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# *LOWER FOX RIVER DAMS*

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17 June 2009



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# ***Outline***

- **National Dam Safety Program**
- **Risk Assessments**
- **Interim Risk Reduction Measures**
- **Schedule for Remedial Action**



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# *History of the National Dam Safety Program*

- “An Act to authorize the Secretary of the Army to undertake a national program of inspection of dams”, approved August 8, 1972 (33 U.S.C. 467 et seq)



# *Elements of Program*

- National Dam Safety Review Board
  - 5 Federal Members
    - FEMA (Chair)
    - Federal Energy Regulatory Commission
    - Department of Interior (USBR)
    - Department of Agriculture (NRCS)
    - Department of Defense (USACE)
  - 5 State Dam Safety Officials
  - 1 Member from Private Sector
    - USSD or other
- Interagency Committee on Dam Safety
  - Established in legislation
- The Director shall establish an advisory board to be known as the ‘National Dam Safety Review Board’ to monitor State implementation of this section, and to advise the Director on national dam safety policy. Authorization includes:
  - Board Activity
  - ICODS Activities
  - Biennial Report
  - Assistance to States



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# ***Main Components of USACE Dam Safety Program***

- Dam Safety Training
- Dam Inspections
- Risk Assessments
- National Inventory of Dams



# ***National Inventory of Dams***

- National Inventory of Dams
  - Managed by USACE
  - Includes information on approximately 79,000 dams
  - Includes USACE dams (600+) and others
  - Can be accessed at:  
<http://crunch.tec.army.mil/nidpublic/webpages/nid.cfm>



## ***Types of Inspections:***

- **Periodic Inspections – Every 5 years**
- **Intermediate Inspections (by project personnel)**
- **More frequently during Special conditions ( high pool, signs of distress, etc)**



# ***Periodic Inspections***

- ***Inspect thoroughly all structures of a project:***

***Reservoir Dams, outlet works, and spillway or navigation locks & dams  
(and all features)***

***+ any other structures such as special levees, flood walls, pumping stations, Railroad or highway gate closures, etc...***



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# ***Periodic Inspection Teams***

**Multi-disciplinary - in house if possible**

- **Geotechnical engineer / geologist**
- **Structural**
- **Hydraulic (H & H)**
- **Mechanical & Electrical**
- **Operations representative**
- **LRD (Division) representative**
- **State Dam Safety / Local sponsor**
- **May borrow expertise from other Districts**



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# ***Fox River Inspection Schedule***

August 2009 - Menasha, Rapide Croche

June 2010 - Upper Appleton, Lower  
Appleton, Cedars, De Pere

May 2011 - Little Chute, Kaukauna, Little  
Kaukauna



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# ***Risk Assessments***

The USACE has developed and is currently implementing a risk-based process to prioritize dam safety deficiencies on a nationwide basis.

The first step is a screening portfolio risk assessment, dam safety action classification codes are assigned.



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# ***Dam Safety Action Classifications***

DSAC I – URGENT AND COMPELLING (Unsafe)

DSAC II – URGENT (Unsafe or Potentially Unsafe)

DSAC III – HIGH PRIORITY (Conditionally Unsafe)

DSAC IV – PRIORITY (Marginally Safe)

