

OHIO RIVER SHORELINE, PADUCAH, KENTUCKY (PADUCAH, KENTUCKY LOCAL FLOOD PROTECTION PROJECT)

Public Meeting
City of Paducah

**Colonel Keith A. Landry – Commander,
Louisville District**

Rick Murphy, P.E. – City of Paducah
Theresa Beckham, PMP - Project Manager

Louisville District

8 November 2010



US Army Corps of Engineers
BUILDING STRONG[®]



OHIO RIVER SHORELINE, PADUCAH, KENTUCKY

- **Overview of Project (including authorities, purpose, and project features)**
- **Problems and Opportunities**
- **Operations and Maintenance (O&M) – Very Diligent Sponsor**
- **Project Without Reconstruction Efforts**
- **Reconstruction Items**
- **Alternatives Considered**
- **Recommended Plan**
- **Path Forward**



OHIO RIVER SHORELINE, PADUCAH, KENTUCKY

Authority for Feasibility Study/Report

- ▶ Section 216 of Flood Control Act of 1970
- ▶ Sec 5077 of 2007 Water Resources Development Act (WRDA)

Purpose of Study/Report

- ▶ Investigate feasibility and extent of Federal interest in providing reconstruction

Scope of Report –

- ▶ Review Reconnaissance Study - May 2000
- ▶ Analyze alternatives
- ▶ Identify a recommended plan



OHIO RIVER SHORELINE, PADUCAH, KENTUCKY

Levee Overview

- **Project located in the metropolitan area of Paducah, KY**
- **Authorization for original flood protection project – Flood Control Act – Aug 28,1938**
- **Owner/Operator (Sponsor) - City of Paducah**
- **Constructed between August 1939 – July 1949 - sponsor assumed Operation and Maintenance (O&M) responsibilities in 1950**
- **Level of Protection – Constructed to Ohio River Flood of Record – 1937 plus 3 ft of Freeboard**



Project Aerial Showing Line of Protection



LINE OF PROTECTION:

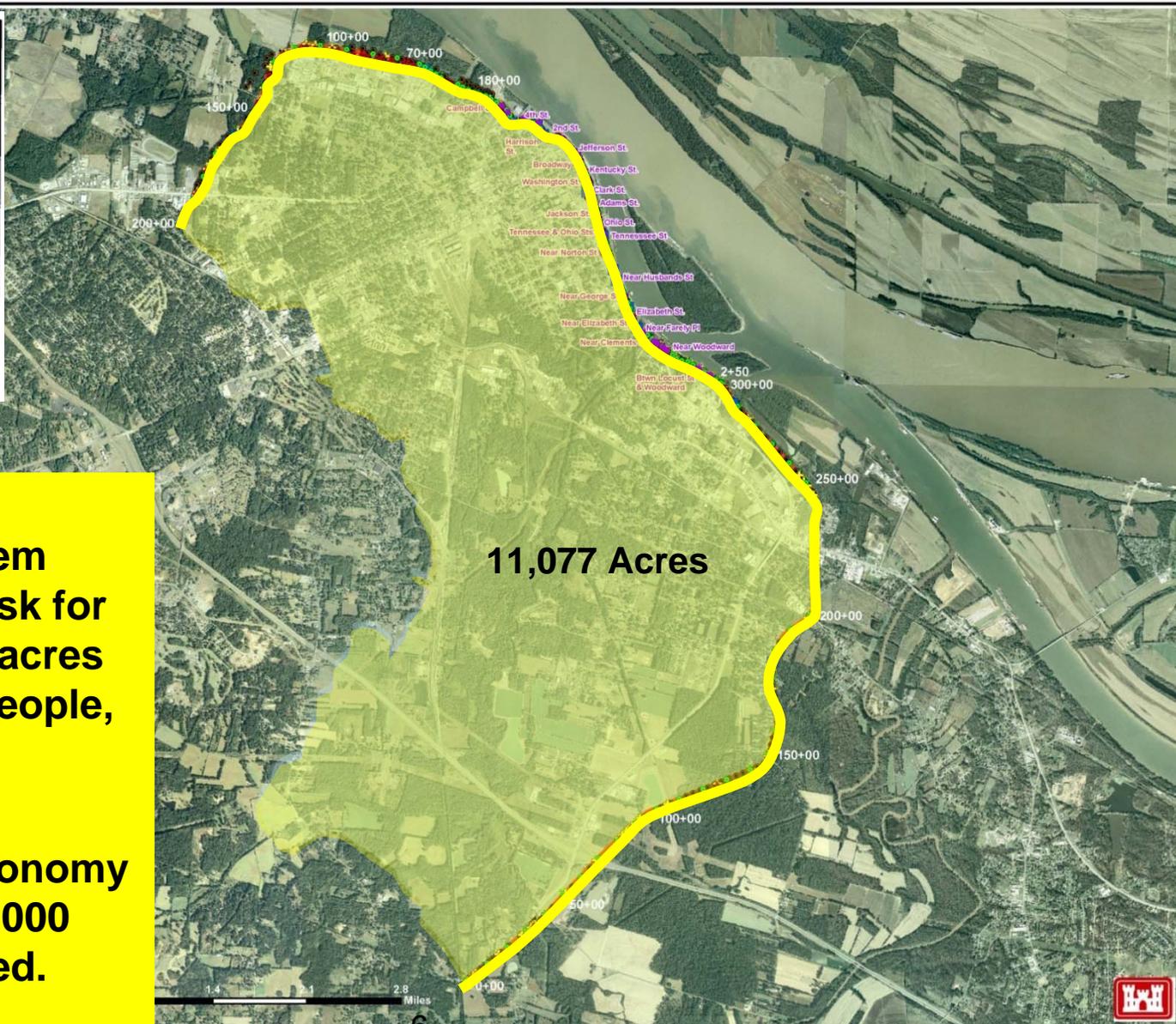
48,700 feet (9.2 miles)
of Earthen Levee

