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Water Operations and Maintenance Bulletin

Review of Operation and Maintenance Workshop



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Mission Statement

This *Water Operations and Maintenance Bulletin* is published quarterly through the Asset Management Division of the Dam Safety and Infrastructure Directorate. It serves as a medium to connect personnel who operate and maintain Bureau of Reclamation water supply systems.

History

The *Water Operations and Maintenance Bulletin* has been published quarterly since 1952. Past issues may be read and downloaded at [Water Operations and Maintenance Bulletins](#), where you can also search the entire bulletin database by subject.

Contact

We welcome suggestions for future issue topics, contributing authors, and comments on the *Bulletin*. Please direct all inquiries to drowateroandm@usbr.gov.

Cover photo: Radial gate raise at Cle Elum Dam, Yakima Project, Washington. Recent modifications to the radial gates allowed up to an additional 14,600 acre-feet of water to be stored and released from Cle Elum Reservoir.

Editor's Note

This April in Seattle, the Bureau of Reclamation's (Reclamation) Asset Management Division (AMD) held its annual Review of Operation and Maintenance (RO&M) Workshop in person for the first time in four years. Combined with February's Water Management Workshop in Denver, O&M staff finally were able to meet up in person, train together, and learn best practices from each other. Many thanks to all those who participated in one or both of the workshops!

To recognize the efforts put forward by RO&M Workshop subject matter experts and help expand the audience for their work, we asked several presenters to develop their presentations into article form for this issue. Please read on to learn more about developing guidance for building inspections to promote safety and reliability, the CARMA 2.0 Project being developed over the next four years in three phases – foundations, enterprise, and optimization, the new Recommendation Management Information System to write and track recommendations, and the innovative capabilities of uncrewed aerial systems (UAS) to access, inspect, and map essential infrastructure.

We are also featuring a retrospective article on the 1983 Utah floods and how similar higher-than-normal releases and elevated snowpack could contribute to flooding in 2023. Finally, Tim Brown, Chief of Civil Engineering Services Division #1 in the Technical Service Center, spoke with us about his career, mentorship and retention, increasing communication between designers and O&M staff, and the importance of always learning. Please join us in congratulating Tim on his upcoming retirement at the end of June! And thank you for reading!

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Around O&M

The RO&M Workshop was held in Seattle, Washington, April 11–13, 2023. This seminar is tailored to Reclamation O&M personnel who are responsible for inspecting Reclamation dams and associated facilities. Examining associated facilities helps to lengthen service life, avoid failures, and reduce facility breakdown.

The RO&M Workshop was a great success and had over 100 attendees! The first two days consisted of classroom training, and the third day involved a site visit to Cle Elum Dam, where participants saw construction of a new fish passage facility.



RO&M Workshop Site Visit to Cle Elum Dam and Fish Passage Facility.

The following statistics are based on polling received from attendees during the classroom training:

- 75% of attendees gave Day 1 a 4- or 5-star rating, while 89% rated Day 2 as 4 or 5 stars.
- Popular Day 1 topics were Reservoir Sedimentation Monitoring; Prestressed Concrete Cylinder Pipe Past, Present, and Future; and CARMA 2.0. Day 2 favorites were UAS Capabilities, W61 Lateral Failure, and Dive and Ropes Access Teams.

AMD looks forward to incorporating your feedback into our 2024 RO&M Workshop. We sincerely appreciate all those who took the time to provide feedback and offer suggestions for future workshops. And thank you to all organizers, presenters, and attendees who helped to make the first in-person RO&M Workshop in four years such a success!

Building Inspections

Ben Radchuk, P.E.

Civil Engineer, Facility Operations and Maintenance Group,
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The Bureau of Reclamation (Reclamation) has not been best known historically for its inventory of building assets, as often what comes to mind are the dams, powerplants, pipelines, and canals constructed in the 17 Western States as part of Congressionally authorized projects. Reclamation's Asset Management Division's (AMD) Operations and Maintenance (O&M) Branch is responsible for overseeing the O&M of Reclamation's assets. The O&M Branch conducts several preventative program activities and initiatives covering the agency's infrastructure, including dams, levees, canals, roads, and bridges. Within the last five years especially, AMD has worked on issuing specific guidance for the inspection of buildings so that operating entities may be better equipped to ensure that Reclamation's inventory of over 2,000 buildings and building-like structures continues to provide safe, reliable, and functional use, and that O&M is performed at an acceptable level.

Current Policy and Guidance

Reclamation Manual Directives and Standards (D&S) [FAC 01-04](#), *Review of Operation and Maintenance (RO&M) Program Examination of Associated Facilities (Facilities Other Than High- and Significant-Hazard Potential Dams)*, provides program requirements, procedures, and field guidance for uniform implementation of the periodic reviews/examinations of Reclamation water-related associated facilities including buildings. The D&S incorporates practical elements of Reclamation's library of O&M guidance documents such as the Review of Operation and Maintenance (RO&M) Program Field Examination Guidelines, Guidelines for Safety Evaluation of Mechanical Equipment, and the Canal Operator Manual. The D&S also identifies necessary training to ensure that personnel leading the associated RO&M Program reviews understand principles related to design, construction, O&M, and facility review.

