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## 1.0 List of Acronyms

**List of Acronyms**

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>BCR</td>
<td>Benefit/Cost Ratio</td>
</tr>
<tr>
<td>CAG</td>
<td>Citizen Advisory Group</td>
</tr>
<tr>
<td>CDBG-DR</td>
<td>Community Development Block Grant – Disaster Recovery</td>
</tr>
<tr>
<td>EFH</td>
<td>Essential Fish Habitat</td>
</tr>
<tr>
<td>EIS</td>
<td>Environmental Impact Statement</td>
</tr>
<tr>
<td>HUD</td>
<td>Department of Housing and Urban Development</td>
</tr>
<tr>
<td>NEPA</td>
<td>National Environmental Policy Act</td>
</tr>
<tr>
<td>NJDEP</td>
<td>New Jersey Department of Environmental Protection</td>
</tr>
<tr>
<td>RBD</td>
<td>Rebuild by Design</td>
</tr>
<tr>
<td>RBDM</td>
<td>Rebuild by Design Meadowlands</td>
</tr>
</tbody>
</table>
2.0 Agenda

Alternatives 1, 2, & 3

Welcome

Presentation

Opening Remarks (10 Minutes)

Welcoming (Linda Fisher, NJDEP)
Agenda (Chris Benosky, AECOM)
Meadowlands Challenge (Garrett Avery, AECOM)
Purpose & Need
Screening Process
Project Roadmap

Alternative 1 Storm Surge Flooding: (Lulu Loquidis, AECOM)
Alternative 2 Frequent Rain Flooding: (Garrett Avery, AECOM)
Alternative 3 Storm Surge & Frequent Rain Flooding: (Garrett Avery & Lulu Loquidis, AECOM)

Build Plan
Future Plan

Next Steps & Q&A/Closure (Chris Benosky, AECOM)

Next Steps
Question and Answers
CITIZENS ADVISORY GROUP MEETING

ALTERNATIVES 1, 2, & 3
OCTOBER 17, 2017

AGENDA

Christopher Benosky, AECOM

• Welcome
• The Meadowlands Challenge
• Alternative 1
• Alternative 2
• Alternative 3
  • Build Plan
  • Future Plan
• Next Steps
• Question & Answer
THE MEADOWLANDS - A COMMUNITY AT RISK

- Nearly all the project area is within the 100-year floodplain

TWO MAIN CHALLENGES

1. Challenges from **MAJOR STORM SURGE**
2. Challenges from **FREQUENT RAIN**
CHALLENGE 1: STORM SURGE FLOODING

CHALLENGE 2: FREQUENT RAIN FLOODING
THE MEADOWLANDS CHALLENGE

The Meadowlands sits at a low elevation in relation to sea level. Protection from complex tidal influence and storm surge is limited. Existing storm infrastructure is under-performing and needs to be updated and maintained.

EXISTING CHALLENGES INCREASE FLOODING RISK

- Low Elevation: Existing flooding conditions & buildings constructed at low elevations are problematic for future sea-level rise.
- Underperforming Infrastructure: The existing pump stations are undersized and underperforming.
- Inadequate Ditches + Drainage System: Existing ditches and drainage systems are undersized and poorly maintained.
- Filled Historic Wetlands: Historical wetlands were filled reducing capacity.
- Failing Berms: Existing berm heights do not protect against flooding.
- Insufficient Protection: There is no protection from tidal range, which can result in severe flooding.
- Insufficient Drainage: The existing drainage system proves to be insufficient during flood events.
- Frequent Storms: Frequent rain storms and severe interior flooding occur multiple times annually.
- Water Quality: Runoff flows directly into the storm system untreated.
RESILIENT SOLUTIONS TO RECOVER MORE QUICKLY

- Provides protection against frequent storm events and improved infrastructure for quicker recovery
- Photo: existing condition of existing tide gate at East Riser Ditch

TWO MAIN CHALLENGES

1. Challenges from **MAJOR STORM SURGE**
   - Flooding

2. Challenges from **FREQUENT RAIN**
   - Flooding
THE MEADOWLANDS - THREE ALTERNATIVES

Alternative 1: Storm Surge Flooding

Alternative 2: Frequent Rain Flooding

Alternative 3: Storm Surge & Frequent Rain Flooding

THE PURPOSE

ADDRESS FLOOD RISK

INCREASE RESILIENCY of the communities and ecosystems

REDUCE IMPACTS to critical infrastructure, residences, businesses, and ecological resources