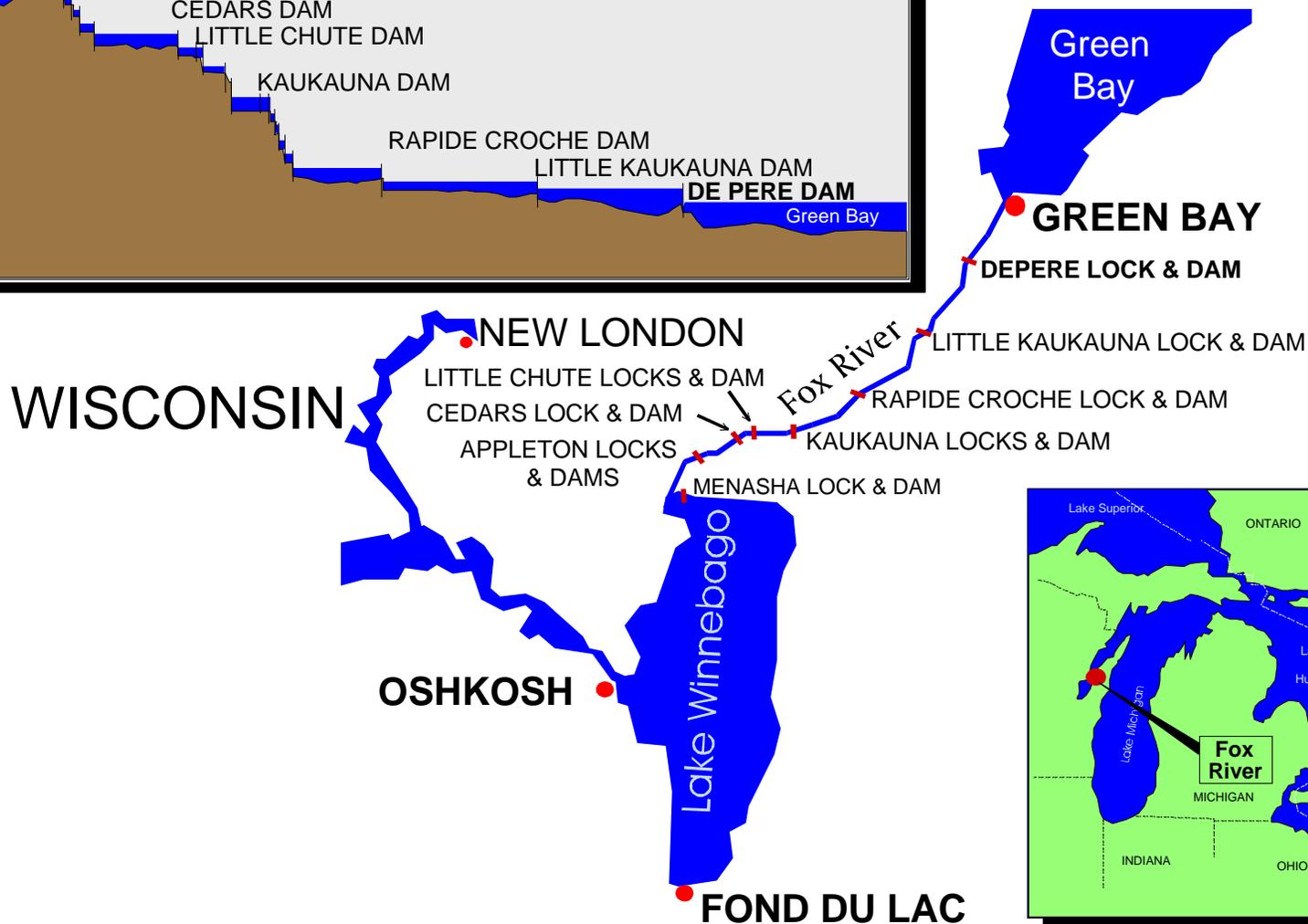
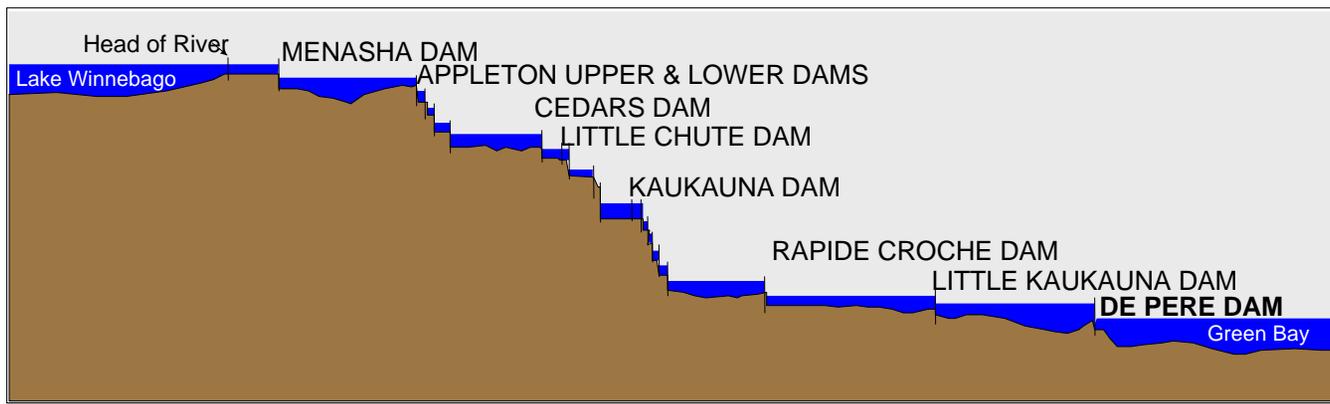
DSAC V – NORMAL (Safe)