Within the contexts of FAC 01-04, Reclamation's library of field examination guidance documents, and training offered to Reclamation and transferred works O&M staff, it is generally understood and agreed upon by the O&M community that guidance specific to the inspection of buildings is lacking and new guidance is overdue. Guidance and tools for the thorough yet quick assessment of the large inventory of Reclamation-owned buildings is necessary to establish the knowledge base and confidence required to perform field condition assessments by O&M staff and extrapolate meaningful and consistent data from the reviews. The general lack of practical examination guidelines specific to buildings and historical priority given to more mission-critical assets within Reclamation's inventory often lead to building inspections lacking comprehensive reviews or any reviews at all.



Sunnyside Canal Mile 50.35 Turbine House, Sunnyside Valley Irrigation District, Washington.

Recent Efforts

AMD began working with the Reclamation Technical Service Center (TSC) Plant Structures Group in 2019 to develop best practices for performing building inspections and determine a plan for establishing guidance within the framework of the existing RO&M Program. The result was a 2021 Buildings and Structures Condition Assessment Program Report (Report) that outlines specific building systems to be reviewed and introduces a risk-scoring matrix and tool to help identify areas of portfolio risk that might jeopardize Reclamation's mission and its ability to perform necessary functions. In 2023, AMD has been working to further develop the examination guidelines and understand how to implement aspects of the risk tool on a Reclamation-

wide level. Additionally, AMD began working with the TSC to award a building inspection contract in fiscal year (FY) 2023 worth \$600,000 to allow for the inspection of approximately 100 buildings per region in FY 2024 under the scope, guidelines, and risk metrics envisioned by the 2021 Report. During the April 2023 Facilities O&M Team quarterly meeting, it was determined that use of the examination guidance and risk metrics would be assessed during the building inspection contract prior to implementation on a Reclamation-wide level.

Building Condition Assessment Guidelines

Regardless of the timeline for the issuance of Reclamation policy and formal building condition assessment guidelines, the O&M community should be aware of the various building systems and what to consider during current RO&M reviews. This basic knowledge and understanding help bring valuable awareness to the need for a more comprehensive yet holistic approach to field condition assessments of buildings. Building condition assessments are not expected to be technically exhaustive. The Field Examiner should note where additional probing, testing, measuring, or examination is necessary for further investigation of suspect or complex building systems or components. Taken as excerpts from the draft Reclamation Building Condition Assessment Guidelines, the Field Examiner should consider the following building systems:

Site

- Inspect for the serviceability of driveways, steps, walkways, patios, parking areas, and flatwork; retaining walls that could affect the building function; the storm water collection and drainage system; and proper grading and drainage slope, noting any adverse conditions such as erosion, ponding, or moisture intrusion.

Structure

- Observe and describe visual structural components, including foundation, grade slabs, floor structure, wall structure, columns or piers, ceiling structure, lateral force resisting system, and roof structure.
- Report cracking, out-of-plumb alignment, unusual vibration of the flooring system, and excessive deformation, corrosion, or deterioration of the structural members.



Palisades Dam Powerplant, Bonneville County, Idaho.



Hungry Horse Dam Powerplant Roof, Flathead County, Montana.



Umatilla Field Office building HVAC equipment, Hermiston, Oregon.

Building Envelope

- Inspect wall cladding materials, flashing, and trim; eaves, soffits, and fascia where accessible and observable from the ground level or readily accessible balconies or rooftops; and exterior doors and windows.
- Report signs of abnormal or harmful water penetration into the building or signs of abnormal or harmful condensation on building components.

Interior

- Inspect typical finishes such as walls, ceilings, and floors for indications of concealed structural deficiencies, water infiltration, or major damage; the condition and operation of a representative number of windows and doors; and steps, stairways, balconies, and the associated railings, guards, and handrails for unsafe conditions.

Roofing

- Traverse the roof to inspect it, if possible.
- Inspect the roof covering or membrane; the roof parapets; the gutters and downspouts; and the vents, flashings, skylights, and other roof penetrations.
- Report areas of inadequate slope, drainage, significant ponding, roof leaks, or the need for material repairs.

Plumbing

- Inspect the interior water supply and distribution system, including piping materials, supports, and insulation and fixtures and faucets, noting functional flow, leaks and cross connections; the interior drain, waste, and vent system, including traps, drain, waste, and vent piping, piping supports, and pipe insulation, noting leaks and functional drainage; and the water heating equipment including combustion air, venting, connections, and energy-source supply systems.

Heating, Ventilation, and Air Conditioning (HVAC)

- Describe the location, inventory, and type of heating and cooling systems, such as furnaces, cooling towers, chillers, package units, split systems, air handlers, and thermal storage equipment.
- Inspect permanently installed heating and cooling equipment and distribution systems, using normal operating controls.
- Verify that routine maintenance is performed on equipment and report any systems that do not operate.

Electrical

- Identify the type of primary service, whether overhead service drop or underground service lateral; transformers, meters, emergency generators, or other such equipment or systems; and the location of the main service entry and distribution panelboards.
- Where visible, report wiring methods that are not consistent with generally established practices such as terminations; multiple tapping of hot and neutral conductors; open junction boxes or open wiring splices; and damaged, scorched, burned, or melted conductor insulation.

As stewards of Reclamation’s infrastructure assets, including buildings, it is our collective responsibility to maintain a preventive maintenance philosophy to identify deficiencies and issues at an early stage, and through recommended actions, avoid more significant concerns such as service interruptions, structural failures, and extraordinary O&M activities. By addressing such concerns, the service lives of building systems can be lengthened, and the need for significant repairs by Reclamation and transferred works entities can also be avoided.