*Purpose & Need from NOI and Public Scoping Document
THE NEED

ADDRESS systemic INLAND FLOODING AND COASTAL FLOODING from storm surges

INCREASE COMMUNITY RESILIENCY

REDUCE FLOOD insurance RATES and claims from future event

ENHANCE WATER QUALITY and protect ecological resources

PROTECT life, public health, and property

Incorporate flood hazard risk reduction strategy with CIVIC, CULTURAL, AND RECREATIONAL VALUES

*Purpose & Need from NOI and Public Scoping Document

PROJECT GOALS

1. Create the BEST POSSIBLE PROJECT with the available funding

2. Meets the Project Mandate by providing FLOOD REDUCTION & CO-BENEFITS such as reducing sediment & improving water quality

3. Construct a project that provides STORM PROTECTION and allows for a QUICKER RECOVERY
PROJECT CONSTRAINTS

1. Construct a complete project that functions as an **INDEPENDENT** **UTILITY** to meet purpose & need without relying on future projects.

2. Use only **AVAILABLE FUNDS** without relying on future funding.

3. Construct a fully-functional project by **SEPTEMBER 2022**.

PROJECT ROADMAP

**NEW MEADOWLANDS WINNING CONCEPT**

**PRESENTATION OF ALTERNATIVES**

**DRAFT/FINAL ENVIRONMENTAL IMPACT STATEMENT**

**PUBLIC COMMENT PERIODS**

**NEW MEADOWLANDS CONSTRUCTION**


**AECOM BEGINS**

**NJDEP ACTION PLAN AMENDMENT**

**DRAFT FEASIBILITY REPORT**

**DRAFT ENVIRONMENTAL IMPACT STATEMENT**

**NJDEP ACTION PLAN AMENDMENT**

**PUBLIC HEARING**

**DRAFT ENVIRONMENTAL IMPACT STATEMENT**

**FINAL ENVIRONMENTAL IMPACT STATEMENT**

**RECORD OF DECISION**

**DESIGN COMPLETE**
OUR PROCESS
THE SCREENING TOOL

Concepts are screened against each other to determine how they will meet the below metrics.

FLOOD REDUCTION BENEFITS  BUILT HUMAN ENVIRONMENT  NATURAL ENVIRONMENT  CONSTRUCTION & MAINTENANCE  COST & BENEFIT

FLOOD REDUCTION BENEFITS

Categories Evaluated:

- Reduces Flood Risk from Coastal Storm Surge (Alternatives 1 and 3)
- Reduces Flood Risk from Rainfall/Interior Drainage Challenges (Alternatives 2 and 3)
- Provides Protection to Vulnerable and Underserved Populations
- Provides Protection to Critical Infrastructure (emergency services, hospitals, transit facilities)
BUILT HUMAN ENVIRONMENT

Categories Evaluated:

- Effects to Existing Utilities & Utility Infrastructure
- Effects to Existing Transportation Network, Local Traffic, and Connectivity
- Effects on Land Acquisition / Housing Displacements
- Potential to Provide Increased Waterfront Access
- Effects to Recreational, Civic, and Cultural Amenities and Uses
- Effects to Viewshed and Local Visual Quality
- Effects to Air Traffic Safety at Teterboro Airport

NATURAL ENVIRONMENT

Categories Evaluated:

- Effects to Existing Hazardous Waste Sites
- Effects to Berry's Creek Remediation
- Effects on the Transport of Environmental Contaminants/ Sediments during Flood Events
- Effects to Water Resources, including Water Quality, "Waters of the US," Wetlands, and Mitigation Banks
- Effects to Fisheries and Essential Fish Habitat (EFH)
- Effects on Protected Species and their Habitats
- Effects on Other Sensitive Ecological Resources, including Biodiversity, Habitat, and Migration/Movement Corridors
- Effects to Historic and Prehistoric Cultural Resources
CONSTRUCTION & MAINTENANCE

Categories Evaluated:
- Constructability
- Minimizes Long-Term Maintenance & Operation Requirements for Overall System
- Potential to Complete by September 2022

BENEFIT & COST

Categories Evaluated:
- Provides Benefits to the Project Area and Community
- Can be Implemented within Available Funding Limits
- Has a Positive Benefit/Cost Ratio
ALTERNATIVE 1 STORM SURGE - PROTECT

APPRAOCH & GOALS

+ INFRASTRUCTURE

By connecting the existing topographical high points, the project can reduce construction costs and minimize additional regrading of the Hackensack River edge.
ALTERNATIVE 1 STORM SURGE - **CULTIVATE**

**APPROACH & GOALS**

+ **INFRASTRUCTURE**

+ **ECOLOGY**
  The ecological systems are essential to the Meadowlands. The approach will minimize disturbance, consider habitat improvements to fragmented systems, and creation of new ecological zones.