15,870 feet (3.0 miles)
of Concrete Floodwall

12 Pumping Plants
47 Closures
60 Discharge Pipes



Project Aerial Showing Protected Area



11,077 Acres

**The levee system
minimizes flood risk for
more than 11,000 acres
and over 20,000 people,**

-AND-

**would affect the economy
of more than 65,000
people if flooded.**



Problems Identified in Study

- 1) **Age of pump plant equipment (>60 years) increases risk of components failure during operation resulting in extensive interior flooding**
- 2) **Extensive deterioration of corrugated metal pipes
(Repairs Completed by Sponsor January 2010 – included in this study)**
- 3) **Existing interior flooding due to lack of pumping plants at key locations**
- 4) **Effect of bank erosion on stability of concrete flood wall
(Repairs Completed by Sponsor August 2009 – included in this study)**
- 5) **Project components do not meet current criteria:**
 - ▶ **Design**
 - ▶ **United States Army Corps of Engineers Safety Manual**
 - ▶ **Occupational Safety and Health Administration (OSHA)**

**NOTE: Not Anticipating Environmental or Real Estate Issues
– Project Within Existing Footprint**



Constraints and Opportunities

Study Constraints

- ▶ **Reconstruction policy, as defined in the “*Reconstruction of USACE Structural Flood Damage Reduction Projects for which Non-Federal Interests are Responsible for Operation, Maintenance, Repair, Rehabilitation and Replacement*”, dated 16 August 2005, excludes any O&M responsibilities**

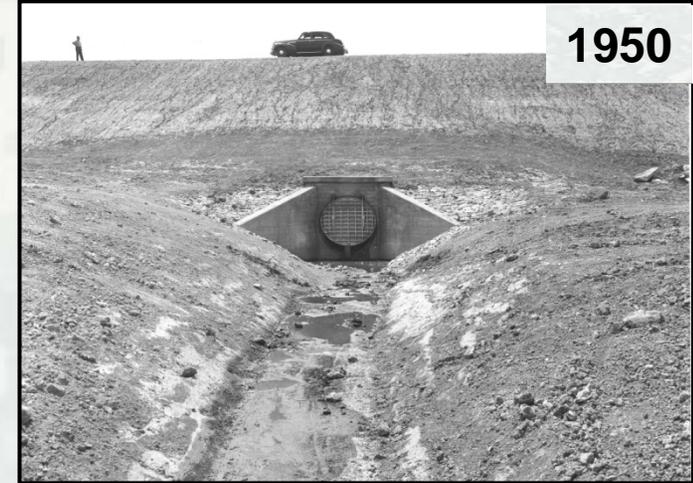
Reconstruction Opportunities

- ▶ **Reduction of flood risk to immediate population of 20,237**
- ▶ **Reduction of economic impact to population of >65,000**
- ▶ **Reduction of risk to property (residences and businesses)**
- ▶ **Partnering with the local sponsor for continued/improved flood risk management**



