

MCNARY SPILLWAY STATUS

FPOM
28 December 2023



US Army Corps
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MCNARY SPILLWAY

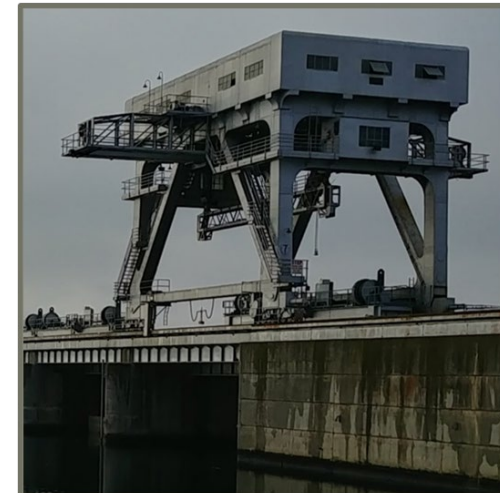
- Operational in 1954
- 22 Spillbays with double leaf vertical lift gates
- 2 Cranes (#6, #7) only initially,
200 ton (400,000 lbs) capacity.
Routinely operated gates in split leaf





MCNARY CRANES 6 & 7

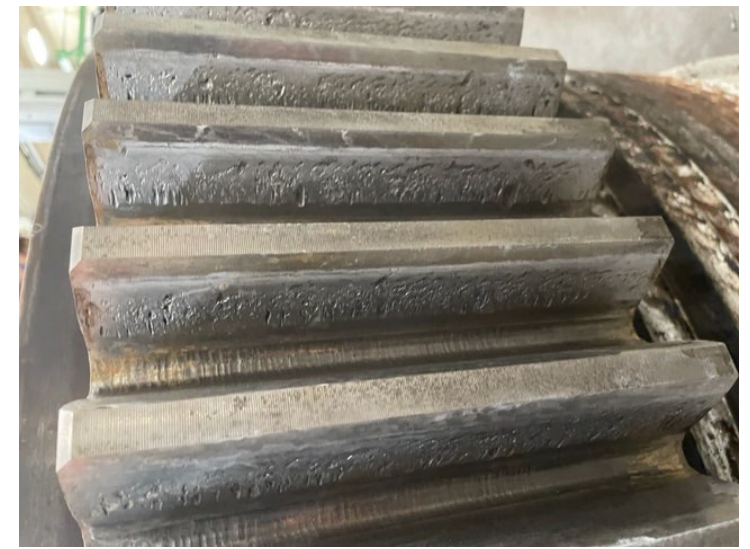
- Overloaded by estimated 20% according to BDI tests in 2003/05- not counting for lifting beam or frictional losses. – Violation of American Society of Mechanical Engineers (ASME) and Engineer Manual (EM) 385.
- Gantry crane frames do not comply with current American Institute of Steel Construction (AISC) codes - Under breakdown torque simulations, the downstream legs fail.
- The electrical system is outdated. Asbestos. DC hoist controls at risk of failure. Obsolete component replacement is becoming more challenging.
- Frequently down for weeks or months at a time – most recently a gantry drive gearbox failure required bearings that are no longer readily available.
- Recently had a main hoist gearbox replacement to address severe vibration issues, with mixed results.
- January 2023, Cranes 6 & 7 were limited to two engineered lifts (250 tons) per year.
 - Lifts that do not overload crane capacity are not limited





MCNARY HOISTS

- 1976, 16 Ederer hoists added, 175 tons (350,000 lbs) capacity
Flow deflectors added
Spillway predominately operated as full gates
- 2002/2003, Four Transco hoists added.
350,000 lbs capacity
- 2002, Failure of hoist gearbox coupler
- 2003-2005, Testing indicated all hoists were overloaded, 13 were > 125% overloaded
Up to 480,000 lbs of load. Did not include sheave friction.
- 2004-2009, Rehab of some gates wheel bearings, guide slots, guide shoes, replaced seals
Minor improvement only
- 2007, Hoist replacement project initiated
- 2020, Work restriction while hoists were under load implemented to reduce risk to health and human safety
- 2021, Load cell data collected on four hoists for prototype hoist project showed overload condition
- 2022, Hoist #6 failed, gears showed severe pitting due to material fatigue from high contact stresses,
replaced with hoist from bay #16. Bay #16 RTS after about three month outage.
Hoist #15 OOS for one week for repairs
Hoist #20 taken OOS for repairs
Hoist #21 gearbox coupler failed and brakes failed during closure causing gate to fall on sill
- October 2023, Hoist operations were limited to either no (13) or two (7) overload lifts per year