CARMA 2.0

Anne Antonelli

Maximo (CARMA) Program Analyst, Infrastructure Investment and Management Branch, Asset Management Division

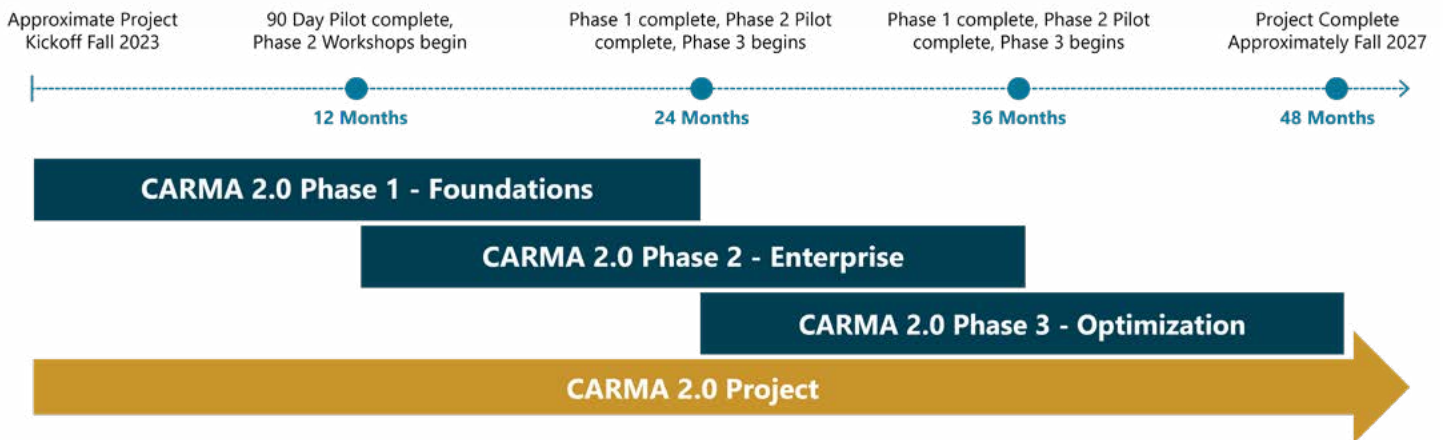
It was a privilege to be able to present at the Review of Operation and Maintenance Workshop this past April. My presentation followed those about the Federal Real Property Profile, Enterprise Asset Registry, and one on Facility Maintenance that allowed me to highlight how the Capital Asset and Resource Management Application (CARMA) fits into the bigger picture of everything we do at Bureau of Reclamation (Reclamation) facilities.

CARMA is Reclamation’s customized deployment of the IBM Maximo Enterprise Asset Management software system. Our current CARMA system, now referred to as CARMA 1.0, is primarily used by power facilities for equipment maintenance at powerplants. Over one million work orders are processed every year at more than 50 Reclamation facilities in our CARMA 1.0 system. It is how we report our maintenance efforts for North American Electric Reliability Corporation/Western Electricity Coordinating Council/Critical Infrastructure Protection compliance, provide information into the HydroAMP site, provide deferred and extraordinary maintenance needs to the Capital Investment and Repair Needs database, and even how we track

the recommendations created in the Dam Safety Information System and Power Review Information System reports after our facility reviews.

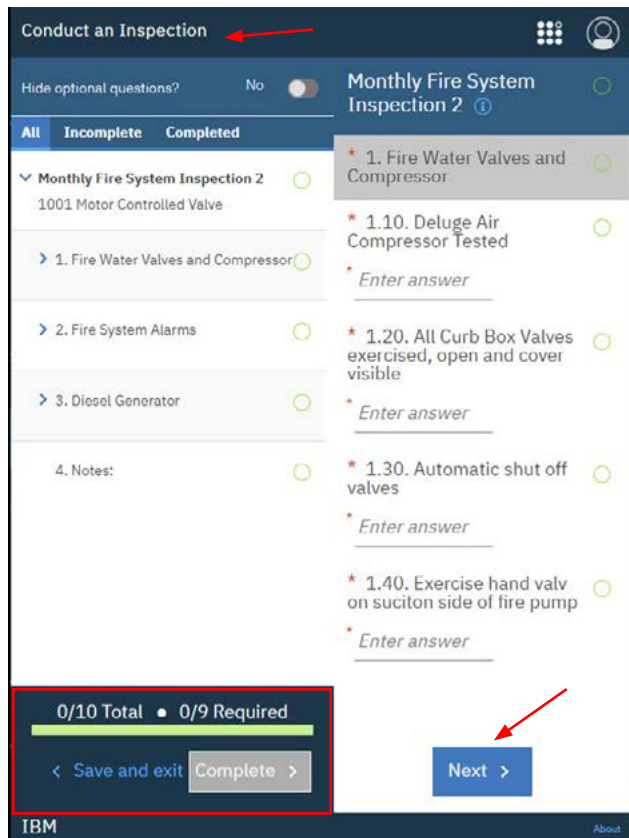
In addition to the power facilities, we have several non-power facilities like Klamath Basin, Yuma Desalting Plant, the Lower Colorado Basin Regional Office Facility Maintenance Group, and others who also use CARMA 1.0 to manage all types of condition assessments/inspections, recommendations, and maintenance of buildings, roads, parking lots, and non-powerplant equipment. CARMA 1.0 is currently based off IBM Maximo version 7.6.1.0.