Operation & Maintenance (O&M)-vs- Operation Maintenance Repair, Replacement, and Rehabilitation (OMRR&R)

- Agreement signed in 1938 - O&M required
- Water Resources Development Act (WRDA) of 1986 added RR&R
- Past 60 years:
 - ▶ Multitude of Pump Plant Repairs/ replacement of parts
 - ▶ Persistent repair of Floodwall/Levee Issues
 - ▶ Proven and effective O&M program
 - ▶ Limited Sponsor resources to perform necessary replacement of failed system components



Proposed Location of Pump Plant #14a
Sta. 111+67A



Sponsor Yearly Operation & Maintenance (O&M) Efforts

- **Original O&M Costs in 1950**
 - ▶ 1950 dollars (new project) = **\$30,000 annually**

- **Average O&M Costs**
 - ▶ 2005-2010 (Aged Project) ~ **\$460,000 - \$520,000 annually**
 - Fluctuations in Cost due to Flood Event Occurrences

- **O&M costs pay for:**
 - ▶ Labor: Mow grass, grease equipment, perform minor riprap maintenance, paint metals, fabricate items, etc...
 - ▶ Materials: Grease, paint, seed, metals, concrete, etc...
 - ▶ Commodities: Fuel, electricity, etc.....





Sponsor Capital Project Cost

Average Cost per yr ~ \$73,000 (1994 to 2006)

Necessary Replacement of System Components



Project Component	Scope of Work	Year	Cost
Pump Plant (PP) #1	Purchase & Install Electrical Equipment	Mar 1994	\$12,315.00
PP #2	Engineering Design - Mechanical and Electrical Components; Purchase of Medium Voltage Starter Group, Variable Frequency Drive, & Vertical Turbine Pump	Jun & Oct 1995	\$109,217.95
PP #2	Installation of Storm Water Pump	Jul 1996	\$113,496.00
PP #2	Engineering Design - Mechanical and Electrical Components	Aug 1997	\$73,545.50
PP #2	30" Force Main Repair	Oct 1997	\$14,548.00
PP #11	Purchase & Install Lubrication System, Vertical Turbine Pump, Vibration Detection System, Programmable Logic Control System, Motor Control Center, & Storm Water Pump Installation	Feb & Aug 1999	\$247,163.87
PP #11	Main Breaker Replacement	Dec 1999	\$13,880.00
PP #5 & #6	Pump Components	Jul-Aug 2001	\$195,003.56
Drain Pipe	Corrugated Metal Pipe Emergency Repair	Mar 2004	\$68,146.90
PP#2	30" Pipe Repair	Sep 2004	\$17,960.00
PP#2	Pump Repair	Dec 2004	\$16,500.00
PP#4	Repair Electrical System Components	June 2006	\$8,030.00
Levee Embankment	Embankment work near Clarkline Rd	July 2006	\$5,211.98
TOTAL			\$878,998.76

Project Without Reconstruction Efforts

- Without Reconstruction Project, Cost of Pipe Slip lining would be 100% Sponsor Responsibility
(\$2.1 million)

- Levee Safety Issues – Project Components do not meet *current* design criteria and affect safe project operation during flood events
 - ▶ **GATEWELLS**: Absence of dual positive closures on large diameter pipes
 - ▶ **CLOSURES**: Permanently seal eight (of 47 movable and service openings) closures (no longer needed) to reduce risk to community associated with movable closure installation
 - ▶ **TRASH RACKS**: Reduce current bar spacing to prevent damage to pump impellers



Project Without Reconstruction Efforts (cont'd)

Life Safety Issues – Many project components do not meet current USACE and Occupational Safety and Health Administration (OSHA) Safety Standards

- ▶ **Example: Bee Branch sluice gate structure**

Access - Boat is required to reach closure

Structural Integrity – Deterioration of load bearing components and connections

Work Area – Limited

Safety – Ladder, catwalk and hand-railing do not meet safety standards



Project Without Reconstruction Efforts (cont'd)

Life Safety Issues – Many project components do not meet current USACE and OSHA Safety Standards

