Staff Report

TO: Board of Directors

FROM: Lacy Cannon, P.E., Associate Engineer

DATE: July 24, 2024

SUBJECT: **Dam Safety Updates**

HYDROELECTRIC

RECOMMENDATION:
Receive an informational presentation on Dam Safety Updates and conduct a workshop on the District's Dam Safety Program.

BACKGROUND:
Staff will present a brief overview of dam safety, a summary of the Owner's Dam Safety Program, a synopsis of the regulatory environment, and a summary of upcoming dam safety work.

BUDGETARY IMPACT:
There is no budgetary impact associated with this item.

Attachments (1):
Presentation

Dam Safety Updates Workshop

JULY 24, 2024

NID
Water for Life

Outline

Part 1 – Dam Safety Overview

Part 2 – Owner's Dam Safety Program

Part 3 – Regulatory Environment

Part 4 – Upcoming Dam Safety Work

Part 5 – Key Takeaways

Part 1: Dam Safety Overview

Overview

NID's Dam Portfolio

Dam Safety Statistics

Overview – What is Dam Safety?

Role of dams:

flood protection, water supply, hydropower, irrigation, and recreation

Dam Infrastructure Introduces Hazards:

natural hazards, man-made threats, imbalance between resources invested and a dam's age

Main Goals:

reduce risk to human life, property and the environment from dam related hazards

Source: FEMA Fact Sheet National Dam Safety Program Overview

Overview – Owner's Role

The dam owner has introduced risk into the environment. The dam owner is legally responsible to maintain their dam(s) in a safe manner.

Awareness of:

- State and Federal laws and regulations
- Proper operation and maintenance practices
- Rehabilitation needs
- Emergency Action Planning
- How to hire qualified staff

In order to:

- Reduce likelihood of incidents and failures
- Reduce liability
- Improve the safety of dams
- Reduce risk to communities

Source: Association of Dam Safety Officials (ASDSO) Being a Responsible Dam Owner

Overview – Regulatory Oversight

Department of Energy

Federal Energy Regulatory Commission (FERC)

Governance = Federal Power Act

Purpose is to protect, mitigate, and enhance beneficial public uses and the environment around hydropower projects.

California State Department of Water Resources

Division of Safety of Dams (DSOD)

Governance = The California Water Code

Purpose is to regulate dams to prevent failure, safeguard life, and protect property.

Overview – Dams and Facilities

Includes:

16 dams, 9 small diversion dams, Appurtenances, Penstocks

Conveyances:

- (Milton-Bowman Conduit (~ 5 miles tunnel & concrete pipe), Bowman-Spaulding Conduit (~10.8 miles of tunnels, canals, and flumes)
- Dutch Flat No. 2 Conduit (~4.7 miles of tunnel, flume, siphon and canals)
- Chicago Park Conduit (~4.1 miles of flume and ditch)
- South Yuba Canal (~19 miles of flume and canal)

Does not include: Powerhouses, Switchyards, and Transmission Lines

Overview – NID's Dam Portfolio

16 dams (13 FERC/DSOD, 1 FERC, 2 DSOD)

- 3 Homogeneous Earthfill
- 3 Zoned Earth Embankment
- 3 Zoned Earth and Rockfill
- 4 Concrete Arch Dams
- 3 Concrete Faced Rockfill

Overview – NID's Dam Portfolio

11 dams are classified as "High" or "Extremely High" downstream hazard potential

ALL of NID's dams are over 50 years old

8 dams are approaching or over 100 years old

(All of NID's dams have been graded as "safe for continued use" by P12D IC's, DSOD, and FERC)

