

## **Emsworth Locks and Dams Ohio River**

### **Project Description**

Emsworth Locks and Dams are located on the Ohio River immediately downstream of the City of Pittsburgh. The main channel dam and locks are located at river mile 6.2 and the back channel dam is located at river mile 6.4. The Emsworth locks consist of a 110 ft wide by 600 ft long main chamber and 56 feet wide by 360 feet long auxiliary chamber. The structural components of the project are the oldest of any project on the Ohio River, dating back to 1919 to 1922 when Emsworth was constructed.



The Emsworth Dams are presently in an exigent situation. Prior to temporary, emergency repairs to the erosion protection downstream of the dams, there were 10 foot deep scour holes and 65 percent of the erosion protection was in a failed state. A temporary repair of the erosion protection was completed in January 2005 by infilling the scour holes with stone. Due to the temporary nature of the repair, soundings are required on an annual basis and following major flood events until a permanent repair is in place. Due to the extreme corroded state of the dam gates, failure of any one of the seven lift gates yet to be replaced would most likely cause a portion of the stilling basin to fail and possibly undermine the dam. The systems are proven to be unreliable due to multiple failures within the past four years. The dams have been categorized as Dam Safety Action Class 1, urgent and compelling.

### **Transportation Importance**

Emsworth L/D is the first of six navigation facilities on the Ohio River operated by the Pittsburgh District. From 2000 to 2007, Emsworth Locks averaged 2,633 recreational vessels, 5,477 commercial tows, and 21.1 million tons of cargo. Coal (76 percent) was the principal commodity at Emsworth. Electric utilities move coal from mines in Pennsylvania and Ohio to power plants serving the mid-Atlantic, southeastern and Midwestern regions of the country. Steel companies move coal from West Virginia and Kentucky mines to coking facilities above Emsworth. Construction companies use the project to move materials like stone, sand and gravel, and cement into the Pittsburgh area. These and other shippers that rely on Emsworth realized average annual transportation cost savings in excess of \$163 million from 2000 to 2005.

### **Risk & Reliability, Economic Impacts of Unscheduled Lock Outages**

Failure of any of the dam lift gates could cause a portion of the stilling basin to fail, possibly undermining the dam. Reliability analysis shows that the dam gates, which were not yet replaced, have a 74% likelihood of failure. Loss of Emsworth Pool and navigation may occur as a result. Shippers using Emsworth have estimated annual transportation savings of \$130 million. During low flow conditions loss of the pools of the Ohio, Monongahela and Allegheny Rivers at the Point of Pittsburgh may occur and all navigation would cease. If the Emsworth pool is lost, two major facilities dependent on river transportation are impacted – the US Steel Clairton Works, the largest coke plant in the United States and the Bailey/Enlow Fork Complex owned by

Consol Energy, the largest underground coal mine in the United States. Disruption in coal supply and transportation would also impact steel plants and coal-fired electric power plants. The impact of the loss of Emsworth pool on the local economy and other communities would be substantial. Approximately 11,700 jobs would be directly at risk due to loss of navigation and disruption to services and material. Lost wages alone would range from \$1.5M to \$2.2M per day.

**Description of Work included in Optimum Plan**

A Major Rehabilitation Evaluation Report for the Dams recommending a \$78 million project was approved in 2002. The total project cost was updated to \$163.8M and approved in 2007. The dam gates, gate hoisting machinery, electrical power and distribution system, emergency bulkheads and a permanent scour protection system will be replaced with construction general funding beginning in 2005 and completed in 2014.

Temporary emergency repairs to the emergency bulkheads and scour protection were initiated in 2004 with operation and maintenance funding and were completed in 2005. Construction General funds were received, \$5 thousand in 2004 and \$3.5 million in 2005, under the Dam Safety and Seepage/Stability Correction Program.