▶ **Example: Pumping Plant #10**

Access – Exceptionally confined working space

Safety – Ladder access unusable requiring tripod/lanyard entry

Pump Plant #10



Project Evaluation

- Reviewed Previous Reconnaissance Study
- Multi-Disciplined Team - Detailed Site Inspection March 2009
 - ▶ Structural; Mechanical; Electrical; Hydraulic; Geotechnical; Civil; Economics; Environmental
- Life Safety Evaluations per USACE & OSHA Guidance



Summary of Reconstruction Items

Reconstruction Items	Project Cost
Total Cost	\$18,728,374
Pump Plants: #1 thru #7 and #9 thru #13 – includes pumps, pump motors, electrical components, safety access	\$5,875,471
Levees: <ol style="list-style-type: none"> 1. Slip-line Deteriorated Pipes (work completed by City of Paducah – Credit per MOU) 2. Landside Blanket Filter – Outlet pipes (2) 3. Sluice Gates/Gatewell Structures (3) 4. Other – Mob, Demob., Prep Work, Misc Items, Seeding 	\$3,762,258 [\$2,100,000] [\$128,590] [\$1,476,441] [\$57,227]
Floodwalls: <ol style="list-style-type: none"> 1. Permanently Close Some Closures (no longer needed) 2. Repair Damaged Waterstops & and Joint Material 3. Construct, Repair and/or Remove Toe Drains 4. Scour Erosion Control Pads 5. Other – Mob, Demob., Prep Work, Traffic Control 	\$3,102,197 [\$105,409] [\$1,868,228] [\$982,964] [\$89,576] [\$56,020]
Proposed Pump Plant #14a (Sta. 111+67A) Submersible Pump Option	\$1,662,938
Miscellaneous Pump Items	\$1,148,537
Lands & Damages	\$436,000
Bank Stabilization	\$100,000
Relocations	\$20,174

Necessary Reconstruction Items

Life Safety Reconstruction Items	Obsolescence Reconstruction Items	Levee Safety Reconstruction Items
<p>Bee Branch Gate Drainage Outlet: Problems noted included corrosion of all major structural members; corrosion of walkway support angles; an unsafe ladder; hand railing that does not meet current safety requirements; insufficient working space on the platform; and substandard safety equipment.</p>	<p>Pump Plants #1 thru #7 and #9 thru #13 Mechanical Equipment has exceeded its life expectancy per EM 1110-2-3105 Para. 2-2 Design Life (35 years).</p>	<p>Pump Plant Discharge Pipes – Deteriorated thru PP walls –Specialized equipment required to remove and replace.</p>
		<p>Bank erosion – Threatening floodwall stability.</p>
		<p>Ruptured water stops and deteriorated joints – Issue with through-seepage and potential concrete deterioration.</p>
<p>Some pumps being replaced with submersibles pumps that are removable and do not require confined space entry</p>	<p>Pump Plants #1-#7 and #9-#13 Electrical Equipment being replaced due to obsolete components. Manufacturers do not keep spare parts on most aged equipment.</p>	<p>Trash Racks – Bar Spacing - deteriorated and do not meet current design criteria.</p>
<p>Pump Plants: Replace Ladders, Access Lids, Grating Systems and Replace Gravity Ventilation System</p>	<p>Permanently Seal several Movable and Service Openings – Add Unnecessary Risk– No longer needed.</p>	<p>New Gatewells/Three Sluice Gate Structures – do not meet current USACE design criteria – Pipes too Large to flood fight.</p>
<p>Pump Plant Distribution Equipment – Arc Flash Training Required</p>		<p>Slip line of deteriorated pipes that pass through line of protection to prevent seepage through and along the pipes to prevent loss of embankment material, thus resulting in levee failure.</p>



Reconstruction Items

Pump Plants (Electrical)

- ▶ Pump motor controls and motor control centers – need to be replaced due to age and components are obsolete. Manufacturers do not keep spare parts on aged equipment
- ▶ More expensive to rebuild in most cases than purchase new
- ▶ No backup emergency power – Adding capability to connect portable generators