Overview – NID's Dam Portfolio

DSOD Downstream Hazard Potential Classification

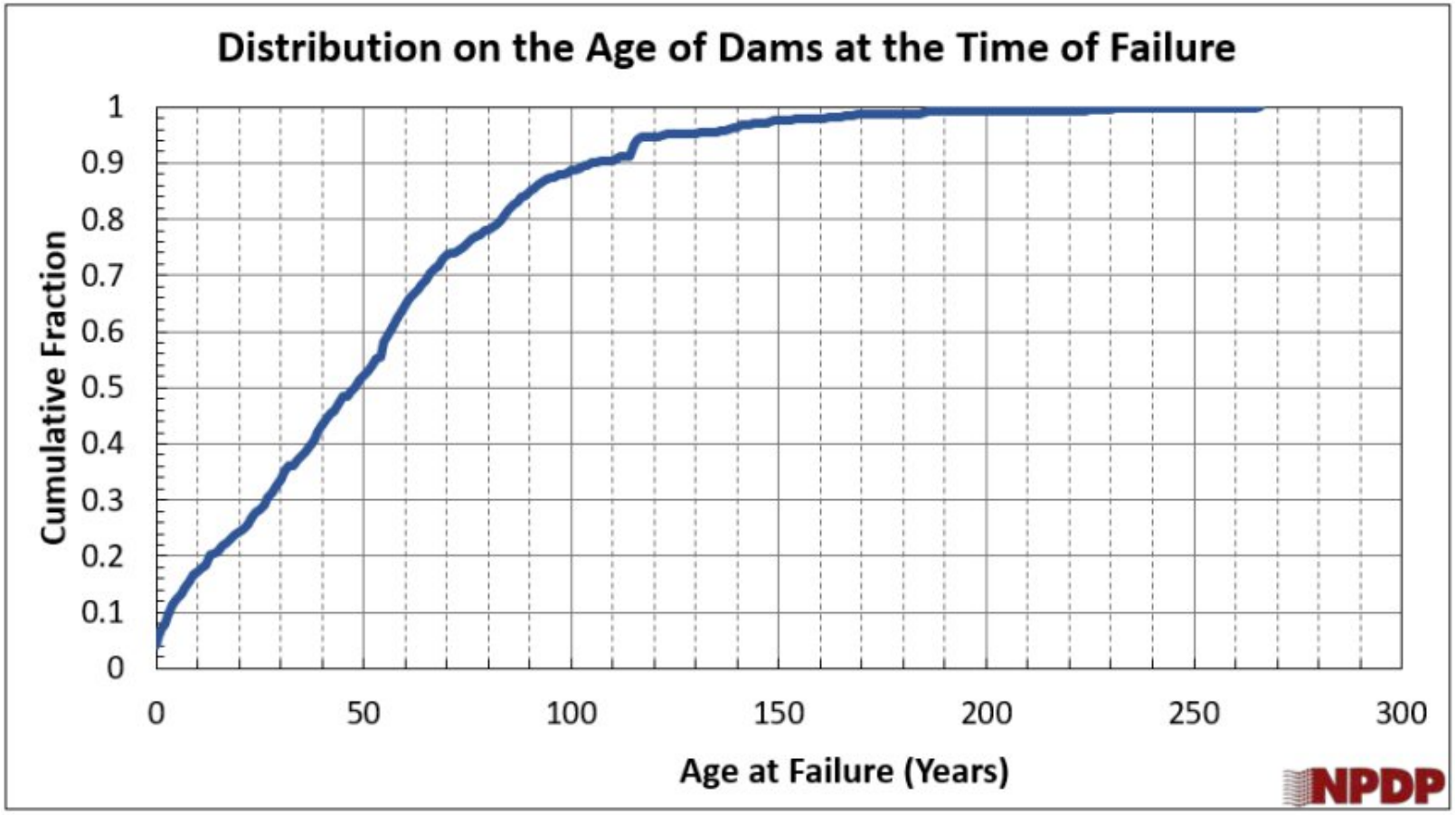
Downstream Hazard Potential Classification	Potential Downstream Impacts to Life and Property
Low	No probable loss of human life and low economic and environmental losses. Losses are expected to be principally limited to the owner's property.
Significant	No probable loss of human life but can cause economic loss, environmental damage, impacts to critical facilities, or other significant impacts.
High	Expected to cause loss of at least one human life.
Extremely High	Expected to cause considerable loss of human life or would result in an inundation area with a population of 1,000 or more.

