

# GREENUP LOCKS AND DAM Main Lock Closure AAR

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11 February 2010

US Army Corps of Engineers  
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## AGENDA

- MISSION
- GENERAL DESCRIPTION
  - Scope of Planned Work
- EXECUTION
  - SUSTAINS
  - IMPROVES
- CONCLUSION
  - Scope of Completed Work
- QUESTIONS



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## MISSION

- LRH conducts a main lock closure at Greenup L/D from 5 Oct 2009 – 7 Nov 2009 to inspect / repair structural members on upper and lower miter gates . In addition, repairs needed on 6 of the 12 floating mooring bitts tracks that were tagged and placed out of service. Execution of all scheduled work while reducing overall river closure time, mitigating adverse impacts to the navigation industry and other waterways users and stakeholders.



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## GENERAL DESCRIPTION

- Annual Fleet Repair Schedules are typically negotiated with the navigation industry and other stakeholders two years in advance.
- In December 2008, LRD discussed the concurrent closures concept at a O&M scheduling meeting. Closures involved Byrd and Greenup Locks and Dam
- Markland miter gate failure one week prior to scheduled concurrent outage forced LRL to shift efforts to Markland. LRH shifted efforts to GRO main lock outage and delayed Byrd dewatering till FY-10.
- The reason for the main lock dewatering was two-fold:
  - Required 3 year dewatering cycle resulting from 2003 inspection and fatigue failure in gates
  - 50% of the mooring bitt tracks were out of service
- The average locking time went from 45 mins to approximately 2.0 hrs. The average delay time for the duration of the outage was 8.8 hours. This was a significant drop from previous year's dewaterings.
- Locking order and priority lockages was policed by industry representatives. Industry utilized self help program for the duration of the outage.



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# SCOPE OF PLANNED WORK

## Greenup L/D

- Dewater main 110-ft. x 1200-ft. lock chamber
- Inspect / Repair Structural components to upper and lower miter gates
- Repair 6 floating mooring bitt tracks
- Repairs to trash guards on 6 mooring bitts
- Repair upstream river wall miter gate latch pin
- Repair upper river wall skin plate crack



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# SCOPE OF PLANNED WORK

Upstream and  
Downstream Miter  
Gates



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# SCOPE OF PLANNED WORK

Mooring Bitt Tracks



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# SCOPE OF PLANNED WORK

Mooring Bitts



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# SCOPE OF PLANNED WORK

## Upstream Latching Pin



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# EXECUTION

1 of 5

- **ISSUE:** CLOSURE PLANNING
  - **DISCUSSION:** SUSTAIN
    - ▶ Annual maintenance assessment performed early fall to ensure incorporation of all needed work.
    - ▶ January meeting between engineers and management on the District's Fleet and at the Station to discuss and plan out upcoming fleet season.
  - **RECOMMENDATION:** Coordinate and begin planning process the preceeding fleet season soon after maintenance assessments are completed.
  - **DISCUSSION:** IMPROVE
    - ▶ Delays in obtained needed equipment for lock closure work.
    - ▶ Increased technical support for inspections.
- RECOMMENDATION:** Revised "5-part request" guidance. Includes agreed upon delivery dates between OR and EC for P&S. Coordinate 5-part work to ensure deadline can be met. Distribute NTN to Design Branch Chief so he can coordinate with site inspectors and insure their availability.



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# Equipment Delays

Newly Fabricated Basket & A-Frame



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# Technical Support

Complex weld  
Repairs



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# EXECUTION

2 of 5

- **ISSUE:** Traffic Control
- **DISCUSSION:** SUSTAIN
  - ▶ Industry representative from the Waterway's Association was POC for all commercial traffic transiting thru GRO
  - ▶ Eliminated Corps involvement in decision making processes with respect to lockage prioritization
- **RECOMMENDATION:** Continue to utilize this process. Allows industry to police themselves and frees up Corps personnel to focus on mission at hand.
- **DISCUSSION:** IMPROVE
  - ▶ Increased communications between Corps and Industry personnel.
- **RECOMMENDATION:** Increased participation in Huntington District Waterway Association monthly meetings. Partnering meetings to identify maintenance issues and possible solutions to extend the life of project equipment.