M McNARY HOISTS



Pitted north drum gear



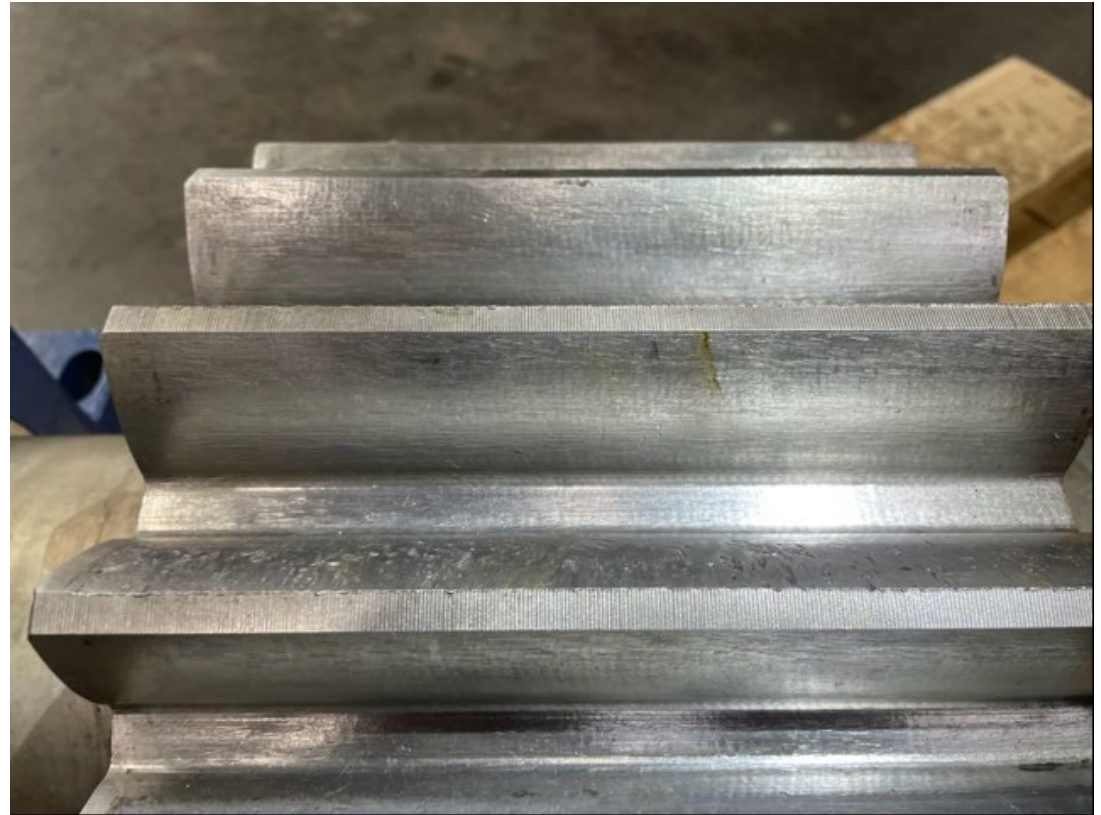
Unworn gear



MCNARY HOISTS



Pitting on south pinion gear



Unworn pinion gear



MCNARY SPILL GATES

- 2022, Testing of lifting eyes showed deterioration and overload of design capacity
Gate girders; several were close to failure for normal operations, and many did not meet criteria for emergency operation
- 2023, Spillbay #16 closed to repair cracks in dogs and dog mounting points
Bays #1, #3, #21 taken OOS to repairs dogs. Other bays to follow over the next year
- Result of structural analysis is that all 22 (+2 spares) spill gates should be replaced



MCNARY SPILLWAY UPGRADE STATUS

SCOPE OF SPILLWAY UPGRADES

Spillway Gate Dogging Mechanism Repairs (NREX):

- Repair and restore dogging mechanisms to allow safe dogging of gates.