FERC Downstream Hazard Potential Classification

Hazard Potential Classification	Loss of Human Life	Economic, Environmental, Lifeline Losses
Low	None expected	Low and generally limited to owner
Significant	None expected	Yes
High	Probable. One or more expected	Yes (but not necessary for this classification)

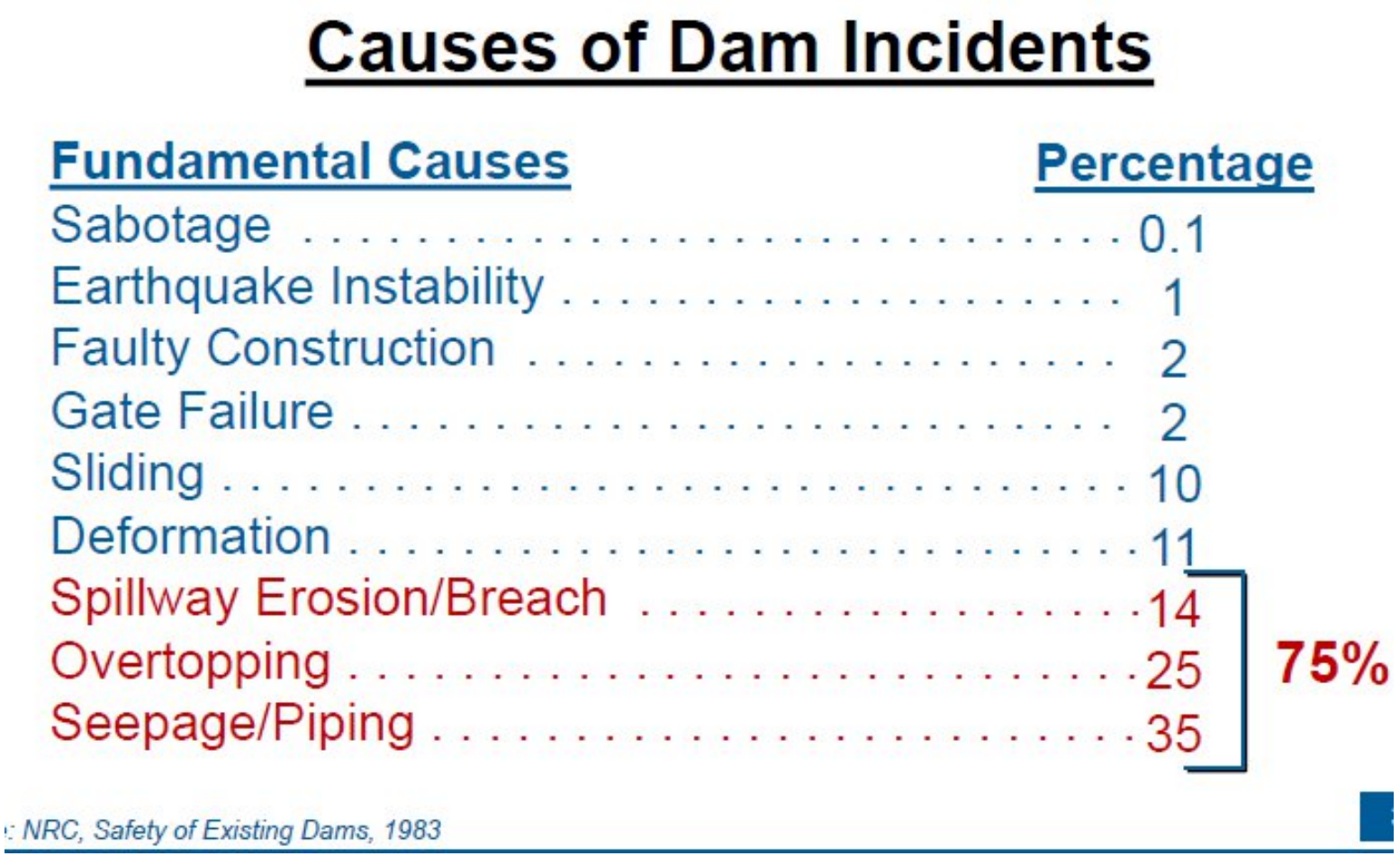
Overview – Dam Safety Statistics

1,645 dam failures in the U.S. documented between 1848 – 2017
National Inventory of Dams Database: ~90,580 dams in the U.S.