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ALTERNATIVE 1 STORM SURGE - **ENERGIZE**

**APPROACH & GOALS**

+ **INFRASTRUCTURE**

+ **ECOLOGY**

+ **PARKS**
  As a co-benefit to flood reduction, the project seeks to connect existing public parks as well as provide new park space on existing public land.
Existing topography was analyzed to determine water flow and identify areas of high ground.

- All proposed flood protection strategies were informed by geotechnical analysis.
- The soil type helped the team determine how deep the piles and substructure needed to extend.

Data Source:
USDA WDI Web Soil Survey
ALTERNATIVE 1 STORM SURGE – SCREENING OF CONCEPTS
PROVIDING PROTECTION TO A 7’ ELEVATION

- Explored many options to a 100-year flood, but all resulted in a fatal flaw
- The 7’ NAVD88 design elevation was further analyzed

<table>
<thead>
<tr>
<th>Initial Concepts</th>
<th>Description</th>
<th>Within Budget</th>
<th>No Increased Flood Risk</th>
<th>Benefit Cost Ratio &gt;1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Option 1</td>
<td>100-year Storm Protection/Expanded Project Area</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Option 2</td>
<td>100-year Storm Protection/Project Area</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Option 3</td>
<td>50-year Level of Protection/Project Area</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Option 4</td>
<td>Brg Level/Reduced Project Area</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Option 5</td>
<td>Storm surge barrier on Hackensack River</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

50-YEAR LEVEL OF PROTECTION ADVANCES

ALTERNATIVE 1 STORM SURGE - PLAN

- Provides protection from a storm surge to elevation 7’ NAVD88 (approximately a 50-yr storm)
- Provides community co-benefits through water access & multifunctional wall elements
- Positive Benefit Cost Ratio greater >1
- Revised Feasibility-level concept cost exceeds $150M

- Existing Riverwalk
- Sheet Pile Cantilever
- Berms at Fluvial Park
- Cantilever Walkway
- Sheet pile Wall
- Surge Barrier
CANTILEVER WALKWAY
CONCEPTUAL RENDERING FOR ILLUSTRATIVE PURPOSES

- The Cantilever Walkway combines flood protection and public access

1. Public walk
2. Modular planter
3. Cantilever access
4. Recreational space

FLOOD PROTECTION
CONCEPTUAL RENDERING FOR ILLUSTRATIVE PURPOSES

- The entire structure is built up to a 7' NAVD88 elevation

1. Flood protection system
2. Newly-created tidal wetland
VIEWING PLATFORM & SHEET PILE
CONCEPTUAL RENDERING FOR ILLUSTRATIVE PURPOSES

- Sheet pile is a cost effective material used in the southeast
- Public viewing platforms were integrated into the system

FLOOD PROTECTION
CONCEPTUAL RENDERING FOR ILLUSTRATIVE PURPOSES

- Sheet pile wraps around viewing platform to form the flood protection system
FREQUENT RAIN FLOODING

ALTERNATIVE 2
GARRETT AVERY, AECOM

ALTERNATIVE 2 FREQUENT RAIN FLOODING - PROTECT

APPROACH & GOALS

+ INFRASTRUCTURE

Through enhancement and restoration, the existing channels of the project area will have capacity to convey stormwater away from flood-prone areas.
ALTERNATIVE 2 FREQUENT RAIN FLOODING - **CULTIVATE**

**APPROACH & GOALS**

+ **INFRASTRUCTURE**

+ **ECOLOGY**
  
  Native plantings and naturalized channel edges provide habitat and improve water quality

---

ALTERNATIVE 2 FREQUENT RAIN FLOODING - **ENERGIZE**

**APPROACH & GOALS**

+ **INFRASTRUCTURE**

+ **ECOLOGY**

+ **PARKS**
  
  New park spaces are integral to the water management system; both by slowing runoff and improving water quality

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REBUILD BY DESIGN MEADOWLANDS

CAG Meeting #11 // October 17, 2017

AECOM
**ALTERNATIVE 2 FREQUENT RAIN FLOODING -ANALYSIS**

**20 SUB-BASINS**

- Analyzed 20 sub-basin areas in the hydrologic model.

- Runoff flows to lower elevations, into creeks or ditches and is conveyed eventually into the Hackensack River or Berry's Creek.