Gate Control Interior
Poor Condition



Circuit Breaker used as Motor Starter
Obsolete Method and Equipment

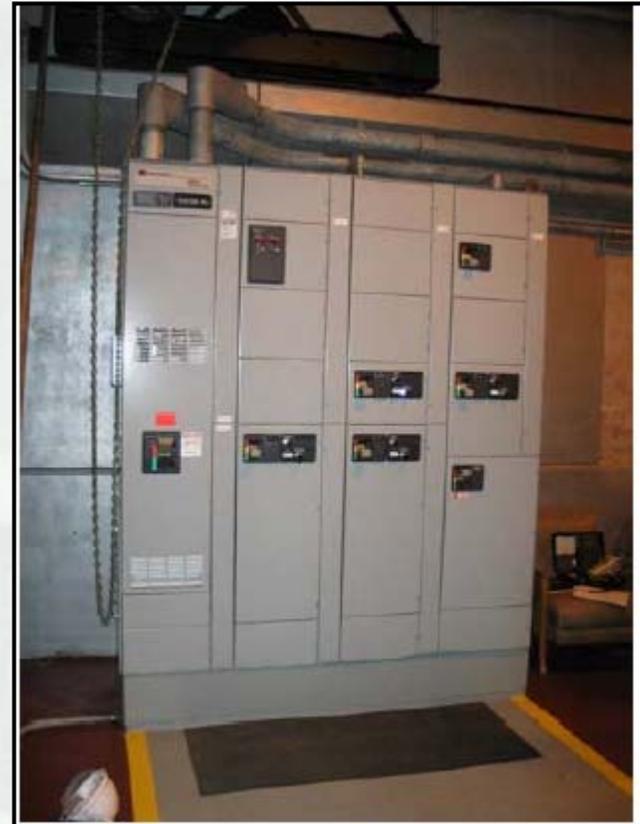


Sponsor Capital Projects

Examples – New Electrical Systems



**New Outdoor Panel – Pump Plant Power
PP #4**



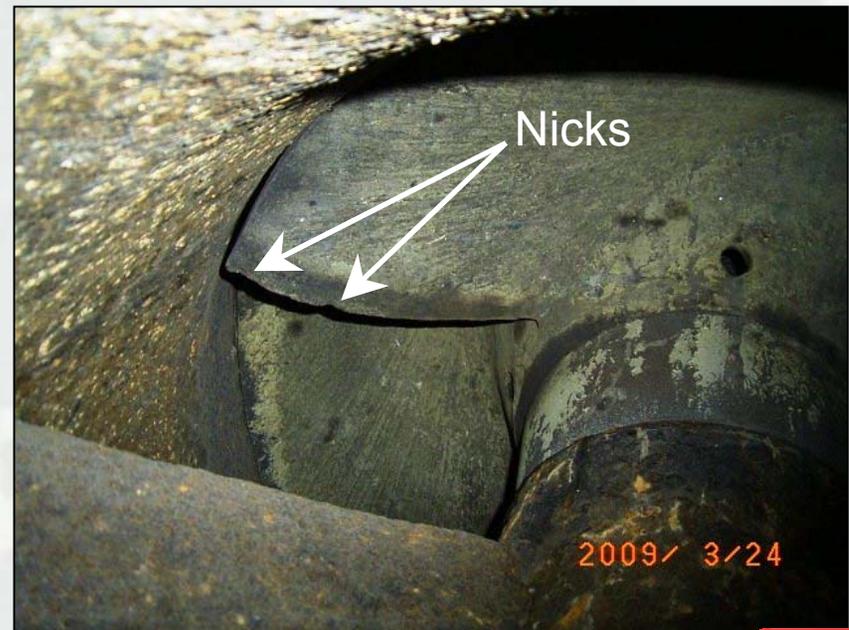
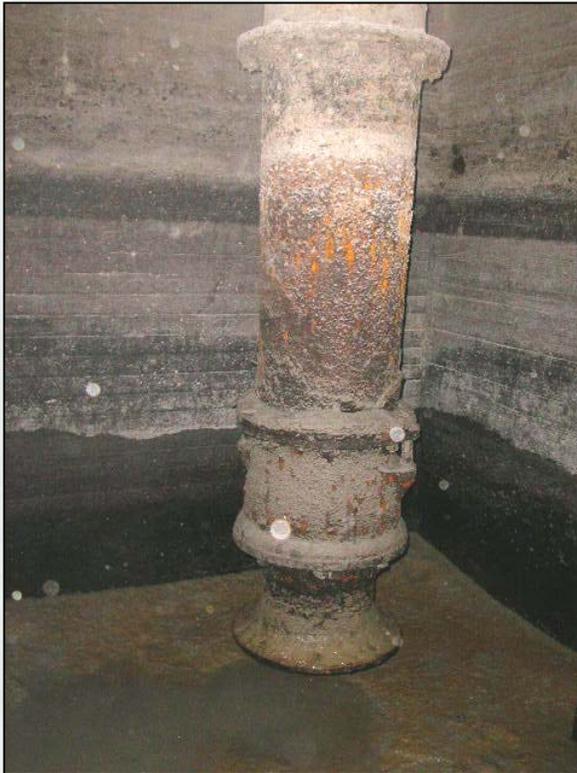
**New Motor Control Center
PP #6**



