process for verification (e.g., frequency, data needed)
- **Engage with co-beneficiaries** to try and bring them in as "payors" to help subsidize the cost for the city.
- **Build the investment model** that includes terms, rates, and structure to attract impact capital for development and maintenance
- **Engage with impact investors and foundations** to gauge interest in funding the project

Environmental Impact Bond

- Municipal bond with variable payments based on project results
- Municipality decides on structure and range of variable payments and how outcomes will be measured
- Municipality oversees construction and maintenance

Outcomes Fund

- Investors seed special purpose vehicle (SPV) to fund project development and maintenance
- Municipality repays SPV based on project results and measured outcomes (e.g., price per gallon)
- Municipality oversees construction and maintenance
- Provides off-balance sheet flexibility in terms and repayment structure

Community-Based Public-Private Partnership (CBP3)

- Investors seed private development venture (typically a SPV) to fund project development and maintenance
- Municipality repays based on project results and measured outcomes
- Other co-beneficiaries brought in to subsidize municipality costs
- 3rd party oversight of construction and maintenance



CASE STUDY: Soil and Water Outcomes Fund

Enhancing Soil and Water Health With Farmers



Project Goal

Partner with the Iowa Soybean Association to develop the Soil and Water Outcomes Fund, a first of its kind multi-payor financial transaction to monetize the multiple benefits of sustainable agriculture best practice implementation

Outcomes

- Reduce nutrient loading credited against municipal water permits
- Enhance carbon sequestration in soil
- Conserve and restore pollinator habitat and biodiversity

Transaction Structure

- Upstream farmers provided with financial incentives to implement agriculture BMPs like reduced tillage and cover crops and structural improvements like nitrate removal wetlands
- Water quality outcomes sold to municipalities, carbon sequestration outcomes to agribusiness to meet supply chain sustainability targets



CASE STUDY:
Southwest Colorado
Wildfire Mitigation
Outcomes Fund

Launching an Outcomes Fund in Southwest Colorado



Multi-payor fund enables long-term cross-boundary wildfire risk mitigation

Project Goals

- Increase the scale of interventions around the San Juan National Forest - mostly private land - to reduce wildfire risk
- Stack payors, investors, biomass revenues, and public and philanthropic contributions to minimize funding required of small rural communities while repaying on risk mitigation outcomes
- Support local biomass industry (renewable power, biochar, etc.)
- Use state bond issuance to help capitalize a revolving fund, enabling treatments to be implemented and self-sustainable over the long term

Outcomes

- Restored forests
- Reduced risk of wildfire
- Protected water resources
- Avoided economic costs
- Resilient communities in wildland-urban interface


Transaction Structure

- Create a \$44M outcomes-based revolving fund, enabling treatments to be implemented and self-sustainable over the long term

Environmental Impact Bonds: A Replicable but Flexible Structure



	WASHINGTON, DC	ATLANTA, GA	HAMPTON, VA
Primary Value Proposition of EIB	What is the cost-effectiveness of green vs. grey infrastructure for CSO reduction?	How can green infrastructure improve local flooding, water quality, and economic conditions?	How we use bond disclosures as a lever to attract new ESG investor demand to finance coastal flooding projects?
Size	\$25,000,000	\$14,020,000	\$12,000,000
Term	30 years (5 year re-tender)	10 years	30 years
Placement	Private	Limited Public	Public
Structure	3-tiered	2-tiered	Disclosures only
Outcome Metric	Volume capture (flow / runoff)	Volume capture (capacity / storage)	Volume capture (capacity / storage)
Regulatory Driver?	Yes	No	No
Types of GI	<ul style="list-style-type: none"> Right of way planters Bioretention on public parks 	<ul style="list-style-type: none"> Right of way planters Bioretention on public parks Stream & floodplain restoration 	<ul style="list-style-type: none"> Drainage ditch conversions to bioswales with native plants Holding pond conversions for stormwater and water quality Transportation corridor elevation and protection against flooding