- We listened to the community members and used their input to map areas of frequent flooding.

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**FREQUENCY & FLOW**

- Floods in regular event
- Floods in heavy event
- Floods in major event
- Primary conveyance direction
- Sub-basin
### ALTERNATIVE 2 FREQUENT RAIN FLOODING SCREENING

<table>
<thead>
<tr>
<th>Initial Concepts</th>
<th>Description</th>
<th>Within Budget</th>
<th>Distribution of Benefits</th>
<th>Benefit Cost Ratio &gt; 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main Street</td>
<td>Increase storage capacity at Indian Lake, improves storm drainage pipes, includes upgrades to existing Yellow Lake pump station discharge line, and new street and park green infrastructure</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>DePeyster Creek</td>
<td>Upgrade of existing pump station, upgrades of existing upstream culvert, channel dredging with habitat restoration, and new street and park green infrastructure</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Losen Slote &amp; Carol Place</td>
<td>Two new pump stations and force mains to divert stormwater from residential area to downstream of Losen Slote, upgrades to existing storm drainage ditches and culverts, and new street and park green infrastructure</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>West Riser</td>
<td>New pump station, channel conveyance improvements with habitat restoration, culvert upgrades, and new street green infrastructure</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>East Riser</td>
<td>Pump station improvements, channel conveyance improvements with habitat restoration, culvert and bridge upgrades, and new street and park green infrastructure</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Revised Concept</td>
<td>New pump station and force mains to divert stormwater from residential area to downstream of Losen Slote, upgrades to culverts and bridge crossings, East Riser Ditch conveyance improvement and new pump station, and new street and park green infrastructure</td>
<td></td>
<td></td>
<td>REVISED CONCEPT ADVANCES</td>
</tr>
</tbody>
</table>

- Top concepts were reviewed and evaluated using the screening criteria
- The Revised Concept was a result of reviewing and rearranging to create a concept carrying increased benefits

### ALTERNATIVE 2 – FREQUENT RAIN FLOODING PLAN

- Reduction in areal extent of flooding and depth of flooding for fluvial storms of a recurrence interval of 100-yr or less
- Provides community co-benefits through green infrastructure
- Positive Benefit Cost Ratio greater >1
- Revised Feasibility-level concept cost exceeds $150M

1. East Riser Channel Improvements + New Park
2. Green Infrastructure + New Park
3. Force Main + Public Facility Improvements
4. Green Infrastructure + New Park
5. Park Improvements + 3 New Parks + Green Infrastructure
LOSEN SLOTE DRAINAGE IMPROVEMENTS
CONCEPTUAL RENDERING FOR ILLUSTRATIVE PURPOSES

- New pump stations improve conveyance capacity by moving water from one location to another.

GREEN INFRASTRUCTURE & PARK IMPROVEMENTS
CONCEPTUAL RENDERING FOR ILLUSTRATIVE PURPOSES

- Wetland enhancement, improves storage and treatment capacities, and improves public recreation opportunity.
STORM SURGE & FREQUENT RAIN FLOODING

ALTERNATIVE 3 - HYBRID

GARRETT AVERY & LULU LOQUIDIS, AECOM

ALTERNATIVE 3 – A PLAN FOR BOTH CHALLENGES

- East Riser Channel Improvements + New Park
- Green Infrastructure + New Park
- Force Main + Public Facility Improvements
- Green Infrastructure + New Park
- Park Improvements + 3 New Parks + Green Infrastructure

[Map with various locations and markers indicating the plan's components]
ALTERNATIVE 3 HYBRID - THE BUILD & FUTURE PLAN

The Build Plan represents a feasible project that can be constructed by 2022. Components include flood reduction strategies to address frequent rain flooding.

Components that were not selected for the Build Plan became elements of a Future Plan. These elements could be implemented by others over time as new funding sources become available.