In the fall of 2023, Reclamation will begin a four-year project to re-implement a new and upgraded version of Maximo called CARMA 2.0 (see timeline below). This new installation will be the first Reclamation-wide software system installed in the Reclamation cloud hosting environment. It will bring Reclamation up to the IBM Maximo Application Suite (MAS8.x) software version (the current version is 8.10). It will standardize how the facilities are built out within the Maximo location and asset hierarchy that drives all reporting



48-month timeline for CARMA 2.0’s three phases of development.

functionality in the tool. Additionally, it will standardize the way Reclamation uses all the applications within the software by utilizing IBM best practices and the out-of-the-box functionality and features of the newest version of the software.



Conduct Monthly Fire System Inspection 2 example window.

These are big goals, but our current CARMA users are excited to be heading down this path. For years, our CARMA power users have been requesting new functionality within our CARMA system. In addition, groups like the Technical Service Center (TSC) have requested to be able to track the maintenance and calibration of their equipment and tools within the CARMA system. However, due to the way the core data was architected and several customizations within our system, we were not able to provide these new features. The re-architecture of the core data and the standardization of utilizing out-of-the-box functionality and IBM Best Practices for our processes in our CARMA 2.0 deployment will change all of that. Reclamation will be able to move into using all features within this world-class enterprise asset management tool.

CARMA 2.0 will continue to send data back and forth between the Department of the Interior Financial and Business Management System and

Quicktime systems. In addition, the project will include an integration between CARMA and the Enterprise Asset Registry, providing the CARMA users Geographic Information System functionality and linking our asset classes to the actual equipment, condition assessments, and maintenance performed on them. The new versions of IBM Maximo include easy-to-build electronic inspection forms for use on mobile devices (see image on left); add-on IBM tools built specifically to work with Maximo to monitor, predict, and prevent equipment breakdowns using AI technology; and all the data our equipment already puts out.

During phase two of the CARMA 2.0 project, we will be showing Water, Lands, Dam Safety, TSC, and others how CARMA can now be used by them in support of their facility review, condition assessment, and maintenance needs. All Reclamation groups who need an asset management system will have the opportunity to be added to the CARMA 2.0 system.

For questions about CARMA 1.0 or CARMA 2.0, Reclamation staff can check out our SharePoint site at: <https://teamssp.bor.doi.net/carmawebsite/SitePages/Home.aspx> and/or attend monthly CARMA User Group meetings on the third Wednesday of every month from 2:00 to 3:00 pm Mountain Time. Finally, we have an email address specifically for anyone to ask questions about CARMA. Please email us at carmahelp@usbr.gov.



Members of CARMA team on a site visit to Hoover Dam.

Recommendation Management Information System

James Sinkovic

Program Specialist, Budget and Administrative Services Office, Dam Safety and Infrastructure

Like many of the Bureau of Reclamation's (Reclamation) assets and facilities, the Sumner Radial Gates at Lake Sumner, New Mexico, have seen quite a few recommendations over the years of their existence. From a maintenance recommendation to recoat the gates in 1993 to a major extraordinary maintenance recommendation for a complete rehabilitation of the three spillway radial gates in 2018 and now a full replacement of the gates, the Albuquerque Area Office (AAO) staff have been able to track these recommendations over time, even as staff have continued to change over the years. AAO's success at tracking its various recommendations has been due in no small part to its use of a recommendation management system. Such a system is essential to ensure the necessary maintenance is done on Reclamation assets so that they continue to stay in good working condition.

Recommendation Management Information System

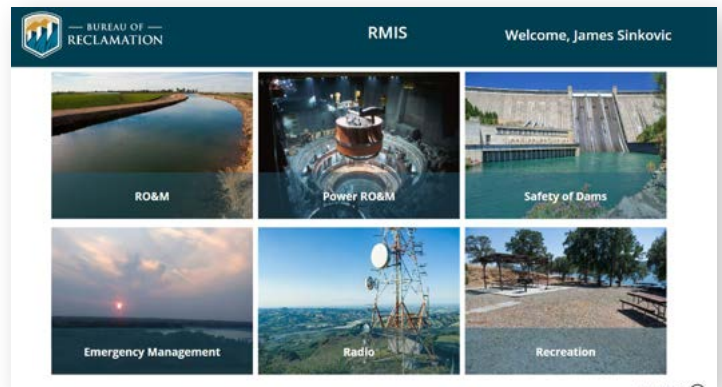
The Recommendation Management Information System (RMIS) is the latest version of asset-related recommendation management at Reclamation. The Asset Management Division (AMD) has been working in conjunction with the Information Resources Office to develop the app using the Power Platform. The app will be used to track recommendation information including the ability to write new recommendations and add status updates to existing recommendations. This may sound familiar to users of the Dam Safety Information System (DSIS) or the Power Review Information System (PRIS). RMIS will be replacing both applications as a major upgrade.

The App Transition

Some might say that DSIS and PRIS are antiquated systems. In reality, the switch is due to a larger effort by AMD to have all asset-related systems use a standardized list of assets. RMIS is being developed with the idea to use asset and facility information from the Enterprise Asset Registry to accomplish this goal. This will enable more accurate reporting and leverage current systems.