**CASE STUDY:
DC Water & Sewer
Authority
Environmental Impact
Bond**

Building Green Infrastructure in Washington, DC



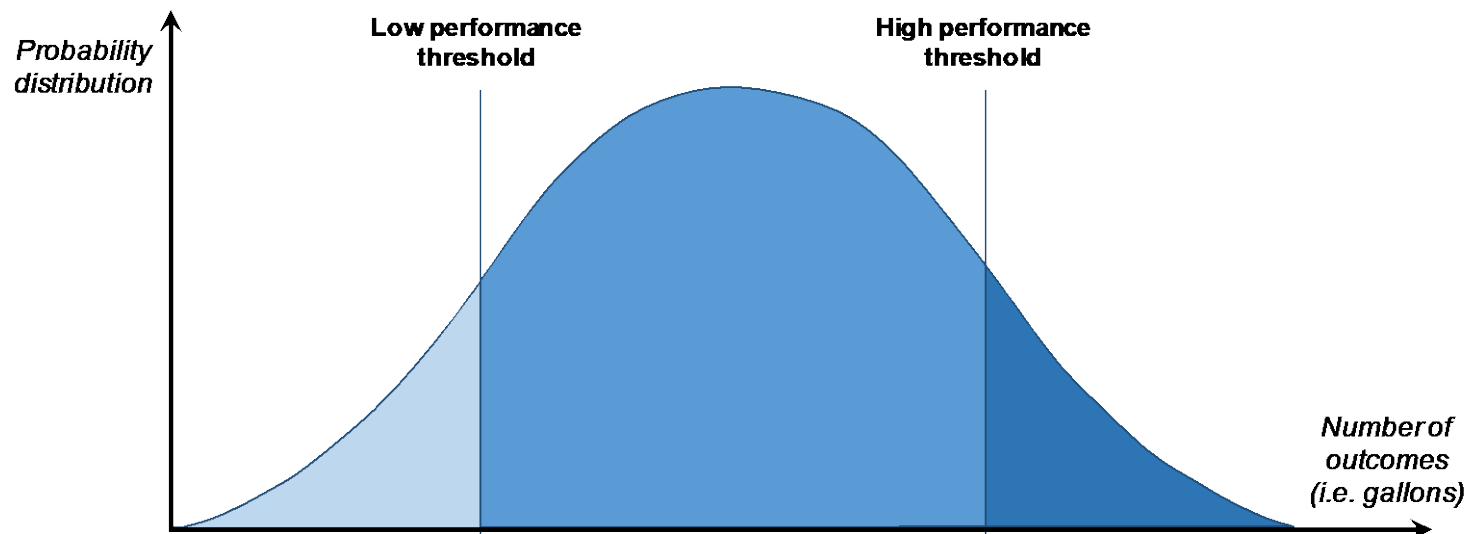
Challenge

- DC's combined sewer system was dumping 2.5 billion gallons of overflow annually into 3 rivers
- DC given consent decree in 2005 to fix the issue
- Original approach - \$2 billion for grey tunnel system – was expensive and didn't provide community benefits
- DC Water interested in green infrastructure, but performance was uncertain and risky

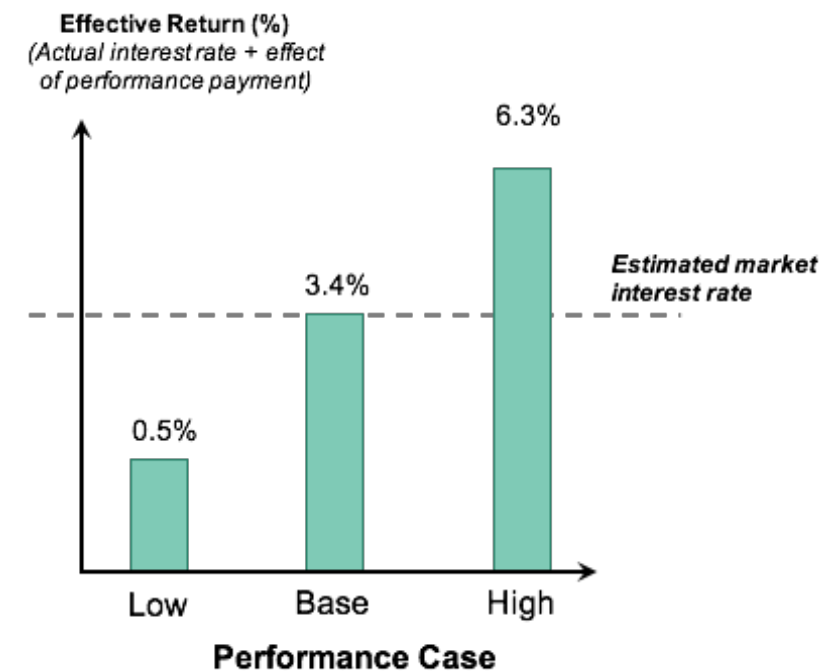
Solution


- \$25 million municipal Environmental Impact Bond issued to fund green infrastructure construction
- Investor payments tied to stormwater volume capture outcomes thereby transferring some performance risk to investors
- New green infrastructure and green space now installed across the city
- Green infrastructure workforce program that's trained >100 candidates

DC Water EIB to Fund Green Infrastructure



Performance:	Low	Base	High
Fixed (Actual) Interest Rate:	3.43% <i>(market rate)</i>	3.43% <i>(market rate)</i>	3.43% <i>(market rate)</i>
Additional Payment:	\$3.3M Clawback <i>(Investors to DC Water)</i>	None	\$3.3M Payment <i>(DC Water to investors)</i>
Probability:	2.5%	95.0%	2.5%





CASE STUDY: Resilient Hampton Environmental Impact Bond

Coastal Resilience in Hampton



Project Goal

Structure municipal debt as high-profile, performance-evaluated, and collaboratively-designed financing for urban green infrastructure

Context

- Coastal location, low elevation, and high impervious surface coverage / groundwater table creates frequent local flooding
- Financed projects are prototypes for a decades-long pipeline of resilience work

Transaction Structure

- \$12 million bond issuance for 3 green infrastructure projects to manage coastal and stormwater flooding
- Outcome metric: gallons of water managed in creek system
- Focus on and measurement of outcomes promotes governance best practices, attracts municipal bond investors with ESG mandates, and informs future planning, financing, and implementation