ALTERNATIVE 3 - BUILD PLAN
FREQUENT FLOOD REDUCTION

1. Pump station + Channel Improvements + New Park
2. Green Infrastructure + New Park
3. Pump Station + Force Main + Public Facility Improvements
4. Green Infrastructure
5. Park Improvements + 1 New Park + Green Infrastructure

- Channel Improvements
- Force Main Improvements
- New Pump Stations
- Street Green Infrastructure
- Created Wetlands
- GI & Open Space Improvements
FOR FUTURE IMPLEMENTATION
ADDITIONAL RAIN FLOODED REDUCTION FROM ALTERNATIVE 2

1. East Riser Channel Improvements Extension toward South Hackensack
2. A second Losen Slote Pump Station & Force Main

FOR FUTURE IMPLEMENTATION
50-YEAR STORM SURGE PROTECTION FROM ALTERNATIVE 1

1. Existing Riverwalk
2. Sheet Pile Cantilever
3. Berms at Fluvial Park
4. Cantilever Walkway
5. Sheet pile or Floodwall
6. Surge Barrier
ALTERNATIVE 3 - BUILD PLAN

- The Build Plan can be constructed and functional by 2022
- The plan put forth will require less maintenance than that of an Alternative 1 system
- Positive Benefit Cost Ratio greater >1
- Plan can be constructed within Available Funds

East Riser Channel Improvements + New Park
Green Infrastructure + New Park
Force Main + Public Facility Improvements
Green Infrastructure
Park Improvements + 1 New Park + Green Infrastructure

PROTECT

- Channel conveyance improvements below Moonachie Ave with a new pump station
- New wetland eco-park with ~13,000 SF of integrated green infrastructure and ~129,000 SF of wooded and emergent wetland to improve storage and water quality
EAST RISER CHANNEL IMPROVEMENTS

CULTIVATE & ENERGIZE

- Channel conveyance improvements include habitat restoration with native vegetation
- New wetland eco-park is part of the flood reduction system, but also offers benefits in the form of habitat, environmental education, and recreation space

EAST RISER CHANNEL IMPROVEMENTS

CONCEPTUAL RENDERING FOR ILLUSTRATIVE PURPOSES

- Improves conveyance capacity
- Captures road runoff and filters suspended solids
- Native vegetation provides habitat and improves visual quality along the channel

1. Gravel trench
2. Channel improvement
3. Native vegetation
4. Curb cut
**LOSEN SLOTE DRAINAGE IMPROVEMENTS**

**PROTECT**

- New pump station within the residential area of the stream
- Stormwater discharges via a 36" force main to the downstream Losen Slote marsh
- Energy dissipation structure limits erosion at discharge points
- Street green infrastructure collects water and filters total suspended solids

**CULTIVATE & ENERGIZE**

- 36" force main is located in the subsurface of the public right-of-way
- Green infrastructure benefits include improved water quality, new habitat, and visual improvements
LOSEN SLOTE DRAINAGE IMPROVEMENTS
CONCEPTUAL RENDERING FOR ILLUSTRATIVE PURPOSES

- A new pump station improves conveyance capacity by moving water from one location to another.

AVANTI PARK

- Water is stored in new open space and green infrastructure.
- ~19,000 SF of improved wetland and ~11,000 SF of native planting and raingardens capture total suspended solids.
### AVANTI PARK

**CULTIVATE & ENERGIZE**

- Street green infrastructure improves water quality, creates new habitat, and provides visual improvements.
- New park space also creates places for people to gather, new habitat, and space for recreation.

### AVANTI PARK

**CONCEPTUAL RENDERING FOR ILLUSTRATIVE PURPOSES**

- Bioretention systems capture and filter 1.25 inches of rainfall in two hours through planting media.
- New retention areas create room for additional water storage.
- Undeveloped land becomes public park and productive ecosystem.

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1. Boardwalk foundation
2. Headwall & inlet pipe
3. Energy dissipator
4. Native planting
5. Integrated seating
Green infrastructure provides a holding space for street runoff that is slowly released back into the stormwater system.

Subsurface green infrastructure features provide storage and ability to infiltrate runoff to reduce peak flow reaching the existing stormwater system.

1. Connection to storm system
2. Filter media
3. Native vegetation
4. Street Trees

NEXT STEPS

CHRISTOPHER BENOSKY, AECOM
UPCOMING SCHEDULE

NEXT STEPS

NJDEP / AECOM: UPCOMING ACTIVITIES

- Recommended Alternative Public Meeting December 2017
  - Alternative 1 – Storm Surge Flooding
  - Alternative 2 – Frequent Flood Reduction
  - Alternative 3 – Hybrid Alternative

- Draft Environmental Public Hearing in Winter/Spring 2018
NEXT STEPS

CAG: CALL TO ACTION

- Submit comments from CAG #11 meeting by **October 24, 2017**
- Share information from this meeting with friends and neighbors
- Continue to build interest in the Project
- Ensure the public knows about upcoming information (to be posted on Project website)

NEXT STEPS

Critical Information

**Project Website**
www.rbd-meadowlands.nj.gov

**Project Email**
rbd-meadowlands@dep.nj.gov

Question & Answer