9 Conclusions and Recommendations

The feasibility assessment report is a result of a comprehensive community and agency stakeholder engagement process that consisted of data collection; evaluation of existing conditions for site constraints and opportunities; development and qualitative evaluation of “Resist” and “DSD” concepts using screening criteria that led to the development of three build alternatives; a detailed evaluation of these alternatives and further use of screening criteria that then led to the development of the recommended preferred alternative. The feasibility study utilized a multidisciplinary team approach to develop flood risk reduction solutions yet providing opportunities to enhance quality of life within the study area. The extensive stakeholder engagement included regular meetings with city, county, state and federal agencies; regular interaction with a Community Advisory Group (CAG) representing the three municipalities in the project area and broader community meetings were held at various timelines during project analysis and key milestones. Appendix T provides presentations developed by OMA, SCAPE and Dewberry for the Executive Steering Committee (ESC) work group meetings.

The feasibility study involved evaluation of three comprehensive master plan alternatives - each alternative consisting of a unique “Resist” alignment and a common “DSD” solution - that together provided varying levels of flood risk reduction benefits and impacts to the built environment. Among these three master plan alternatives, Alternative 3 also known as the “Alleyway” alternative was chosen as the recommended preferred “Resist” alternative because this alternative provided a balanced solution to providing flood risk reduction benefits in consideration of public input, cost and the need for urban amenities built into the system. This “Resist” alternative can be constructed with the available $230 million funds. Additionally, the “Resist” alignment of the recommended preferred alternative has lower impacts to the built environment when compared with the other two alternatives; has the fewest number of gates and the least impact to waterfront access and views. It should be noted that the entire DSD solution that is part of the Alternative 3 master plan cannot be funded with the available funds.

The recommended preferred “Resist” alternative, as seen in Figure 9-1, has two distinct areas for design and construction – one in the north near Weehawken Cove and another in the south adjacent to New Jersey Transit rail infrastructure. Table 9-1 includes a summary of quantities for the preferred “Resist” alternative. It is recommended that the design and construction of the recommended “Resist” alternative be conducted concurrently in these two areas. Construction staging areas should be identified in reasonable proximity to these work areas. It is recommended that a portion of the BASF site be considered for construction staging. Further information on construction staging can be found in Appendix R. Additionally, Appendix S provides a list of buildings that are located on the unprotected side of the recommended preferred “Resist” alternative.
Figure 9-1. Recommended Preferred “Resist” Alternative
Dewberry's recommendations during the design phase of the “Resist” portion of this project is provided below:

a. Coordinate with NJ Transit, City of Hoboken and LCOR developers during the design of flood barrier structure along the proposed LCOR redevelopment boundary in the NJ Transit terminal. Given the requirement to be completed by September 2022, the timing of making property within the current NJ Transit yard available for design activity and eventual construction represents a significant schedule risk. Additionally, the project cost estimates do not consider and account for any relocation/removal of the existing NJ Transit assets along the proposed LCOR redevelopment property and instead assumes that the area around this redevelopment property would be available for this project.

b. Early coordination with various public and private property owners is required to obtain right of entry for design field activity as well as construction and permanent easements that are required for the recommended preferred alternative, including land use and permitting issues.

c. Beginning early in the design phase, finalize and incorporate feedback from the community on the architectural approach for the “Resist” features and the associated costs.

<table>
<thead>
<tr>
<th>Recommended Preferred Alternative 3</th>
<th>OPTION 1</th>
<th>OPTION 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Approx. length of new “Resist” barrier structure including berms</td>
<td>8,053 feet</td>
<td>7,782 feet</td>
</tr>
<tr>
<td>Approx. length of existing embankments as part of “Resist” system</td>
<td>1,735 feet</td>
<td>1,735 feet</td>
</tr>
<tr>
<td>Potential number of deployables</td>
<td>19</td>
<td>23</td>
</tr>
<tr>
<td>Approx. length of deployables</td>
<td>860 feet</td>
<td>975 feet</td>
</tr>
<tr>
<td><strong>Total approx. length of “Resist” system</strong></td>
<td><strong>10,648 feet</strong></td>
<td><strong>10,492 feet</strong></td>
</tr>
<tr>
<td>Approx. length of high level storm sewer in north study area</td>
<td>5,918 feet</td>
<td>5,918 feet</td>
</tr>
<tr>
<td>Approx. length of high level storm sewer in south study area</td>
<td>4,165 feet</td>
<td>4,165 feet</td>
</tr>
<tr>
<td><strong>Total approx. length of high level storm sewer system</strong></td>
<td><strong>10,083 feet</strong></td>
<td><strong>10,083 feet</strong></td>
</tr>
</tbody>
</table>