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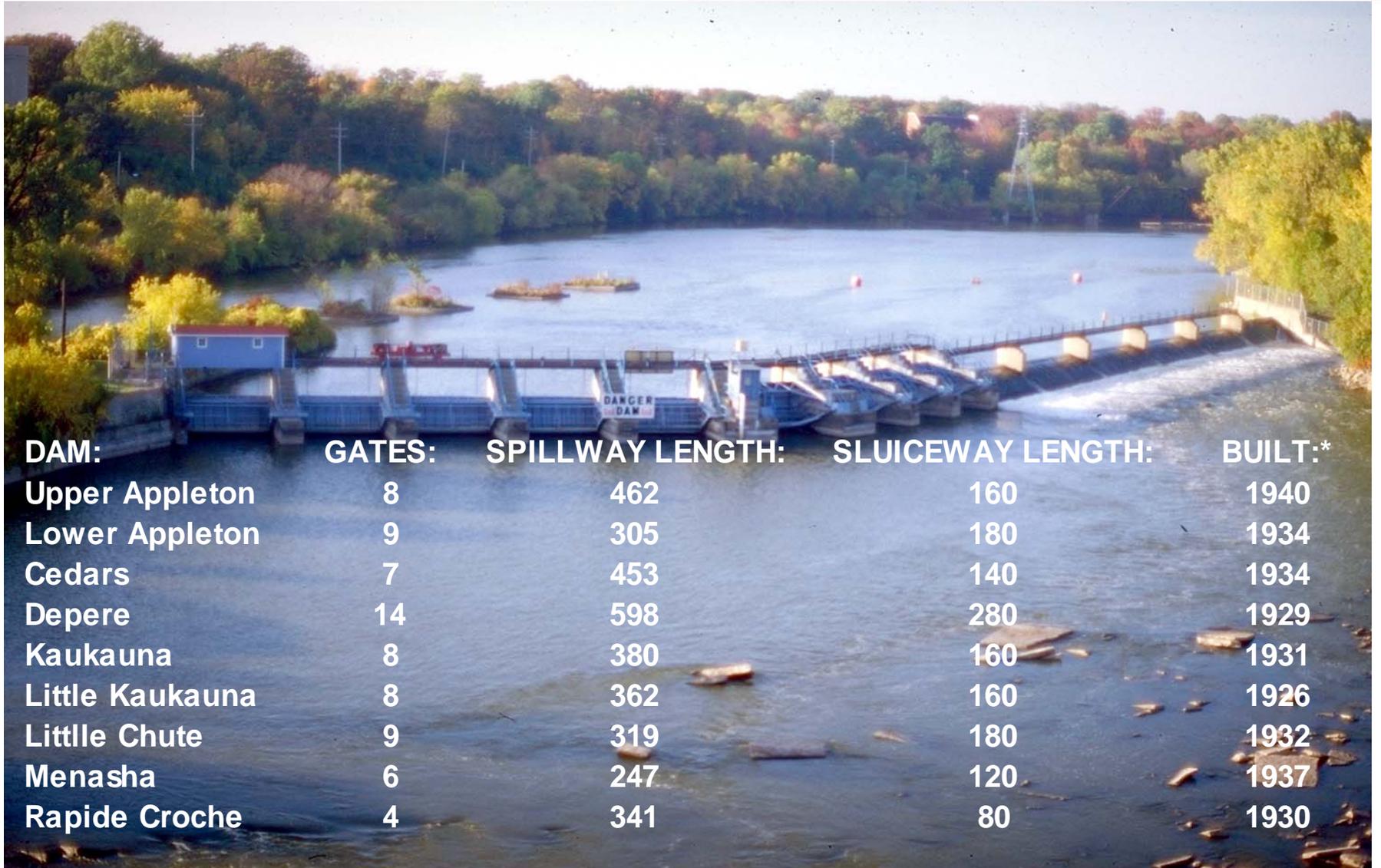
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| DAM:            | GATES: | SPILLWAY LENGTH: | SLUICEWAY LENGTH: | BUILT:* |
|-----------------|--------|------------------|-------------------|---------|
| Upper Appleton  | 8      | 462              | 160               | 1940    |
| Lower Appleton  | 9      | 305              | 180               | 1934    |
| Cedars          | 7      | 453              | 140               | 1934    |
| Depere          | 14     | 598              | 280               | 1929    |
| Kaukauna        | 8      | 380              | 160               | 1931    |
| Little Kaukauna | 8      | 362              | 160               | 1926    |
| Little Chute    | 9      | 319              | 180               | 1932    |
| Menasha         | 6      | 247              | 120               | 1937    |
| Rapide Croche   | 4      | 341              | 80                | 1930    |