Replace Spillway Cranes 6 & 7 (BPA Joint Capital):

- Replace spillway gantry cranes with updated (350 ton) cranes (**PRIORITY**)
- Replace spillway gate lifting beams with updated lifting beams

Gate Hoist Replacements (BPA Joint Capital):

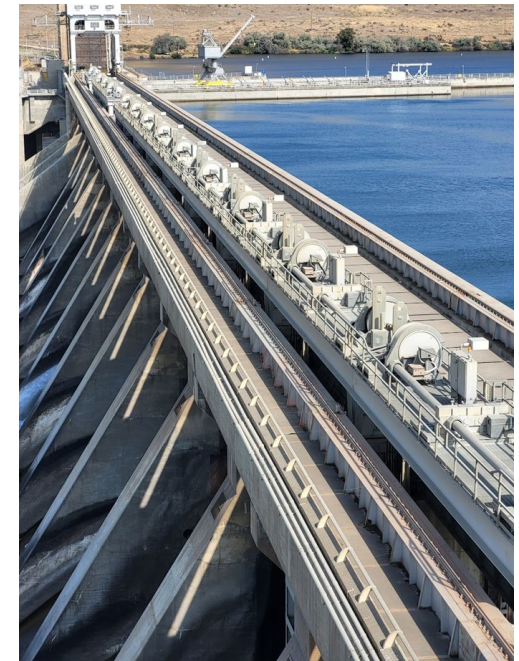
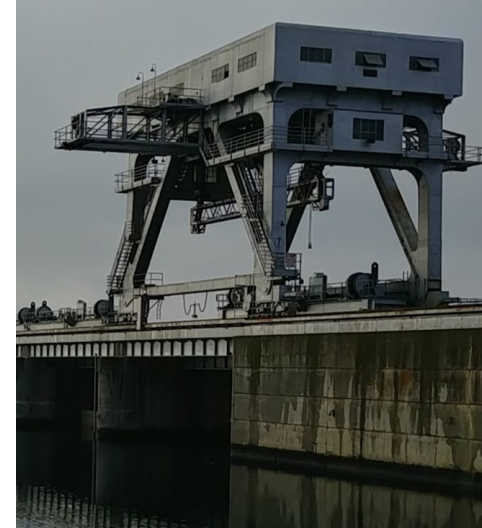
- Replace all 20 gate hoists (**PRIORITY**). **Add 2 new gate hoists** so each spill bay has a hoist. 350 ton capacity

Spillway Gate Replacement (BPA Joint Capital):

- Based on 2023 structural analysis, we must replace all spillway gates with updated capacity for sheave friction and hydraulic down-pull forces.

Spillway Gate Repair Pit Upgrade (BPA Joint Capital):

- Remove lead and asbestos.
- Add explosion-proof lighting, ventilation, doorways, electrical, pedestal upgrades, deck slab repairs and handrail upgrades, and fire protection.