Table 9-1. Summary of Preferred “Resist” Alternative Quantities
e. Develop and conduct a comprehensive geotechnical investigation plan consisting of borings, permeability test, groundwater monitoring, test pits and others along the recommended preferred “Resist” alignment and the proposed high level storm network.

f. Develop and conduct a comprehensive topographic and utility mapping survey along the recommended preferred “Resist” alignment and the proposed high level storm network. It should be noted that there may be potential utility manhole covers and utility lines located outside the study area that feed into the protected side of the “Resist” alignment. A combination of Ground Penetrating Radar (GPR) and test pit program will be required to identify utilities especially those located at shallower depths from the existing ground surface.

g. Coordinate with all the applicable utility companies to identify potential utility conflicts and develop solutions to mitigate these conflicts.

h. Perform dye and/or smoke testing of utility and sewer lines to fully map areas on the unprotected side of the “Resist” alignment within the study area which would help to identify any potential coastal storm surge intrusion points.

i. Assess sewer connections of buildings located on the unprotected side of the “Resist” alignment that are connected into NHSA’s system and determine the potential for coastal storm surge intrusion into NHSA system.

j. Coordinate with NHSA and JCMUA to identify and finalize the potential intrusion points through the existing storm-sewer system.

k. Finalize the design intent of the “Resist” flood barrier with stakeholders, including whether to design and construct the superstructure and foundation to flood levels associated with the 100-year or 500-year event and the appropriate design factors of safety and freeboard associated with each event.

l. Develop a final basis of design document based on USACE/FEMA/ASCE guidelines to inform the development of structural and geotechnical solutions. This basis of design document should include the various types of forces along with various loading conditions to be considered as part of the final design.

m. Coordinate design of the deployable structures with manufacturers and/or fabricators. If required, perform laboratory and/or field testing of the proposed deployable structures, backflow preventers, and watertight manholes to verify potential leakage rates and ability to withstand hydrodynamic and debris impact forces.

n. Develop an operation and maintenance plan for the proposed “Resist” system, in particular the deployable structures, which can be approved by FEMA as part of the levee accreditation process.

o. If necessary, perform traffic modeling studies that could be implemented during the time of deployment of deployable structures.

p. Update the flood hazard and risk assessment with the final design of the flood protection system to quantify and communicate risk associated with the “Resist” alignment to all stakeholders.

q. Coordinate with NJ Transit and Hartz Mountain to develop the design approach to ensure the structural stability of the existing embankments that are part of the recommended preferred “Resist” alignment.
r. Coordinate with PANYNJ to design the “Resist” barrier structures that are proposed to cross over the existing PATH tube tunnels and obtain any necessary security clearances to develop appropriate design of the structures.

s. If required, perform additional analysis to finalize the location and types of deployable structures that can be operated with minimal impact on public safety and circulation.

t. As the design and final detailed alignment develops, determine if any additional temporary access and/or construction easements are required.

u. Conduct environmental investigation to identify any potential hazardous materials. Refer to the Environmental Impact Assessment (EIS) for a list of known environmental concerns.

A similar list of recommendations that should be considered during the design phase of the “Delay, Store, and Discharge” portion of this project is provided below:

a. Develop and conduct a comprehensive geotechnical investigation plan consisting of borings, permeability test, groundwater monitoring, test pits and others at the recommended implementation sites and the proposed high level storm network.

b. Develop detailed design including modeling for each DSD component to manage systemic inland flooding as part of a phased DSD implementation. This includes size and location of subsurface detention tanks, connecting the tanks to the NHSA drainage infrastructure, and providing pump stations as required for stormwater management in the study area.

c. Consider potential retrofitting parks and recreation sites with DSD elements during future improvement projects where public use will already be impacted.

d. Investigate traffic calming measures near proposed public recreation areas to promote public safety while utilizing the available space.

e. Coordinate with various public and private property owners to obtain easements that are required for the recommended implementation sites.

f. Incorporate feedback from the community to develop amenities that would improve quality of life with the implementation of this portion of the project.

h. Develop an operation and maintenance plan for each component of the DSD system.

i. Conduct environmental investigation to identify any potential hazardous materials.

A list of recommendations has also been provided in the Task 4-Hydrology and Flood Risk Assessment report that focuses on the coastal and stormwater modeling aspects of this project. Refer to Chapter 7 of the EIS document for a list of potential permits and agencies that may be required during the design phase.