Lower Appleton Dam shown

# Lower Fox River Federally Owned Dams

Green Bay

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De Pere

Little Rapids

Wrightstown

Kaukauna

Appleton

Menasha

Rapid  
Croche Dam:  
DSAC II

De Pere  
Dam:  
DSAC II

Cedars  
Dam;  
DSAC II

Little  
Kaukauna  
Dam: DSAC IV

Lower Appleton Dam:  
DSAC IV

Upper Appleton Dam:  
DSAC II

Kaukauna  
Dam:  
DSAC IV

Little Chute  
Dam: DSAC  
II

Menasha  
Dam:  
DSAC IV

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**Cedars Dam**

## Fox River DSAC II Dams



**Little Chute Dam**



**De Pere Dam**



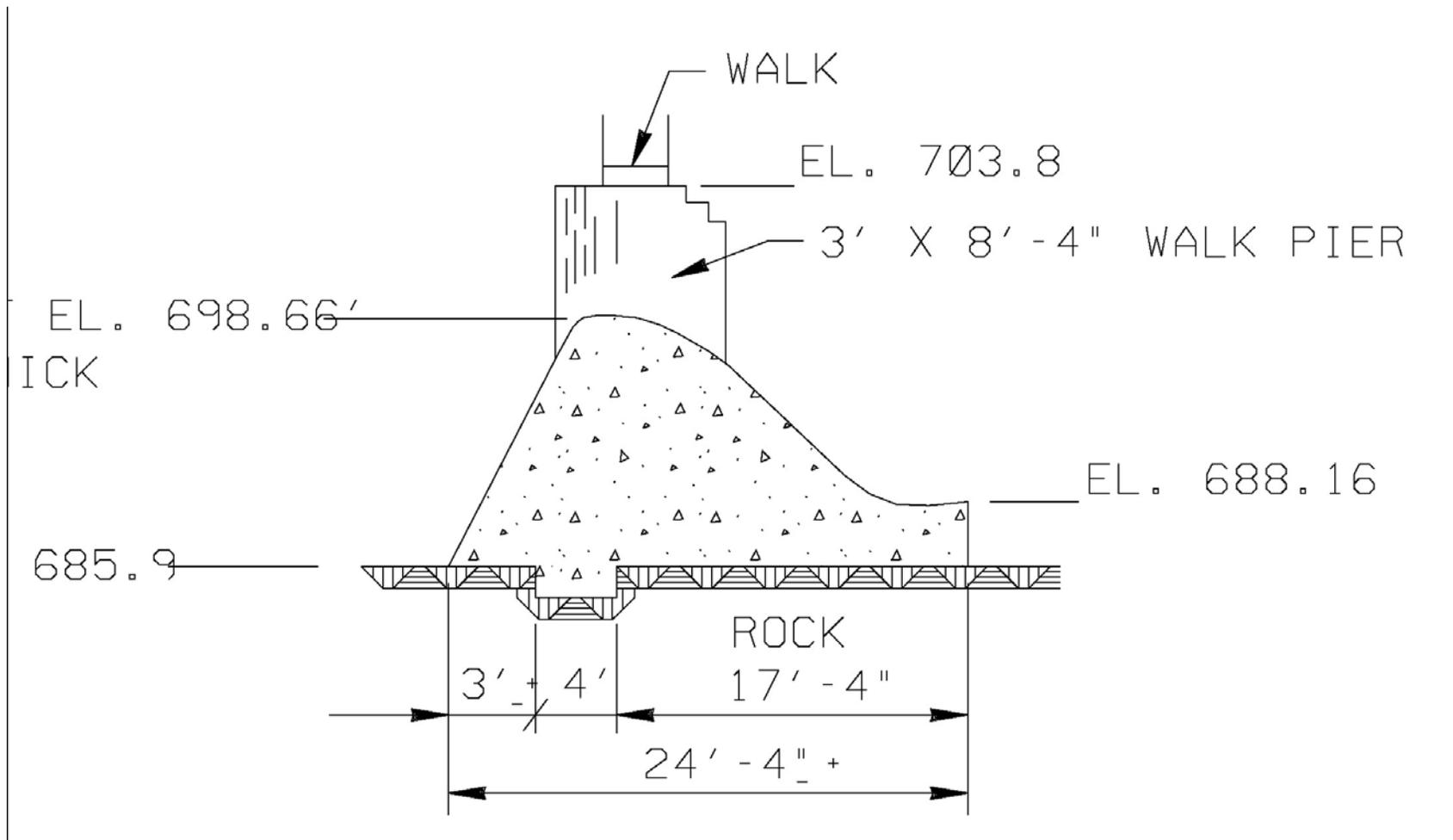
**Rapide Croche Dam**



**Upper Appleton Dam**

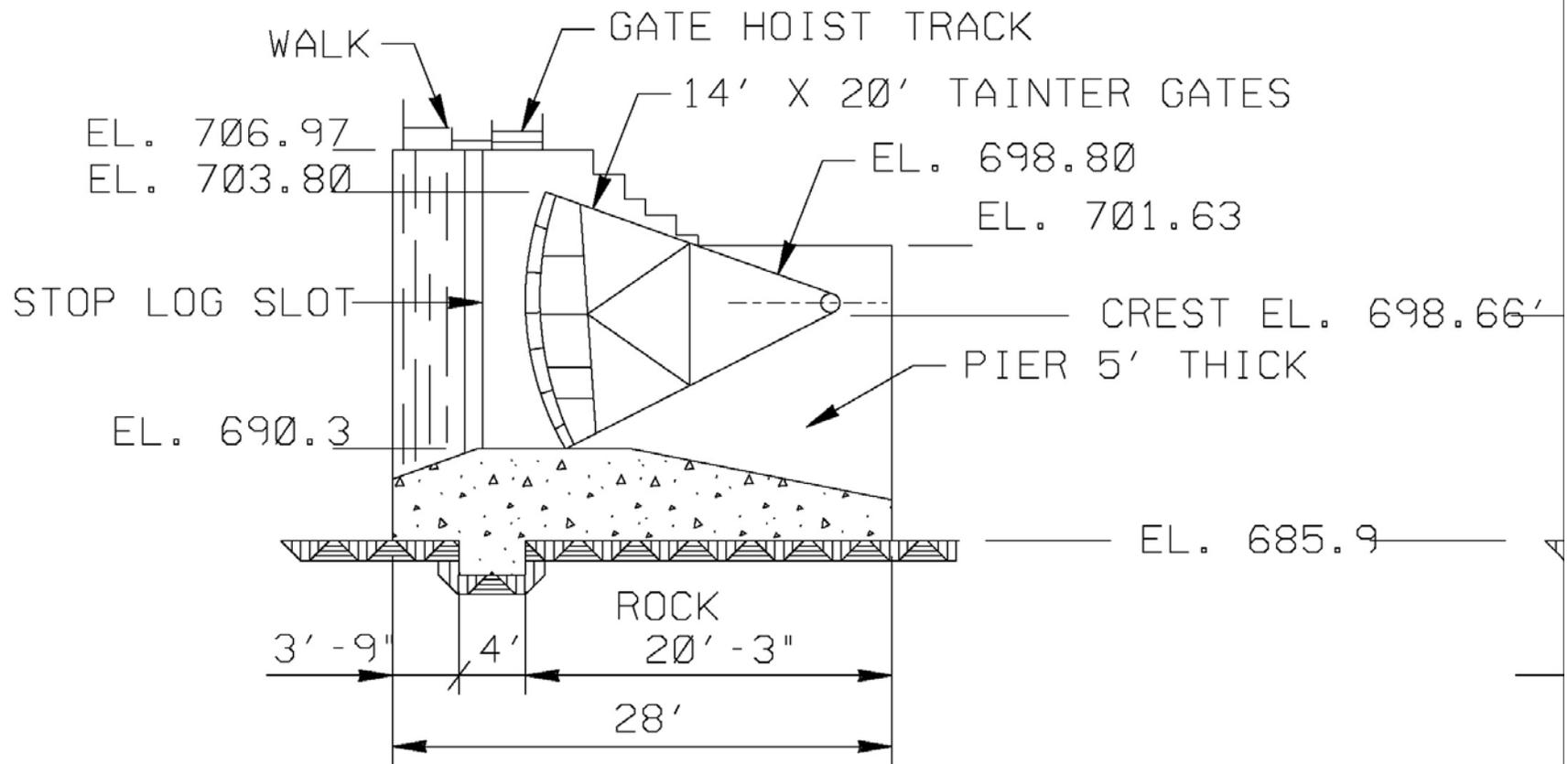


## TYPICAL SPILLWAY CROSS SECTION





## TYPICAL SLUICeway CROSS SECTION





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# *Trunnion Pin Issue*





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# What's Next?

**Short term measures (known as interim risk reduction measures or IRRMs) were evaluated to determine what actions could be initiated to reduce the probability and/or consequence of failure while waiting for funding for the permanent repairs.**



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# ***Interim Risk Reduction Measures (IRRM):***