MCNARY SPILLWAY UPGRADE STATUS

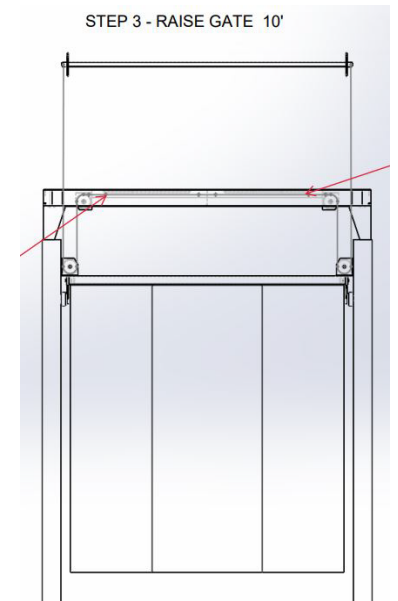
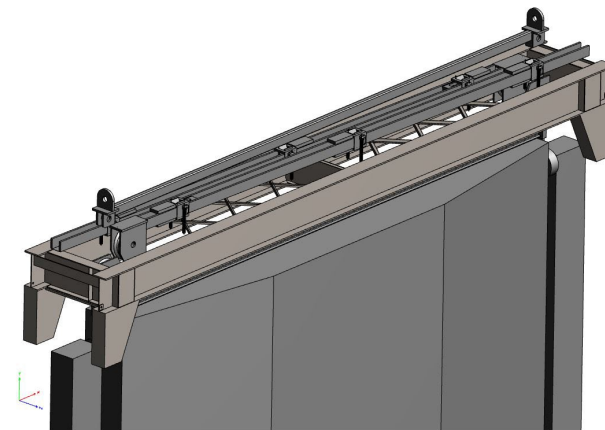
SCOPE OF SPILLWAY UPGRADES

Spillway Deck Safety Handrail (NREX):

- Procure 21 new sets of handrail for the upstream spillway gate slots
- Move spillway gates and spillway gate hoists to upstream slots
- Operate spillway in upstream, split-leaf configuration for spill and fish passage requirements (**PRIORITY**)

Spillway Lifting Auxiliary Beams (SLABs) (BPA Joint Capital):

- Purchase new SLABs to allow use of spillway cranes without overloading (**PRIORITY**)
- Reduces spillway gate load from the spillway cranes and allows spillway crane operation within acceptable load limits





- **McNary Spillway Working Schedule**
 - MCN Replace Spillway Cranes 6 & 7
 - Phase 1a approved. FY23-24 Funding in place.
 - Design FY24-25? (pending appropriated \$\$s)
 - Award 1 crane (pending appropriated \$\$s):
 - Start fabrication crane 1 in FY26
 - Award 2nd crane (pending appropriated \$\$s):
 - MCN Spillway Major Rehab Evaluation Report (MRER)
 - Creating new project for FY24-25 budget request
 - MCN Spillway Hoist Replacements
 - First hoist in final design
 - Award prototype early FY24. Install FY24-Early FY25
 - Award follow-on contract for remaining hoists FY26: three per year?
 - Safety handrails – Pending Phase 1&2 Approval: Construction FY24
 - SLABS – Pending 1&2 Approval. Construction FY24-FY25
 - MCN Spillway Gate Replacements
 - Phase 1a pending Dec 2024 Capital Work Group Meeting
 - Phase 1 design in FY24-25
 - Award:
 - New spillway gates delivered FY26?: Three per year?
 - MCN Spillway Gate Dogging Mechanism Repair underway with FY23 NREX funds.
 - Funded. Repairs to occur in FY25 and complete in FY26
 - MCN Spillway Gate Repair PIT Upgrade
 - Phase 1a has been approved, but no appropriated match
 - Lower priority since gates are to be replaced
 - Repair pit will likely be used for storage when new spillway gates start to be delivered.
 - Modeling – Latest estimate, \$1.5M to create new model
 - Initial funding from CRFM allotment has been sent to ERDC to initiate construction



MCNARY SPILLWAY CRANE MILESTONES

Kick off	August 2023
Phase 1 Approval	April 2024
Ready to Advertise	September 2024
Award	March 2025
Onsite Construction	Summer 2027





SPILLWAY GATE HOIST REPLACEMENTS

MILESTONES

Kick off	Dec 2014
Phase 1 Approval	Nov 2019
Phase 2a Approval	Jul 2022
Contract Award	Apr 2024
Onsite Construction	Apr 2025
Phase 2b Approval	Jun 2024
Contract Award	Nov 2024
Onsite Construction	Sep 2025 – 2032 (~Three per year)

Phase 2a = Prototype Spillway Gate Hoist (1 hoist)

Phase 2b = Remaining Spillway Gate Hoists (21 hoists)