Sumner Dam, Sumner Lake, New Mexico. Inset image is close-up of rusted radial gates.



Recommendation Management Information System Landing Page.

The upgrade will include a new interface using the Power Platform that will enable users to interact with the recommendation data without needing to be on VPN, a tie into the Enterprise Asset Registry to ensure standardized asset and facility names, an expanded set of program modules (starting with Review of Operation and Maintenance (RO&M), Power RO&M, Safety of Dams, Emergency Management, Radio Communications, and Recreation), and a suite of data fields that cuts across the modules for a more comprehensive and integrated approach to recommendation-related reports viewed via PowerBI. The major advantage to shifting to the Power Platform is the ability to connect with other systems (especially authoritative sources such as the

Enterprise Asset Registry).

Use Cases

Any staff who uses DSIS or PRIS will most likely be using RMIS to input their asset- and facility-related recommendations once RMIS is released. Future potential users include any staff throughout Reclamation who input and track recommendation data for Reclamation assets (dams, bridges, radio communication systems, water conveyance systems, pumping plants, etc.). Note that the PowerApp portion will be for staff who need to add in a new recommendation or modify an existing entry by submitting a status update. The PowerBI portion will be for any users who need to see the recommendation data in the form of dashboards and reports.

Projected Timeline

Although the app is still in development, AMD is currently planning to pilot the RO&M module with the Upper Colorado Basin (UCB) Region at the end of fiscal year (FY) 2023. After several months of the pilot, AMD will survey the initial users to see what worked well and what didn't work so well. With many of the modules having similar fields and

capabilities, any issues discovered during the test phase will most likely apply to all modules and will be addressed at the same time. While there is no plan to pilot any of the other modules at this time, we do plan to roll out the RO&M module with the remaining regions first followed by the remaining modules for use gradually over FY 2024 starting in the second quarter.

Along with the continued development of the app and associated reports, AMD will work on migrating existing recommendations from DSIS and PRIS into RMIS. This will be done one region at a time starting with UCB. During each migration effort for a region, there will be a black out period when the region won't be able to use either system until all data can be migrated.

Conclusion

The goal of implementing this system is that RMIS can provide more transparency for our recommendations through a more user-friendly app and a suite of reports and dashboards so that maintenance projects like those being performed on the Sumner Radial Gates can continue to be tracked and accurately reported on.

The screenshot shows a web form titled "Sumner Dam" with the sub-header "Add a new recommendation". The form is part of the "BUREAU OF RECLAMATION" system. It contains several dropdown menus and text input fields. The fields are: Rec Year (2023), Rec Category (2), Rec Letter (A), Status (Incomplete), Rec Type (Maintenance), Rec Classification (Concrete), Rec Source (Periodic Facility Review (PFR)), Rec Source Date (5/5/2023), Responsible Office, Cost Level, Current Cost Range, Current Scheduled Completion Date, CARMA Work Order, and a large text area for the Recommendation. The text area contains the placeholder text "This is a test. Your recommendation goes here...".

Adding a new recommendation in RMIS.



Recommendation Update *

[Empty text box for recommendation update]

Status Update

ROM Status : Incomplete	Status Source : Special Inspection	Status Source Date : 5/6/2023 12:00 AM
Cost Level : Preliminary	Completion Cost: \$10,001 - \$25,000	Completion Date : 9/30/2023 12:00 AM
Status Update : This is a test. Update #1		
Updated By : James Sinkovic	Date Updated : 5/5/2023 6:30 AM	
ROM Status : Incomplete	Status Source : Periodic Facility Review (PFR)	Status Source Date : 5/5/2023 12:00 AM
Cost Level :	Completion Cost:	Completion Date :
Status Update : This is a test. Your recommendation goes here...		
Updated By : James Sinkovic	Date Updated : 5/5/2023 6:28 AM	

Image

There is no file.
Upload file

Modified On

5/5/2023 6:30 AM

Modified By

James Sinkovic

Adding a recommendation status in RMIS.



Search Inventory... [Search icon]