**Interim Risk Reduction Measures (IRRM) are measures taken to reduce the probability of failure or the consequences of failure. Interim measures are a **SHORT TERM APPROACH** to managing Dam Safety risks while long-term solutions are under development.**



# ***Interim Risk Reduction Measures Considered:***

- Seal concrete cracks around trunnion pins
- Replace bolts on gate arms
- Install ice-controls at dam
- Lower pools behind dams
- Purchase stop logs for emergency use



# **Interim Risk Reduction Measures Considered:**

- **Update hydraulic studies and flood inundation mapping**
- **Update emergency action plan**
- **Increased monitoring**
- **Perform Emergency Exercise Drill**
- **Develop Risk Communication Plan**



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## ***IRRM's NOT Recommended:***

- **Lower pools behind dams**
- **Purchase stop logs for emergency use**
- **Install ice-controls at dam**



## ***IRRM's Recommended:***

- Seal concrete cracks around trunnion pins\*
- Replace bolts on gate arms
- Update hydraulic studies and flood inundation mapping
- Update emergency action plan & com plan
- Increased monitoring
- Perform Emergency Exercise



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**\*Temporary sealing of cracks around trunnion pins will only be done at dams that do not receive immediate funding for the permanent repairs. This is intended to reduce any further damage while waiting for funding for the permanent repairs.**