Catastrophe Bonds

Summary:

- Catastrophe (cat) bonds blend bonds and insurance
- Issued by governments or insurance companies

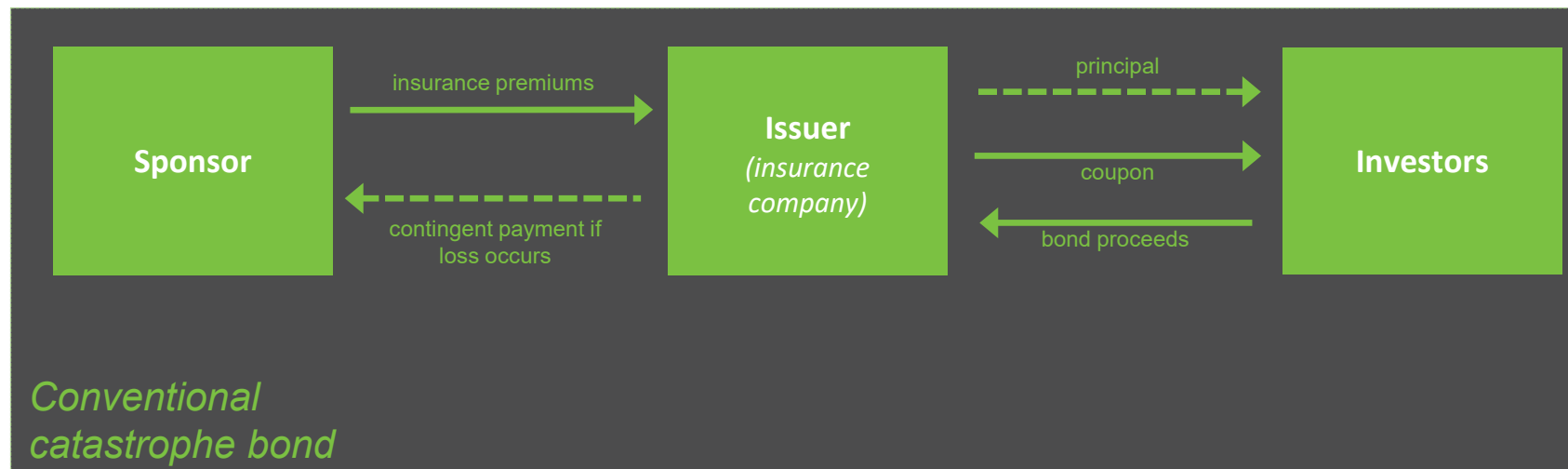
Market Outlook: growing demand despite riskiness

Structure:

 Returns vary based on occurrence of a disaster

- Disaster occurs → Investor forfeits some or all returns, and funds are used to pay for recovery
- No disaster occurs → Investor receives significant returns (relatively high and uncorrelated with other investments)

Pricing:

 driven by probability models and estimation of expected losses

Summary

- Conceptual add-on to cat bonds
- Fund resilience infrastructure proactively rather than reactively paying for damage
- Monetize avoided losses through reduced insurance premiums