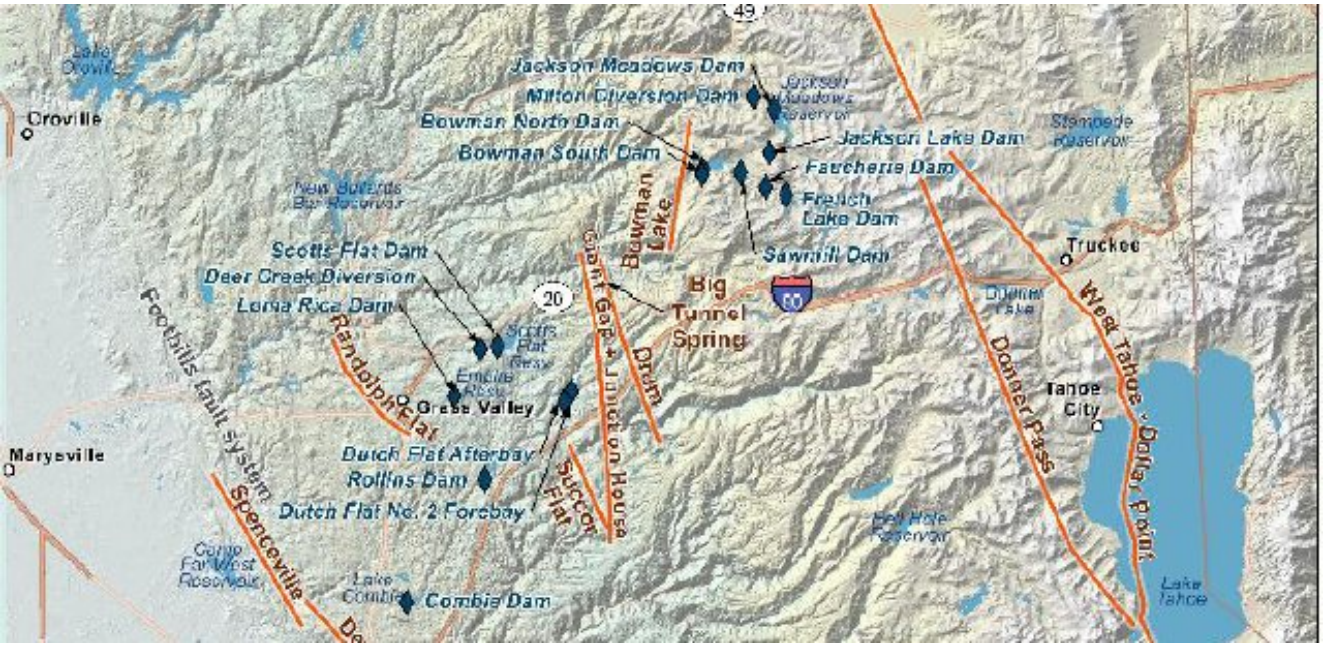


Source: Dam Failures in the U.S., National Performance of Dams Program, Dept. of Civil & Env. Eng., Stanford University, September 2018, NPDP-01-V1

Overview – Dam Safety Statistics



Source: ASDSO Inspection and Assessment of Dams: Session 2 Why Do Dams Fail?