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# EXECUTION

3 of 5

- **ISSUE:** SAFETY
- **DISCUSSION:** SUSTAIN
  - ▶ No recordable lost time accidents
  - ▶ Identified and assigned Safety Officers to both shifts using in-house resources
- **RECOMMENDATIONS:** Certify more in-house employees in CDSO and coordinate with local EMS prior to the start of work. Maintain good record of safety related issues.
- **DISCUSSION:** IMPROVE
  - ▶ Review of PPE and operation / inspection of equipment. Replace as required with improved equipment
  - ▶ "Retrofit" mooring bitt baskets with lessons learned
- **RECOMMENDATIONS:** Coordinate work with EC on design changes. Ensure changes are captured on paper and distribute changes to LRL. Complete implementation of FEM to ensure PM maintenance on equipment is performed and documented



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# EXECUTION

4 of 5

- **ISSUE:** RESOURCES
- **DISCUSSION:** SUSTAIN
  - ▶ Adequate staffing
  - ▶ Pre-staged equipment at the projects prior to mobilization.
- **RECOMMENDATION:** Leverage District and Division resources (labor, plant and equipment). Pre-stage equipment and prepare work sites prior to mobilization and subsequent closure. Have a contingency plan in place.
- **DISCUSSION:** IMPROVE
  - ▶ Use of temporary positions should be evaluated and implemented for specific work
  - ▶ Contract for annual rental of tired mounted cranes for lockwalls.
- **RECOMMENDATION:** Have signed equipment rental agreements in place with local equipment rental companies. Borrow equipment from other district elements. Assure visiting district equipment capabilities are adequate for the host district projects.



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# EXECUTION

5 of 5

- **ISSUE:** EMERGENCY GATES
- **DISCUSSION:** SUSTAIN
  - ▶ Quarterly flushing and inspection
  - ▶ Temporary modifications around sheave nest to facilitate dewatering
- **RECOMMENDATION:** Communicate temporary emergency gate modification to other LRH L&D projects.
- **DISCUSSION:** IMPROVE
  - ▶ Ensure gate rehab is on backlog maintenance and prioritized for outyear budget package.
- **RECOMMENDATION:** FEM inspection and documentation for use in condition assessments and budget package formulation



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# CONCLUSION

- The planned main lock closure was originally scheduled for 33 days.
- Total project time growth was 27 days.
- Significant additional work resulted in extending outage.
- Industry self help program worked outstanding. There were no issues with lockage prioritization or procedure
- Unplanned work contributed to planning and initial staffing issues.
- Findings reinforced the need for new miters gates. Both upper and lower gates are in need of MORE work and considered to be in failure.
- LRH Fleet workforce did an exceptional job adapting to unplanned work and the challenges that brought.



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# SCOPE OF COMPLETED WORK

- **Greenup L/D** –
  - ▶ Dewater main 110-ft. x 1200-ft. lock chamber
  - ▶ Clean and Inspect both upper and lower miter gates
  - ▶ Repairs to 8 of the 12 mooring bitt tracks
  - ▶ Crack repairs to lower miter gates
    - 3 cracks on each leaf at the pintle casting
    - 6 flange welds on G-15
    - Major crack repair on G-9, middle wall leaf
    - 35 various other crack repairs
  - ▶ Crack repairs to upper miter gates
    - Major crack on each leaf in pintle area
    - 7 large cracks on river wall leaf
    - Multiple cracks upstream and downstream on both leaves
  - ▶ Repaired 8 mooring bitt tracks
  - ▶ Repaired 8 mooring bits
    - Fabricated and installed new trash screens
    - Installed new bushings on rollers and chamfer roller edge
    - Replaced guide shoes
  - ▶ Removed, fabricated and installed new gate fenders
  - ▶ Repaired diagonal gate protection
  - ▶ Replaced seal Apron on two leaves
  - ▶ Replaced upstream G-5 Quoin girder on both upper gates
  - ▶ Fabricated / Installed latch pin bracket on upstream river wall gate
  - ▶ Repaired grease lines



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# QUESTIONS

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