Region	Area Office	Project	Asset Class	Asset Name	CRID	O&M Responsibility	Primary Operating Entity	Reset	
Region	Area Office	Project	Asset Class	Asset Name	CRID	O&M Responsibility	Primary Operating Entity	Add	View
LCB	Yuma Area Office	0050-Gila Project	Water Conveyance	A Canal	41	Transferred	Yuma Mesa Irrigation & Drainage District	+	[View]
LCB	Yuma Area Office	0050-Gila Project	Water Conveyance	A Canal	106	Transferred	Yuma Mesa Irrigation & Drainage District	+	[View]
LCB	Yuma Area Office	0050-Gila Project	Water Conveyance	A Canal	285	Transferred	Yuma Mesa Irrigation & Drainage District	+	[View]
LCB	Yuma Area Office	0050-Gila Project	Water Conveyance	A Canal	20	Transferred	Yuma Mesa Irrigation & Drainage District	+	[View]
LCB	Yuma Area Office	0050-Gila Project	Water Conveyance	A Canal	40	Transferred	Yuma Mesa Irrigation & Drainage District	+	[View]
CGB	Klamath Basin Area Office	0012-Klamath Project	Water Conveyance	A-3 Lateral	107	Transferred		+	[View]
CPN	Columbia Cascades Area Office	0415-Rogue River Basin Project - Talent Division	Dams	Agate Dam		Transferred	Rogue River Valley Irrigation District	+	[View]
CPN	Columbia Cascades Area Office	0415-Rogue River Basin Project - Talent Division	Reservoirs	Agate Reservoir			Rogue River Valley Irrigation District	+	[View]
CPN	Snake River Area Office	0126-Vale Project	Dams	Agency Valley Dam		Transferred	Vale Oregon Irrigation District	+	[View]
MB/ART	Wyoming Area Office	0144-Kendrick Project	Dams	Alcova Dam		Reserved	Bureau of Reclamation	+	[View]
MB/ART	Wyoming Area Office	0144-Kendrick Project	Hydropower	Alcova Powerplant		Reserved	Bureau of Reclamation	+	[View]
MB/ART	Wyoming Area Office	0144-Kendrick Project	Reservoirs	Alcova Reservoir			Bureau of Reclamation	+	[View]
UCB	Western Colorado Area Office	0270-Fruitgrowers Dam Project	Dams	Alfalfa Ditch Diversion Dam		Transferred	Orchard City Irrigation District	+	[View]

RO&M module filter screen.

The 3DR Solo operated at Upper Stillwater Dam in Utah (credit David Salas).



What Can Reclamation Employees Do with Uncrewed Aerial Systems?

Matthew Klein, P.E., Ph.D.

Civil Engineer, Concrete and Structural Laboratory, Technical Service Center
Uncrewed Aerial Systems Lead Instructor, Department of the Interior

Did you know that any Bureau of Reclamation (Reclamation) employee can become certified to operate a drone or Uncrewed Aerial System (UAS)? Did you know that drones can be purchased from the Department of the Interior's (DOI) Office of Aviation Services (OAS)? Do you know that in addition to capturing unique and breathtaking aerial photos and videos, drones can be used to collect highly accurate and detailed scientific and engineering data and documentation? And finally, did you know that there are many drone operators already within Reclamation who may provide a more efficient way to complete your project? This article will respond to these questions as well as present several use cases where UASs have already been used by Reclamation for some of these purposes.

First, it is necessary to explain the organization of aviation within Reclamation and DOI with respect to drones. Drones are considered by the Federal Aviation Administration (FAA) as aircraft, and the FAA is the first organization with oversight responsibility for their operation. For commercial use of a drone, the operator must pass the FAA Part 107 Knowledge Test at a FAA-approved Knowledge Testing Center. But, for operation

within Reclamation, that is not all. The prospective operator must coordinate with their supervisor and Reclamation's Aviation Management Specialist (AMS) to be nominated as a DOI Remote Pilot candidate (currently, Reclamation's AMS is Natalie Adams, nadams@usbr.gov). Once that nomination is approved, both the candidate *and* their supervisor must meet the appropriate training requirements as outlined in Operational Procedures Memorandum – 04, DOI Aviation User Training Program (OPM-04). The DOI Remote Pilot candidate will then complete the A-450 Basic Remote Pilot course, which is a 32-hour classroom and hands-on instruction including both a knowledge and performance evaluation by an OAS inspector. Remote pilots have an ongoing responsibility to maintain flight proficiency and currency as well.

The next step is to obtain a DOI OAS-approved drone, though this step can be completed alongside the Remote Pilot training. All drone requests are coordinated through Reclamation's AMS and are routed through OAS and the Interior Business Center, Acquisitions Services Directorate, using the DOI UAS Acquisition Request Form, OAS-13U. As tempting as it may be, we are not allowed to

purchase a drone using our DOI purchase cards. Information about approved drones can be obtained by contacting Reclamation's AMS. It is important to note that a Remote Pilot is required to be trained on each different make and model of UAS that they intend to operate.

More details about training and UAS acquisition requirements can be found in OPM-11, Reclamation's National Aviation Management Plan, and a special DOI Talent information course: Aviation 101.

It is important to note that even if an employee has access to a UAS and is authorized to operate it, UAS operations may be complex and require experienced operators to complete the mission objectives and ensure that the data collected is meeting the project requirements. There are many experienced UAS operators throughout Reclamation who can either consult on your drone project or even complete the project for you. These drone pilots usually have experience with both drone operations and processing and analyzing drone data to meet your project requirements. Reclamation's AMS can assist with connecting you to one of these DOI Remote Pilots.

One of the most common uses for UAS is to capture aerial images or videos for a unique perspective of the subject. Since many of Reclamation's facilities are either large in height or cover a large area, getting an aerial view of the facility helps to describe features within the facility. These aerial images or videos can be used in public relations communications or for general discussions about the facility. They can be used to document changes in the facility such as those that occur during construction or repairs or during special water operations and events.

Since drones usually have the ability to capture high quality digital imagery and can be preprogrammed to follow specific flight paths, the UAS can be used to collect data for photogrammetric processing. Photogrammetry can be used to create 3D information about the subject by processing overlapping digital images into 3D models. These models can be highly accurate and can be used for a variety of applications including topographic maps, high-resolution large-format orthophotos, difference modeling for change detection, 3D printing, computer-aided design (CAD) models and drawings, surveying, biological mapping, and much more.