Part 2: Owner's Dam Safety Program

Dam Safety Performance Monitoring Program Overview

Owner's Dam Safety Program

Part 2 – DSPMP Overview

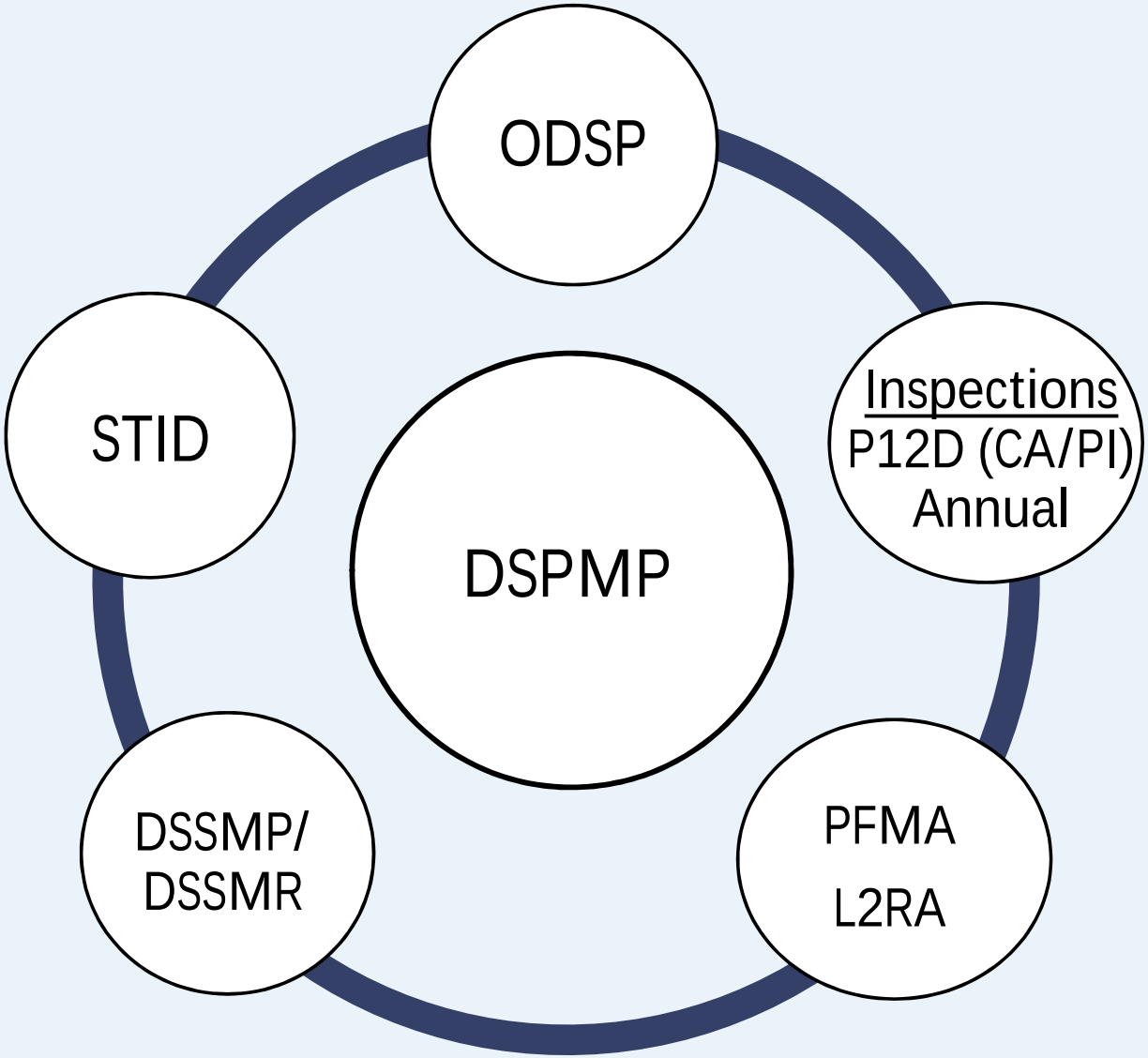
Dam Safety Performance Monitoring Program (DSPMP):

To address long-term monitoring of dams to assure their continued safe use and reliable operations.

