Delaware Bay Dikes Repair and Prevention Project Preliminary Design for New Castle Dikes

New Castle Conservation District DNREC August 22, 2012







Project Background

Project Objectives

Engineering Investigations

New Castle Dikes Upgrade and Repair

Comments and Questions

Next Steps



- Delaware Bay Dikes Repair and Prevention Project
 - Authorized in Senate Bill 130 (FY 20120) \$3M appropriated
 - > Authorized in House Bill 410 (FY 2013) \$2.5M appropriated to DNREC for "dikes/dams"
 - Priorities for improvements:
 - 1. Red Lion Dike
 - New Castle City Dikes (from North to South Buttonwood, Broad Marsh and Gambacorta)
 - 3. Army Creek Dike



Engineering Investigations

- Scope of Engineering Investigations
 - Visual Inspections
 - Geotechnical Investigations
 - Topographic Survey



Site Location Map – City of New Castle Dikes





New Castle Dikes Inspection – Buttonwood Dike





New Castle Dikes Inspection – Broad Marsh Dike





New Castle Dikes Inspection – Gambacorta Dike





New Castle Dikes Geotechnical Investigation



Buttonwood Dike Plan



PLAN VIEW - BUTTONWOOD DIKE



Buttonwood Dike Profile





Broad Marsh Dike Plan



PLAN VIEW - BROAD MARSH DIKE SOLLE: 1"-80'



Broad Marsh Dike Profile





Gambacorta Dike Plan





Gambacorta Dike Profile





Dike Elevation Design Criteria





Key Dike Data from Topographic Surveys

Dike	Approximate Dike Length (FT)	Minimum Crest Elevation (FT NAVD 88)	Length-weighted Average Elevation (FT NAVD 88)	South End of Dike Elevation (FT NAVD 88)	North End of Dike Elevation (FT NAVD 88)
Gambacorta	1,600	6.8	8.2	8.4	8.0
Broad Marsh	1,350	5.2	7.8	6.7	8.2
Buttonwood	1,800	5.8	7.5	>10.0	>10.0

USACE RIP Minimum Elevation – 8.2'



City of New Castle – Buttonwood Dike

- Raising Up to 2.7 Feet Required (1.0 feet Average)
- Unwanted Vegetation





City of New Castle – Broad Marsh Dike

- Raising Up to 3.3 feet Required (0.7 feet Average)
- Extension Required at South End
- Unwanted Vegetation





City of New Castle – Gambacorta Dike

- Raising up to 1.7 Feet Required Minimal on Average
- Extensions Needed at North End
- Flood Side Erosion to be Addressed
- Unwanted Vegetation





New Castle Dike Findings

- Settlement
- Revetment Protection Loss
- Erosion
- Overtopping
- Seepage
- Unwanted Vegetation
- Tie-out Extensions Required



Recommendations:

- Raise Dikes to Elevation 8.5 Feet
- Enlarge Dike in Portions (Raising and Broadening)
- Supplement/Replace Flood Side Rip Rap
- Remove Trees and Woody Vegetation
- Construct Filters on Seepage Areas
- Extend Dikes to Tie-Out as Required



Buttonwood Dike Improvements





Broad Marsh Dike Improvements





Gambacorta Dike Improvements





Improvements – All Dikes





Broad Marsh Dike – South Extension





Gambacorta Dike – North Extension





New Castle Dikes Improvements – Estimated Construction Costs

TOTAL COST							
Description	Gambacorta Dike	Broad Marsh Dike	Buttonwood Dike				
Overall Site Preparation , includes: Clearing/grubbing, common fill for access roadway, topsoil and pavement stripping	\$120,000	\$130,000	\$120,000				
Flood (Bay) Side Improvements , includes: Rough grading, earthfill (where required), geotextile, cushion stone layer, riprap	\$650,000	\$570,000	\$650,000				
Protected (Land) Side Improvements , includes: Rough Grading, replenish riprap, earth fill (where required), geotextile, turf reinforcement mat	\$190,000	\$170,000	\$190,000				
Crest Improvements , includes: Rough grading and compaction, new aggregate surfacing, geotextile, new paving (Gambacorta only)	\$170,000	\$140,000	\$150,000				
Site Restoration , includes: Topsoil and seeding, fine-grading of crest/roadway, fine-grading of slopes	\$60,000	\$60,000	\$70,000				
Subtotal	\$1,190,000	\$1,070,000	\$1,180,000				
Contingency (35%)	\$420,000	\$375,000	\$415,000				
Total	\$1,610,000	\$1,445,000	\$1,595,000				



Permit Requirements

US Army Corps of Engineers (Section 10 and Section 404)

DNREC Wetlands and Sub-Aqueous Lands

NPDES Stormwater Discharge Associated with Construction Activity

New Castle County Floodplain

New Castle County Application for Plan Review



Comments and Questions





Complete Detailed Design of Selected Dike Improvements

> Prepare and Submit Permit Applications for Selected New Castle Dike

> > Advertise for Dike Construction

Construction of Selected New Castle Dike Improvements



THANK YOU

New Castle Conservation District DNREC