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# ***Permanent Repairs***

**Funding has been received through the American Recovery and Reinvestment Act of 2009 (stimulus funding) to perform permanent repairs at 4 of the 5 DSAC II dams. Permanent Repairs consist of replacing the current trunnion pins and significant concrete repairs.**



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# ***Schedule for Permanent Repairs at DSAC II Dams:***

**De Pere: 4 Gates repaired in 2008/2009.**

**Contract award scheduled for July 2009 to repair remaining gates.**

**Little Chute, Rapide Croche & Cedars: Contract award planned for July 2009 to repair all gates.**

**Upper Appleton: Design underway. Will award contract for repairs in 2009 if funding is available.**



# ***Schedule for Permanent Repairs at DSAC IV Dams:***

- **Kaukauna & Little Kaukauna**: Will be awarded in 2009 if funding is available.
- **Lower Appleton**: Design underway. Will award contract for repairs in 2009 if funding is available.
- **Menasha**: Trunnion pin issue not present at Menasha Dam. Minor concrete repairs will be scheduled as part of normal O&M.



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# *Trunnion Pin Repairs at De Pere*





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# ***QUESTIONS?***

*[www.lre.usace.army.mil/newsandevents/fox\\_river](http://www.lre.usace.army.mil/newsandevents/fox_river)*