Reconstruction Items

Pump Plants (Mechanical)

- Pumps have exceeded their life expectancy (60 years in operation vs. 35 year current minimum design life)
- Some pumps being replaced with submersibles pumps that are removable and do not require confined space entry



Reconstruction Items (cont'd)

Proposed Location for

New Pump Plant #14a – Sta. 111+67A (2300 North 8th St)

4 Structures/Properties Flooded during 1997 Event



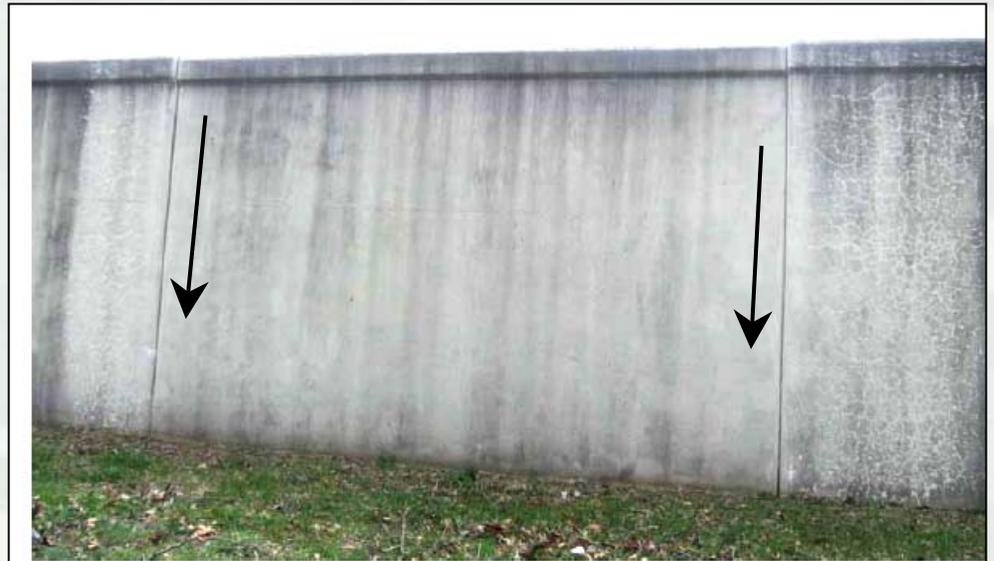
**1997 Interior Flooding
Ohio River Flood = 60yr**



Reconstruction Items (cont'd)

Levees/Floodwalls

- Differential Wall Movement caused damage to waterstops



Reconstruction Items (cont'd)

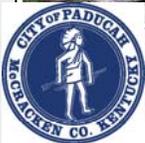
Levees/Floodwalls

- Bank Erosion (within 10 feet of heel of floodwall) - Threatening Stability of T-Walls

Before Riverbank Repair



After Riverbank Repair



Reconstruction Item (cont'd)

Levees/Floodwalls

Deteriorating Corrugated Metal Drainage Pipes:

- Pipes video inspected for condition assessments and rated per National Industry Standard – ratings in November 2008 revealed pipes in imminent failure



Reconstruction Item (cont'd)

Levees/Floodwalls

Slip lined 37 Deteriorated Pipes:

- Sponsor Completed Repairs – January 2010



Alternatives Considered for Existing Levee System

The Reconstruction Guidance Memorandum (August 2005), states that:

*“...**depending on the interest of the non-Federal sponsor, the feasibility study may be limited to examination of the reconstruction of the existing project with no change in its scope or function.** Under this limited objective, evaluation would be limited to individual project features, (closure structures, pumping stations, gravity drains, relief wells, etc.) to establish the justification of reconstruction based on a comparison between the with and without reconstruction condition.”*