In 2005 the design for the emergency bulkheads and Back Channel lift gate and machinery replacement were completed. This enabled a \$2.4 million contract to be awarded in August 2005 for the supply of new emergency bulkheads and an \$18.6 million continuing contract to be awarded in September 2005 for the replacement of the six Back Channel Dam lift gates and operating machinery.

In 2006 \$14.935 million was received from the Construction General appropriation. \$8.8 million was used to continue the Back Channel Dam Gate replacement, \$1.6 million to fully fund the Emergency Bulkhead Supply Contract, \$1.2 million to award and fully fund a Lift Gate Supply contract, \$732 thousand to award and fully fund Emergency Bulkhead Hoist Supply Contract and \$2.6 million to advance the engineering and design of the Main Channel Apron and Erosion Protection to enable construction award in 2008.

In FY 2007 the work allowance amount of \$17.0M was used to continue the Back Channel Dam lift gates and operating machinery contract, fully fund contracts for the fabrication of Main Channel lift gates, and engineering for future contracts.

In FY 2008 \$42.3M was used to initiate and complete the \$2.36M main channel abutment stabilization contract and award the main channel dam gate, machinery and scour protection replacements base contract for \$34.44M and engineering for future contracts.

In the FY 2009 appropriations act and in the FY 2009 President's budget, this project was identified to equally share the total construction cost with the Inland Waterways Trust Fund.

In 2009 \$25.8M CG and \$3.33M ARRA was used to award the main channel dam scour protection options, award the back channel dam service bridge rehabilitation contract, award the back channel dam abutment stabilization contract, and engineering for future contracts.

The optimum plan in 2010 through 2014 includes the use of fully funded construction contracts to complete the remaining scope of the Rehabilitation Project for the Dams. If optimum funds were provided work would be awarded as follows: FY 2010 Back Channel Apron/Erosion Protection; and FY 2011 the Main Channel Dam service bridge rehabilitation.

There are additional repairs to the dam that would be operations and maintenance funded and is interrelated to repairs being completed with construction general funding and necessary for continued safe operation of the dam. These repairs are documented in the Major Rehabilitation Evaluation Report and the latest Periodic Inspection Report and include repairs to the piers, abutment, bulkhead storage pit, and service bridge deck. The concrete repairs would be designed and constructed concurrently with the construction general funded contracts. Additionally the maintenance cranes need replaced, gate brake units need replaced, and the bulkhead hoist needs reconditioned. Additional temporary repairs to the scour protection could also be necessary given the past history of stone protection displacement and recent high flow conditions. Completing the needed operation and maintenance funded repairs concurrently with the construction general funded contracts would achieve economy of scales savings and cost less instead of completing them under separate contracts. The cost to complete this additional work on the dams is estimated to be \$5 million.

Navigation improvement opportunities are being evaluated under the Upper Ohio River, Emsworth, Dashields, and Montgomery Navigation Improvement Study. The study, scheduled to be complete in 2008, has been delayed to at least 2011 due to insufficient funding. When permanent improvements at Emsworth Locks will be initiated is uncertain. Miscellaneous repairs are needed now to keep the lock operating safely and reliably. Included are replacement of the hydraulic system cylinders and hydraulic piping repairs, tow haulage system replacement, upper guard wall fender system replacement and downstream mooring cell replacement. The cost to complete the work on the locks is estimated to be \$5 million.

O&M projected 5 year (FY 2010 through FY 2014) average cost to operate and maintain Emsworth Locks and Dams at an acceptable level of risk is \$4.0M per year. Maintenance items include maintenance, repair, and/or replacement of lock operating equipment; lock gates, anchorages, and sills; lock valves; lock walls; dam operating machinery; dam bulkhead and hoist; and hydraulic systems. These costs are above and beyond the routine day to day maintenance of all system components. This cost does not include any costs associated with the rehabilitation of the dams.