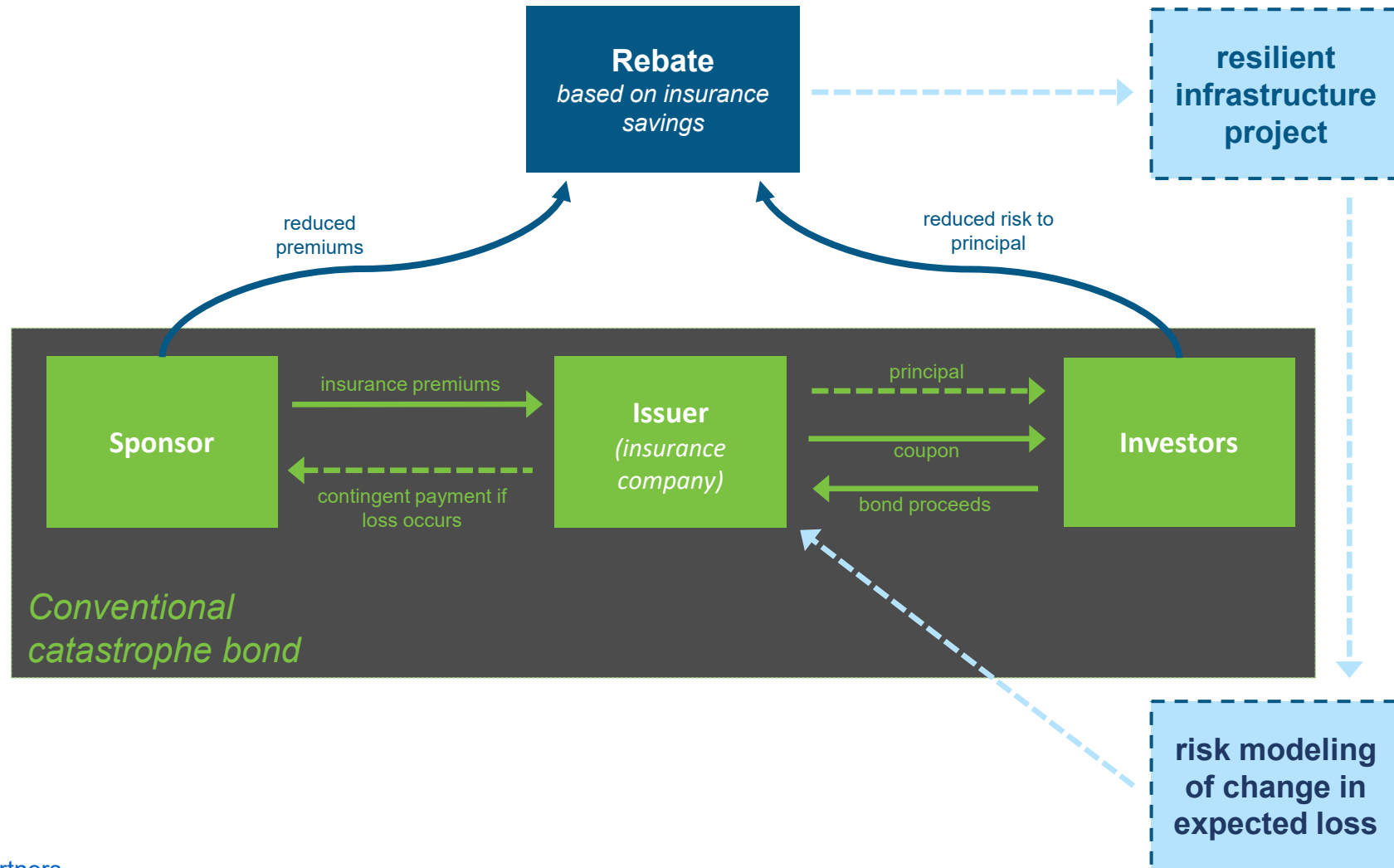
Who benefits? Large asset holders (public or private) that anticipate insurance obligations as a result of damage to their assets. Examples: cities, universities, utilities, hospitals, developers.

Example projects include seawalls, coastal flood barriers, green infrastructure

Challenges include

- Estimating future premiums to project cash flow of savings
- Competition with reinsurance markets

Resilience Bonds Structure





Eric Letsinger, CEO

letsinger@quantifiedventures.com

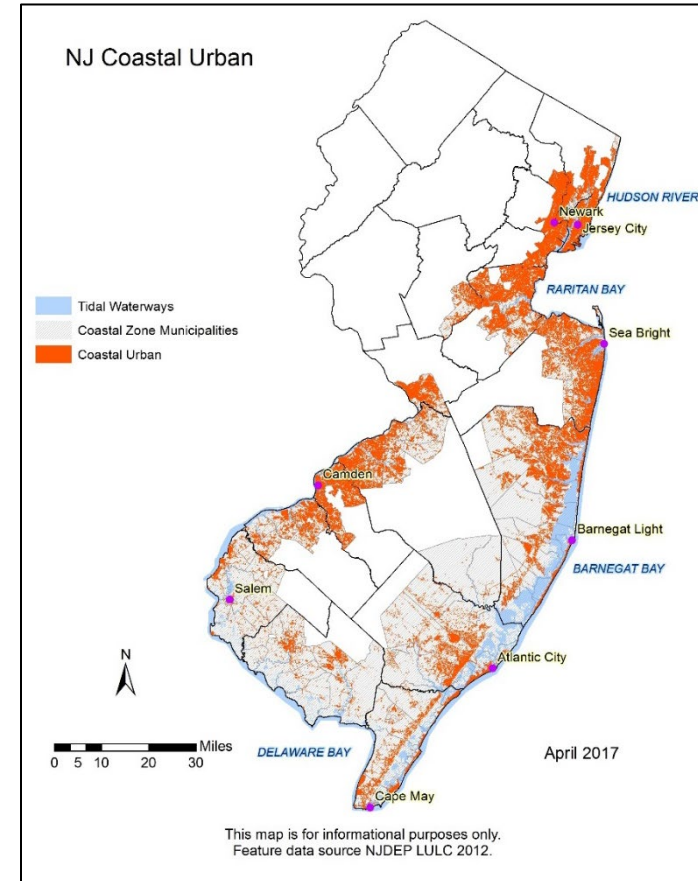
(240) 388-8994

Virginia Coastal Policy Center-William & Mary Law School Webinar-April 26th, 2021

NJ Blue Acres Buy-out Program

A Changing Climate

- Rising Sea Level
- Storm Intensity Increasing
- Coastal Erosion
- Development causing storm water run-off
- Sunny-day (nuisance) flooding



*FEMA, August 4, 2004

A Densely Populated & Flood-prone State



October 29, 2012: Superstorm Sandy Strikes

- 365,000 homes damaged
- 2.8M homes w/o power
- 100,000 downed trees
- 600 roads/tunnels closed
- 80 water/wastewater plants inoperable
- 1,400 vessels sunk/displaced
- 6.2M Cu Yds of housing materials and debris removed
- 100,000 Cu Yds of debris from waterways
- \$382M in commercial property damages