Common Acronyms

CA	Comprehensive Assessment
DPA	Digital Project Archive
DSPMP	Dam Safety Performance Monitoring Program
DSSMP	Dam Safety Surveillance & Monitoring Plan
DSSMR	Dam Safety Surveillance & Monitoring Report
IC	Independent Consultant
ODSP	Owners Dam Safety Program
PFM	Potential Failure Mode
PFMA	Potential Failure Mode Analysis
PI	Periodic Inspection
PMF	Probable Maximum Flood
STID	Supporting Technical Information Document
SQRA	Semi-Quantitative Risk Analysis

Part 2 – DSPMP Overview



Source: FERC Expectation in Owner Review of DSSMPs and DSSMRs Training Presentation

Part 2 – ODSP

Owner's Dam Safety Program (ODSP):

- Highest-level dam safety document.
- Most important factor in maintaining safe dams and preventing dam failures.
- Dams with owners who do not have effective ODSP represent a higher risk.
- Owners of High and Significant hazard potential dams are required to have an ODSP plan and submit to FERC
- Owners with High hazard potential dams are required to have a Chief Dam Safety Engineer

Part 2 – ODSP

Basic Principles of a GOOD dam safety program:

- ✓ Acknowledgment of Dam Safety Responsibilities
- ✓ Communication
- ✓ Clear Designation of Responsibility
- ✓ Allocation of Resources to Dam Safety
- ✓ Learning Organization

No power production or other business objectives shall be allowed to compromise dam safety or regulatory compliance.

Part 2 – ODSP

ODSP Requirements:

- Updated Annually; Training for Upper Management; Letter to FERC
- Independent Consultant Audit Every 5 Years

Important Elements in Maintaining Safe Dams (FERC)

- Owners must dedicate the resources and expertise to maintain safe dams. Owner is primarily responsible for safety.
- Don't rely on regulatory oversight for dam safety program. (Be proactive)

Source: FERC Importance of the ODSP <https://www.ferc.gov/sites/default/files/2020-04/importance-odsp.pdf>

Part 2 – ODSP

NID's ODSP:

Adopted Board Policy 9300, Dam Safety Program, on April 13, 2011

Board of Directors Responsibilities for Dam Safety:

- Providing policies, directives, budgets, and staffing for the District.
- Responsible for understanding both the responsibilities and liabilities involved with dam ownership and incorporating that knowledge into their decisions.
- Responsible for understanding life safety and financial risks associated with dam ownership and incorporating that into their decisions.
- Providing final approval in the decision-making process, including policies, budgets, and staffing to assure dam safety.

Part 2 – ODSP

2023 ODSP Audit Recommendations and Status:

Recommendation	Status
(2019 & 2023) Increase Dam Safety Staff to include a CDSE, CDSC, and 2 dam safety engineers	1 FTE with Dam Safety Expertise Consulting Support 0.5 FTE allocated to Dam Safety (little experience and needs training) Some support from Engineering, but need training with respect to DSP.
(2019 & 2023) Implement a Maintenance Management System	Attempted during the last cycle. No current plan.
Update hierarchy, include granular descriptions of responsibilities	In Progress
Expand Dam Safety Training Program	Expanded from 1/year to quarterly

Part 2 – ODSP

2023 ODSP Audit Recommendations and Status Continued:

Recommendation	Status
Train and Learn Risk Informed Decision Making (RIDM)	In Progress CDSC attended trainings
Complete a formal risk assessment of dam portfolio (including appurtenant structures and conveyances)	In progress
Present ODSP to Board of Directors	Will do after the next draft
Engage and network in professional dam safety organizations	ASDSO, USSD, SW2

Part 2 – ODSP

2023 ODSP Audit Recommendations and Status Continued:

Recommendation	Status
Non-Conformance tracking tools should be updated: transition from spreadsheet to database activity tracking	Still using spreadsheets. Researching other options.
Improve electronic file storage methods	In progress. Consultant and CDSC are working on this.
Grow in dam safety expertise with an effort to keep consistent staff to develop a detailed understanding of the facilities	Current: 1 FTE with dam safety expertise and detailed understanding of the facilities.

Part 3: Regulatory Environment

Regulatory Policy Changes

Impacts on the Industry

Part 3 – Regulatory Policy Changes

The 2017 Oroville Dam Spillway incident triggered industry-wide dam safety reviews, forensic analyses, and policy changes.