## **Dashields Locks and Dam Ohio River**

### **Project Description**

Facility is located 13.3 miles downriver from Pittsburgh at Glenwillard, PA. It was built from 1927-1929 and began operation in August 1929. It is comprised of a 1,585 foot fixed crest dam, a 110 ft x 600ft land side lock, and a 56ft x 360ft river side lock which provide for a 10 foot vertical lift.



### **Transportation Importance to the System**

Dashields L/D is the second of six navigation facilities on the Ohio River operated by the Pittsburgh District. From 2000 to 2007, Dashields Locks averaged 1,837 recreational vessels, 4,823 commercial tows, and 21.9 million tons of cargo. Cargo consists of coal, petroleum, chemicals, crude materials, manufactured goods, farm products, manufactured machinery, and other commodities. Coal is the principal commodity at Dashields. Electric utilities move coal from mines in Pennsylvania and Ohio to power plants serving the mid-Atlantic, southeastern and midwestern regions of the United States. Steel companies move coal from West Virginia and Kentucky mines to coking facilities on the Monongahela River. Construction and companies use this facility to move raw materials into the region. Average annual transportation cost savings associated with this facility from 2000 to 2005 is over \$173 million.

### **Risk of economic impacts of unscheduled lock outages**

Failure to provide adequate funding to maintain this facility will have significant detrimental effects to the local and regional economy. Failure of the dam or any critical lock component in the main or auxiliary chambers, or both, will result in increased transportation costs and delays to the shipment of critical raw materials for power production, manufacturing, and other commercial activities.

### **Scope of work to achieve acceptable level of risk**

The projected 5 year (FY 2010 through FY 2014) average cost to operate and maintain Dashields Locks and Dam at an acceptable level of risk is \$4.4M per year. Maintenance items include maintenance, repair, and/or replacement of lock operating equipment; lock gates, anchorages, and sills; lock valves; lock walls; and hydraulic systems. These costs are above and beyond the routine day to day maintenance of all system components.



## Montgomery Locks and Dam Ohio River

### **Project Description**

Facility is located 32 miles downriver from Pittsburgh near Shippingport, PA. It was built from 1932-1936 and began operation in June 1936. It is comprised of a 1,379 foot gated dam, a 110 ft x 600ft land side lock, and a 56ft x 360ft river side lock which provide for a 17.5 foot vertical lift.



### **Transportation Importance to the System**

Montgomery L/D is the third of six navigation facilities on the Ohio River operated by the Pittsburgh District. From 2000 to 2007, Montgomery Locks averaged 1,156 recreational vessels, 4,913 commercial tows, and 23.0 million tons of cargo. Cargo consists of coal, petroleum, chemicals, crude materials, manufactured goods, farm products, manufactured machinery, and other commodities. Coal is the principal commodity at Montgomery. Electric utilities move coal from mines in Pennsylvania and Ohio to power plants serving the mid-Atlantic, southeastern and midwestern regions of the United States. Steel companies move coal from West Virginia and Kentucky mines to coking facilities on the Monongahela River. Construction and supply companies use this facility to move raw materials into the region. Average annual transportation cost savings associated with this facility from 2000 to 2005 is over \$197 million.

### **Risk of economic impacts of unscheduled lock outages**

Failure to provide adequate funding to maintain this facility will have significant detrimental effects to the local and regional economy. Failure of the dam or any critical lock component in the main or auxiliary chambers, or both, will result in increased transportation costs and delays to the shipment of critical raw materials for power production, manufacturing, and other commercial activities.

### **Scope of work to achieve acceptable level of risk**

The projected 5 year (FY 2010 through FY 2014) average cost to operate and maintain Montgomery Locks and Dams at an acceptable level of risk is \$5.8M per year. Maintenance items include maintenance, repair, and/or replacement of lock operating equipment; lock gates, anchorages, and sills; lock valves; lock walls; repair or replacement of dam gates; dam operating machinery; and hydraulic systems. These costs are above and beyond the routine day to day maintenance of all system components.