Hoboken, NJ, Oct. 2012

Criteria for a Blue Acres Buyout

1. Flood damage from Superstorm Sandy or repeated flooding
2. Clusters of homes
3. Willing sellers/support of local officials
4. Opportunity for significant impact on environment, or public health, safety, and welfare
5. Repeated NFIP claims
6. Benefit-cost analysis(FEMA)
7. National Objective (HUD)



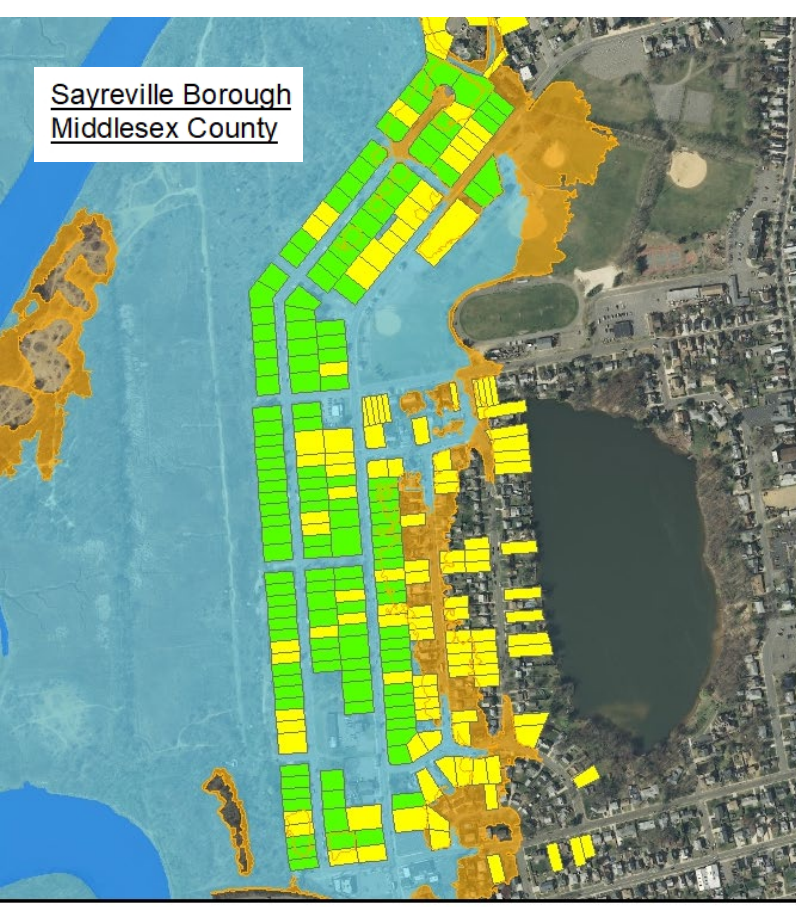
Process: From Mapping to Demolition



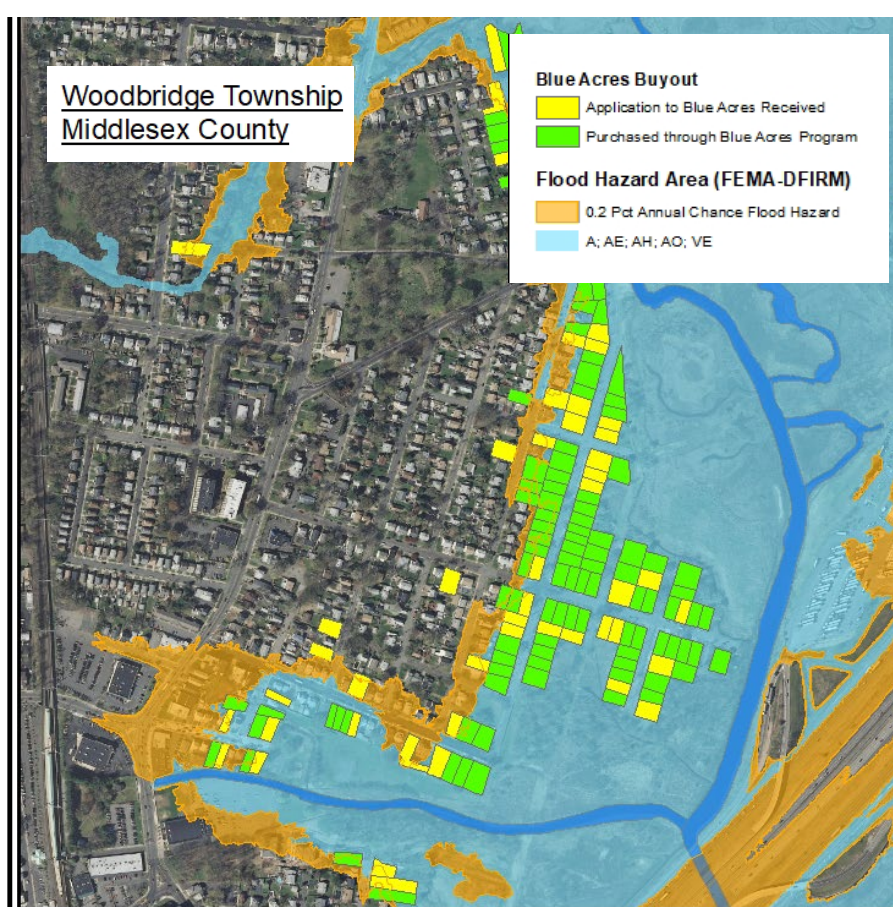
Planning: Sayreville map shows storm surge, willing sellers, open space, Substantial Damage determinations, and acquisition area