PROPOSED SPILL OPERATIONS

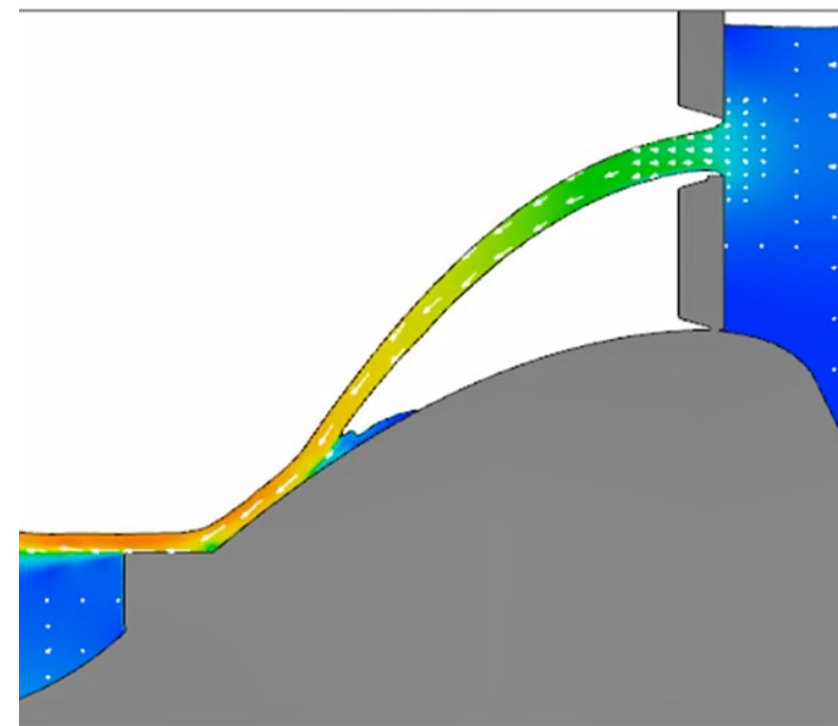
Retain two TSW's in normal location

Move 13 hoists to upstream slot and use in split leaf configuration

- Construct new control cables
- Procure materials for handrails with Small Cap
 - Assemble handrails in-house

Retain 7 gates in downstream slot closed in full gate configuration

- Needed to maintain Standard Project Flood (SPF) capacity
- Adaptively manage operations once risk for spring floods are better understood
- Incorporate use of SLAB's when available





SPILLWAY OPERATION EVALUATIONS

SRWG has met several times to discuss evaluation plans

Research Summary was distributed 18 December. Comments due 31 December

FY24 DIRECT INJURY STUDY OBJECTIVES:

1. Estimate direct injury and survival of yearling Chinook salmon passing through a McNary Spillway after being set in the upstream slot in split-leaf operation by direct releases of fish equipped with balloon tags at two different elevations. (Sample sizes sufficient to estimate with a precision of $\pm 5\%$ @ 95% Confidence Interval [CI]).
2. Estimate direct injury and survival of yearling Chinook salmon passing through McNary Dam TSW by direct releases of fish equipped with balloon tags at two different elevations. (Sample sizes sufficient to estimate with a precision of $\pm 5\%$ @ 95% CI).

FY24 ACTIVE TAG STUDY OBJECTIVES:

1. Estimate spillway survival of out-migrating juvenile salmonids passing through McNary Dam with split-leaf spillway operations from dam face detections to outside of project influence downstream.
2. Estimate survival of out-migrating juvenile salmonids passing through all passage routes at McNary Dam with split-leaf spillway operations.
 - a. Estimate tailrace egress time for juvenile salmonids downstream of McNary Dam.
 - b. Estimate spillway passage efficiency (SPE) for split-leaf spillway operations at McNary Dam.
 - c. Estimate forebay survival and forebay residence time for split-leaf spillway operations at McNary Dam.

Evaluations are intended to be early spring. Before April spill season if possible.

Funding available is still TBD



SPILLWAY OPERATIONS MODELING





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