Considered Two Alternatives:

- No Action
- Reconstruction



Alternatives Considered to Address Interior Flooding

Station 111+67A (behind the Smoke Shop at 2300 North 8th Street)

- No Action
- New Pump Plant * - Considered array of pump sizes * **Recommended**
- Non Structural Alternative of Flood-Proofing (*Impractical*)

Station 19+11B (2059 4th St – Woodward Hollow)

- No Action
- New Pump Plant
- Install Permanent Discharge Pipe * **Recommended**



Recommendations of Study

- **Reconstruction of Existing Project to include (but not limited to):**
 - ▶ **Replacement and/or repair of pumps, pump motors, etc.**
 - ▶ **Slip lining of Corrugated Metal Pipes – Repairs Completed January 2010 by Sponsor**
 - ▶ **Bank Stabilization – Repairs Completed August 2009 by Sponsor**
 - ▶ **Permanent Discharge Pipe (under road) at Woodward Hollow**
 - ▶ **Addition of Pump Plant #14a at Sta. 111+67A - (2300 North 8th St - behind the Smoke Shop)**



Summary

- **Project minimizes flood risk for over 20,000; reduces *economic* impact from potential flooding for population - 65,000+**



Summary

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- **Project in Service More Than 60 Years**



Summary

- Project minimizes flood risk for over 20,000; reduces *economic* impact from potential flooding for population - 65,000+
- Project in Service More Than 60 Years
- **Sponsor's Diligent Operation & Maintenance Record**
 - ▶ **Addressed critical issues that needed immediate attention (slip lining of pipes and bank stabilization) and completed numerous other repairs with consistent response to O&M issues**
 - ▶ **Safely and efficiently operating the levee system**



Summary

- Project minimizes flood risk for over 20,000; reduces *economic* impact from potential flooding for population - 65,000+

- Project in Service More Than 60 Years

- Sponsor's Diligent Operation & Maintenance Record
 - ▶ Addressed critical issues that needed immediate attention (slip lining of pipes and bank stabilization) and completed numerous other repairs with consistent response to O&M issues
 - ▶ Safely and efficiently operating the levee system

- **Problems are typical of similar projects across the country – levee system is functioning properly (however there are major components that need attention)**



Summary

- Project minimizes flood risk for over 20,000; reduces *economic* impact from potential flooding for population - 65,000+
- Project in Service More Than 60 Years
- Sponsor's Diligent Operation & Maintenance Record
 - ▶ Addressed critical issues that needed immediate attention (slip lining of pipes and bank stabilization) and completed numerous other repairs with consistent response to O&M issues
 - ▶ Safely and efficiently operating the levee system
- Problems are typical of similar projects across the country – levee system is functioning properly
- **For \$19 million (cost-shared) public receives another 50 years of service life for the levee system**



Way Ahead

- Currently – Public and Headquarters US Army Corps of Engineers Review of Feasibility Report
- Chief's Report
- Requirements:
 - ▶ Assistant Secretary of the Army Approval
 - ▶ Authorization for Final Design and Construction
 - ▶ Funding (Appropriations)



Proposed Schedule

Task	Date
Public and HQ Review	Complete by end of November 2010
Incorporate Comments into Feasibility Document	Complete by December 2010
Chief's Report; Assistant Secretary of the Army (ASA) Review & Approval	July 2011
Authorization for Final Design and Construction	TBD
Funding (Appropriation of Funds)	TBD
Design *	Begin upon receipt of funding; expected timeframe for design - approximately 12-15 months
Construction *	Begin upon completion of design and receipt of funding; expected timeframe for construction – approximately two – three years

*** Subject to Available Funding**



Contact Information for Submission of Comments

- **Draft Report Available for review at the following locations:**
 - ▶ **Website:**
<http://www.lrl.usace.army.mil/poi/default.asp?mycategory=449>
 - ▶ **McCracken County Public Library**
555 Washington Street
Paducah, KY 42003
 - ▶ **City Hall**
300 South 5th Street
P.O. Box 2267 Paducah, KY 42002-2267
- **Questions can be directed to:**
 - ▶ Amy Nuckolls (City of Paducah) - 270-444-8511
 - ▶ Theresa Beckham (US Army Corps of Engineers) – 502-315-6875



Questions?