Because the UAS can generate such high-resolution optical imagery, the data products can be used to enhance inspections by allowing measurements and identifying defects within the imagery. Reclamation's Technical Service Center is working to develop an automatic crack detection system to find and detect cracks from drone data using machine learning.



Aaron Murphy and Todd Gaston conducting proficiency flights at the Denver Federal Center.



Matthew Klein and Nate Bradley collecting sedimentation data at the Truckee River in Nevada (credit Sara Horgen).

Another application of the photogrammetric 3D modeling is the ability to use the data for updated reservoir area-capacity curves if the reservoir is empty at any time. The photogrammetric data is processed into high-resolution digital elevation models and can be used to provide volumetric analysis.

In addition to being equipped with high quality cameras, UAS can also carry many other payloads. These payloads include thermal infrared cameras, multi- and hyper-spectral cameras, ground penetrating radar, acoustic sensors, gas detection sensors, and Light Detection and Ranging (LiDAR) scanners among many other payloads.

Drones have been successfully operated at dozens of Reclamation facilities including Elephant Butte Dam, Upper Stillwater Dam, East Canyon Dam, Hoover Dam, Folsom Dam, and Brock Reservoir. Most Reclamation employees usually have their own unique application or idea for drone operations, and if you think you have an idea or application, maybe it is time to have a conversation with your supervisor and Reclamation's AMS about scheduling UAS services from one of our DOI Remote Pilots or to talk about becoming a DOI Remote Pilot yourself. The sky is literally limitless!

Jakeb Prickett and Matthew Klein collecting inspection data at Elephant Butte Dam in New Mexico (credit Grace Yukawa).



State Street in Salt Lake City, Utah, during 1983 flooding. Sandbags were added to the street curbs to divert flood flows.

Retrospective: Flooding in Utah in 1983 (and Today)

Paul Craig, P.E.

Lead Examiner, Geotechnical Design Group 1, Technical Service Center

I grew up in Provo, Utah, in the 80s and 90s and loved camping and fishing with my family in the Wasatch Mountains. On some level, that is a big part of why I love my job so much. As part of the Bureau of Reclamation's (Reclamation) Comprehensive Reviews, I get the opportunity to go back and inspect a lot of the dams that I fished off and camped at as a kid. It certainly has brought back many fond memories for me.

This year, I've had other memories from my childhood get stirred up by work-related activities. We have gone from years of historic droughts in the West, to this year having dozens of back-to-back

atmospheric river events that have, in part, led to above average and even historic snowpack totals. Historically, when we have above average snowpack, it typically results in some level of flooding from higher-than-normal releases and snowmelt runoff. In Utah, 1983 was one of these years when flooding occurred due to an abnormally large snowpack. I started seeing news articles earlier this year about the historic 1983 flooding in Utah, drawing a comparison to the snowpack this year and posing the question if similar flooding would occur.

I was 7 years old in 1983, and although I am not able to remember all that much from that year, I do

have several distinct memories of the flooding. I remember my dad taking my brother and I to help fill sandbags for our community. As a dad of two boys myself, I'm fairly certain that I wasn't much help filling those sandbags, but I do remember feeling good about what we were doing to help our community. I also remember my parents, teachers, and other adults stressing the importance of staying away from rivers, streams, and canals. In connection with that memory, I do remember still wading and playing in our neighbors' flooded irrigation ditch with my brother and friends, having the time of my life. My final memory of the flooding that year was seeing videos and photos on the local news about the successful efforts that were made to sandbag and channel and divert flood flows from City Creek down State Street in Salt Lake City.



8- or 9-year-old Paul fishing at an unknown reservoir in Utah.

As for whether or not we will have similar extreme flooding this year in the communities that we all serve, it largely depends on how fast temperatures heat up in May and June. By mid-June, we will have a better handle on this question, as it will have mostly played out. Trying to predict future temperatures, runoff, and ultimately flooding gives a deeper appreciation for the water managers,

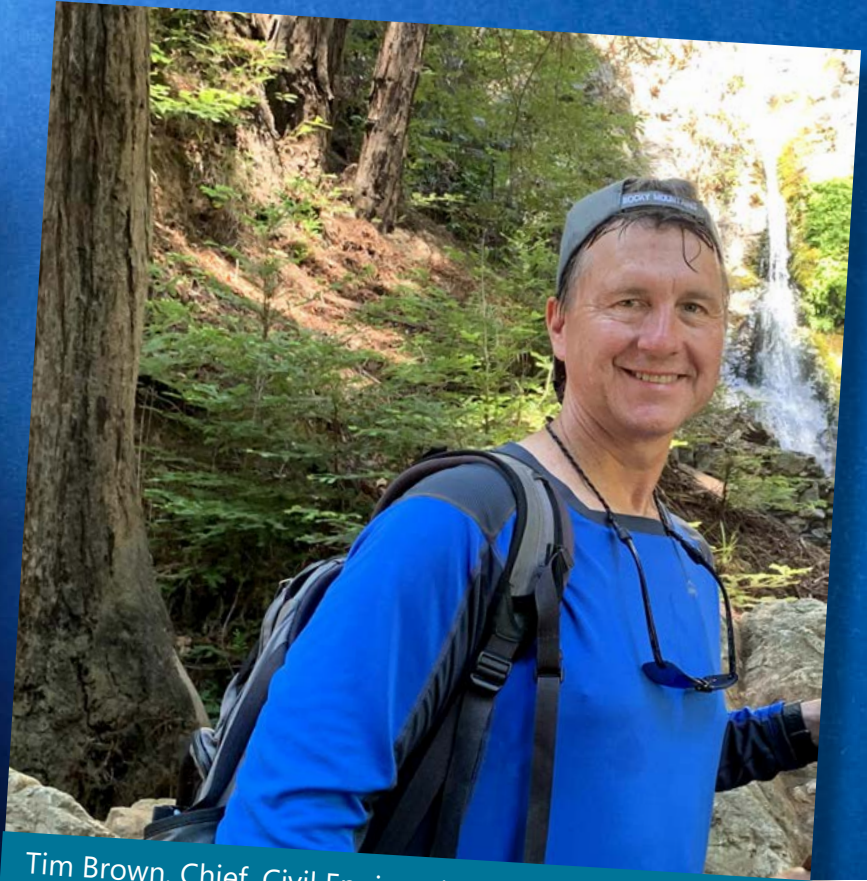
hydrologic engineers, and others who do such a great job gathering the right data to make the tough decisions of how much water to release and when to release it. I made efforts to speak with those in our operations and maintenance (O&M) community who work on the front lines to get a better perspective about what preparations have been made this year in anticipation of potential high runoff flooding. Ironically, as I tried to connect with several of them, I quickly realized that they were incredibly busy with preparing for and dealing with issues related to the high runoff.