Sayreville Borough
Middlesex County



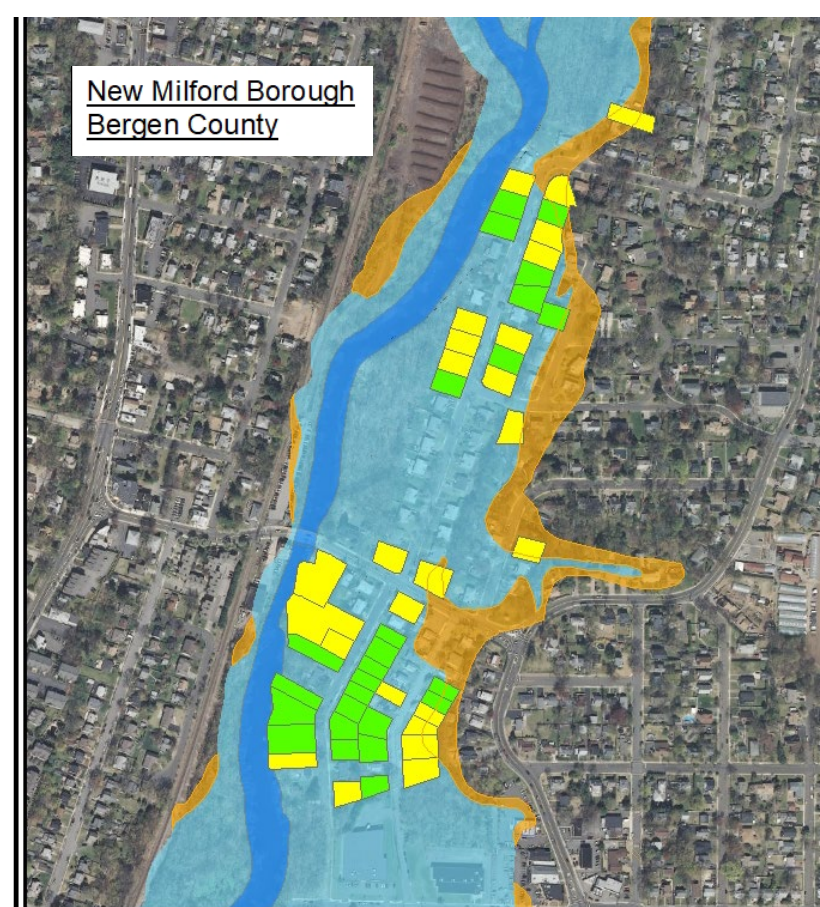
Woodbridge Township
Middlesex County



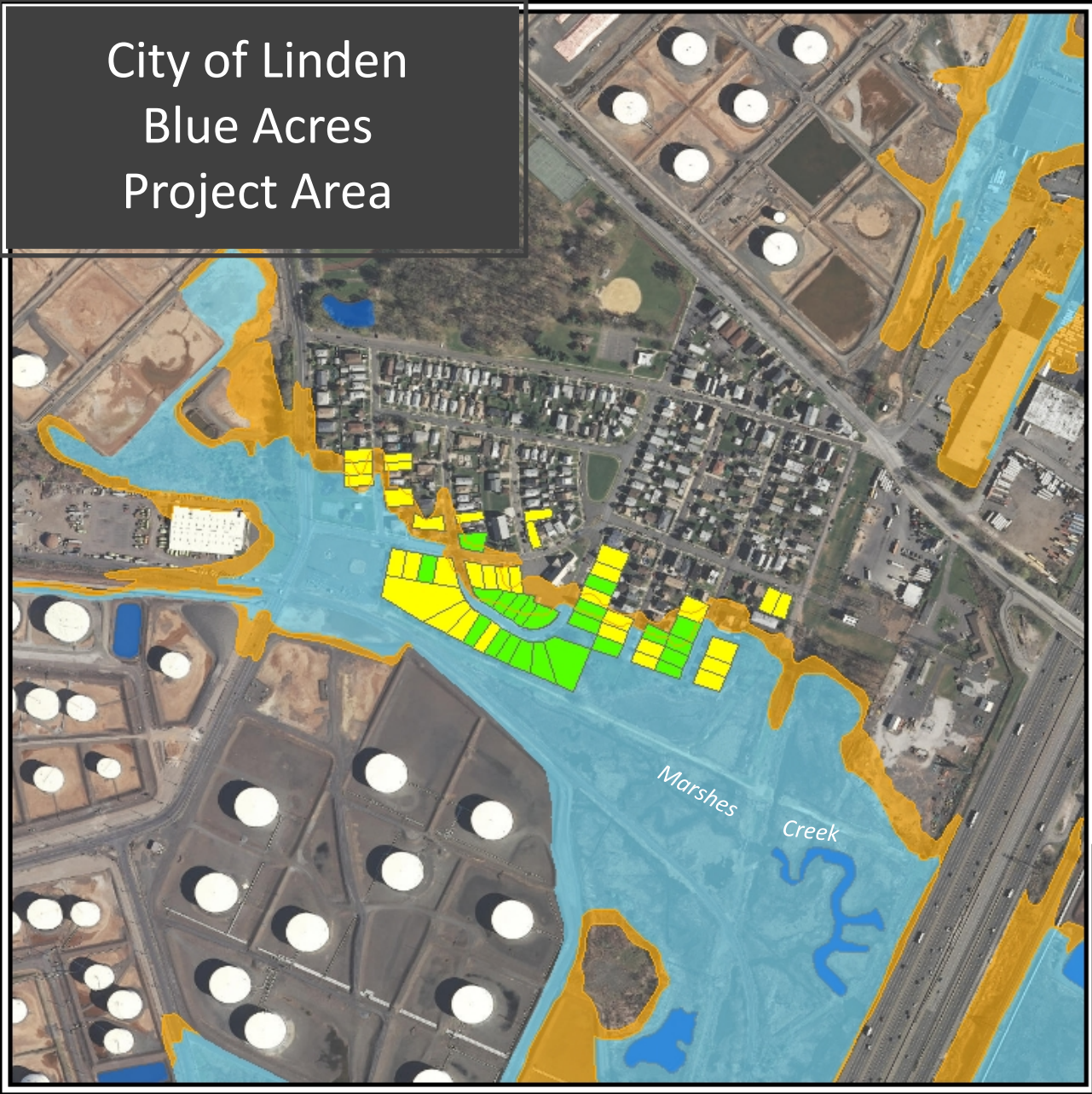
Blue Acres Buyout
Application to Blue Acres Received
Purchased through Blue Acres Program

Flood Hazard Area (FEMA-DFIRM)