DSOD Spillway Re-evaluation Program (2019):

- Jackson Meadows
- Rollins
- Scotts Flat

FERC Order 880, Dec. 16, 2021, Final Rule:

- Added 4 Chapters to FERC Engineering Guidelines
- Changed Part 12D Process from 5-year inspections to alternating Comprehensive Assessments (CA) and Periodic Inspections (PI)
- CAs include Potential Failure Mode Analysis (PFMA) and Level 2 Risk Assessment (L2RA)

Part 3 – Impacts on the Industry

New Part 12D Requirements:

- Independent Consultants (ICs) – FERC approved
- PFMA/L2RA Facilitators – FERC approved
- Subject Matter Experts – FERC approved
- Additional submittals and FERC approvals required
- FERC approval of submittals is low
- PFMAs and L2RAs are lengthy (up to 2 weeks or more per dam)
- There are 3 additional studies required to complete the L2RA (Seismic Hazard Assessment, Hydrologic Hazard Curve, Consequence Analysis)
- FERC approved IC's/Facilitators/SMEs are in short supply and high demand

Part 4: Upcoming Dam Safety Work

Part 12D CAs and PIs

French Dam Low-Level Outlet Gate Refurbishment

Scotts Flat Dam Spillway Upgrades

Combie Dam Upgrades

Loma Rica Seismic Hazard Retrofit

Part 4 – Part 12D CAs and PIs

Proposal are due for the first round (2026-2028) on July 18, 2024

NID's P12D CA and PI Schedule

Dam No.	Dam Name	FY2026	FY2027	FY2028	FY2029	FY2030	FY2031	FY2032	FY2033	FY2034	FY2035	FY2036	FY2037	FY2038
02266-01-01	Jackson Meadows	3/1/2026 CA					3/1/2031 PI					3/1/2036 CA		
02266-02-01	Bowman Main	3/1/2026 PI					3/1/2031 CA					3/1/2036 PI		
02266-04-01	Jackson Lake	3/1/2026 PI					3/1/2031 PI					3/1/2036 CA		
02266-05-01	French Lake			3/1/2028 PI					3/1/2033 CA					3/1/2038 PI
02266-06-01	Faucherie Lake Main			3/1/2028 CA					3/1/2033 PI					3/1/2038 CA
02266-07-01	Sawmill Main			3/1/2028 PI					3/1/2033 CA					3/1/2038 PI
02266-15-01	Dutch Flat Forebay		3/1/2027 PI					3/1/2032 CA					3/1/2037 PI	
02266-16-01	Dutch Flat Afterbay		3/1/2027 PI					3/1/2032 CA					3/1/2037 PI	
02266-19-01	Rollins		3/1/2027 CA					3/1/2032 PI					3/1/2037 CA	
02981-01-01	Lake Combie		3/1/2027 PI					3/1/2032 PI					3/1/2037 CA	
05930-01-01	Scotts Flat			3/1/2028 CA					3/1/2033 PI					3/1/2038 CA

Part 4 – Upcoming Dam Safety Work

French Low-Level Outlet Gate Refurbishment: 2025

Scotts Flat, Combie, and Loma Rica Tentative Schedule:

Task	Scotts Flat Spillway Upgrades	Combie Dam Upgrades	Loma Rica Seismic Retrofit
Planning	Completed	Completed	2032
Design	In Progress	2029	2033
Construction	May 2026 through Nov. 2027	2030-2031	2034

Part 5 – Key Takeaways

- NID has a large portfolio of dams, including dams that could result in significant loss of life in the event of a problem.
- Dam maintenance needs (and costs) will continue to be significant due to the age of the dams.
- Regulatory requirements (and costs) will continue to escalate, especially as we prepare for upcoming P12D Comprehensive Assessments (starting in 2025).
- ODSP audit has indicated that NID's Dam Safety Program is understaffed considering the number of dams, age of dams, and increasing regulatory requirements.

Questions and Discussion