0.2 Pct Annual Chance Flood Hazard
A; AE; AH; AO; VE

New Milford Borough
Bergen County



City of Linden Blue Acres Project Area



Linden City Union County

Blue Acres Buyout

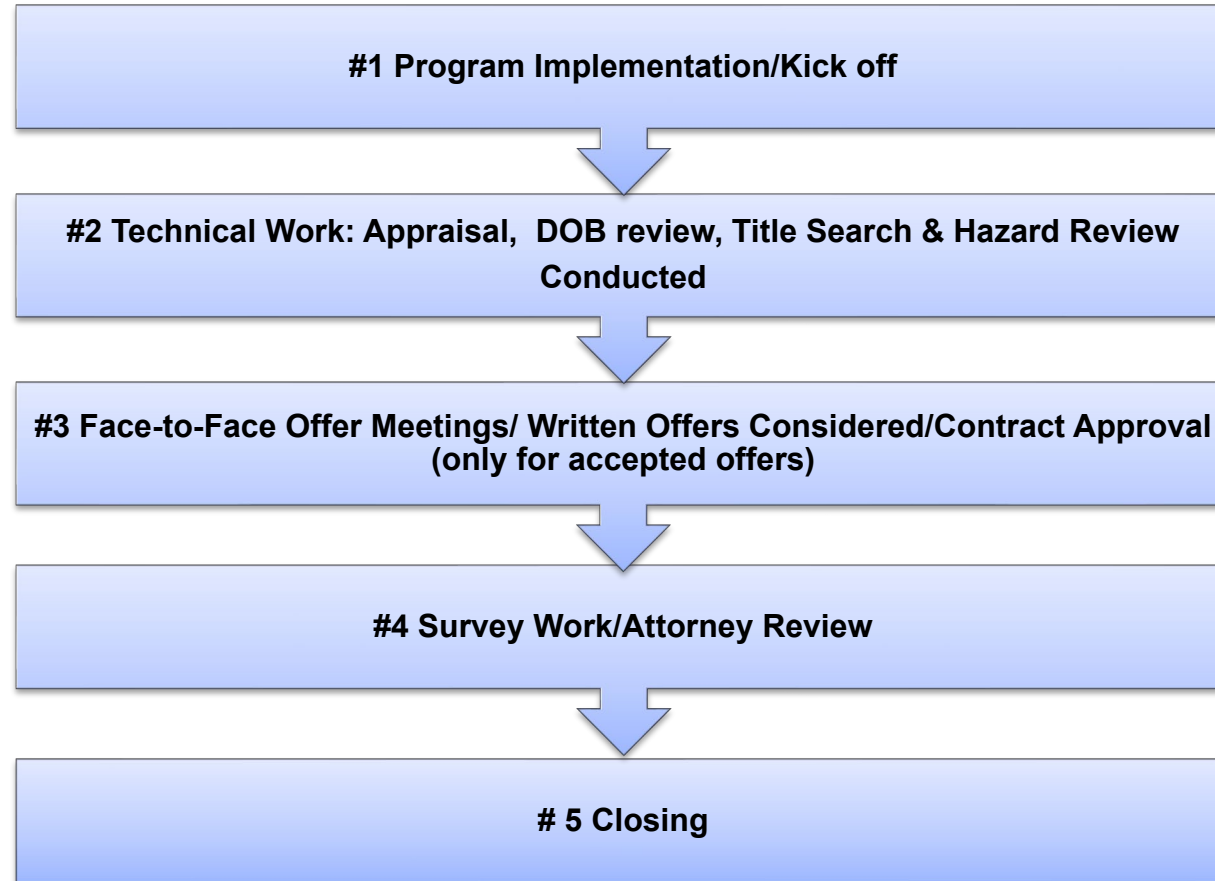
- Application to Blue Acres Received
- Purchased through Blue Acres Program

Flood Hazard Area (FEMA-DFIRM)

- 0.2 Pct Annual Chance Flood Hazard
- A; AE; AH; AO; VE



5 Steps to A Blue Acres Closing



Blue Acres Program: Innovations

- **Appraisal Appeal Process:** Instituted an offer appeal process to address homeowner concerns.
 - **Dedicated Mortgage Team:** Forged relationships with lenders: FHA, Freddie Mac, Fannie Mae, NJ Housing and Mortgage Finance Agency and NJ Division of Banking and Insurance.
 - **Tenant Relocation Team:** Relocate displaced Tenants. Units must meet Housing Quality Standard for both occupancy and habitability. Decent, safe and sanitary and “outside of the flood prone areas”.
-
- Successfully negotiated with 35 lenders resulting in \$5.7m in mortgage forgiveness for 73 homeowners





Post-Buyout Demolition

- Structure and site Improvements removed
 - Property graded and seeded
- Property deed restricted for conservation and passive recreation
 - Municipality provides long-term care

NJDEP Blue Acres Buyout Program

1995-2012: Purchased 300 homes pre-Sandy

2013: Blue Acres designated as State's Sandy buyout program to use federal funding to move families from harm's way.

June 2019: Governor Murphy signs constitutional measure creating a stable source of annual funding for Blue Acres.

April 2021: More than 759+ properties closed since 2013.

Current funding:

FEMA HGMP: \$185M
HUD CDBG-DR: \$100M
State bond funds: \$15M+



1,187 OFFERS



759+ CLOSINGS



699 DEMOLITIONS



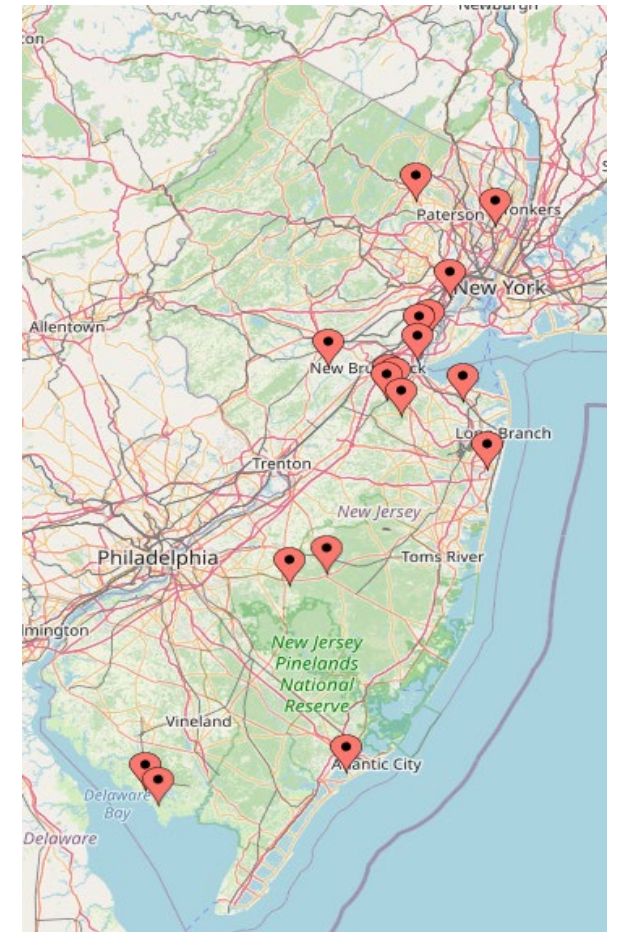
\$5.7M in DEBT FORGIVENESS



48 TENANT RELOCATIONS



20 MUNICIPALITIES/10 COUNTIES





For more information on the Blue Acres Program, visit:
http://www.state.nj.us/dep/greenacres/blue_flood_ac.html

Fawn Z. McGee, Director

New Jersey Department of Environmental Protection

Sandy Blue Acres Buyout Program

Tel: 609.940.4092 (office-direct)

609.940.4140 (office-main)

609.433.8489 (cell)

E-mail: fawn.mcgee@dep.nj.gov