Whenever I give trainings on inspecting dams for Classroom Dam Operator Trainings or for the Safety Evaluation of Existing Dams Seminar, I like to pose the trick question, "When is the best time to inspect a dam – when it's full or when it's empty?" Of course, the correct answer is both. You want to inspect it when it is empty because you can see more of the upstream face and potentially even the upstream toe. You also want to inspect it when it is full because it is being loaded and you can see how the dam performs under that load. A good number of our dams haven't been full for several years due to drought. This year will be a great year to inspect them under higher reservoir loads. Additionally, our spillways will likely be used and exercised to a greater degree this year. This gives us an opportunity to do thorough inspections looking for any damage that may have occurred.

Ultimately, it is likely there will be several issues due to high runoff and flooding this year. I hope that we as an O&M community take time after everything settles down and have the important discussions within our own groups and organizations about what went well and what we would do differently next time. It is important to not only discuss but to also document these lessons learned and share them with others in the O&M community.



Spillway chute at Lost Creek Dam in Utah – 2022 Comprehensive Review Exam.



Tim Brown, Chief, Civil Engineering Services Division #1, Technical Service Center.

Q&A

Tim Brown, P.E.

Chief, Civil Engineering Services Division #1, Technical Service Center

Tim Brown, P.E. is one of two division chiefs for Civil Engineering Services in the Bureau of Reclamation's (Reclamation) Technical Service Center (TSC). After over 28 years at Reclamation, Tim is retiring at the end of June 2023. Here he discusses the range of work experiences he had before becoming Division Chief, staff mentorship and retention, increasing communication between designers and operations and maintenance (O&M) staff, and the importance of always learning and being proactive.

Can you provide a high-level summary of your work before joining Reclamation?

I joined Reclamation in 1989. I was hired out of college from the University of Arizona. I didn't

have a lot of design experience. I did a couple of internships with the Pima County Department of Transportation, down near Tucson. But I mostly worked food service stuff. For the internship with Pima County, I was a striper, so we would do all those yellow stripes on the highway. We also did intersections. It was a bit of design work, since you had layout and measuring, but it was mostly physical labor. Tucson in the summer. Striping on asphalt, and it's 110 degrees.

What made you want to work for Reclamation?

When I was a young engineer, I knew I wanted to do design work. How you get from what you want to do to what you actually do wasn't as clear to me. What attracted me to Reclamation was the rotation

program. A rotation program where the agency would pay you, train you, and put that effort into their employees was attractive.

Can you describe notable roles you've held since joining Reclamation?

One of my early rotations was a field assignment to New Waddell Dam and Pump-Generating (PG) Station. They were building the Central Arizona Project at the time, and I got to do a three-month rotation at New Waddell Dam. I got to see the construction of the PG plant, dam foundation grouting, and outlet works tunnel lining. I met several seasoned construction folks that taught me the ropes.

As for different positions I have held, I got to do a five-month detail at Hoover Dam when they were constructing the visitor center. We were a bunch of young engineers trying to work through construction submittals and a host of other issues. It was one of the best learning opportunities I had. I'm most proud of becoming Division Chief. And all my group manager positions. Leadership roles

are something you don't take lightly. I've also been on several committees, Reclamation's Design and Construction Coordination Team (RDCCT), and a member of the Interagency Committee on Seismic Safety in Construction (ICSSC).

Have you always worked for Reclamation?

I went back and forth between Reclamation and private industry. One of my early rotations was to Denver. I saw the type of work they were doing at the TSC, and I wanted to get a full-time position. I was eventually hired in the Plant Structures Branch. In the early-1990s, Reclamation went through a reduction in force. I was assigned to the Instrumentation Group. It was a position I was grateful for, but I wasn't in love with it. So, I left Reclamation and went into private industry for six years. I started out with a small architectural-engineering (A-E) firm called Martin Design. I was the 13th employee. I had come from an industrial background to doing residential design. The structural engineering concepts are the same, but the approach is way different. After four years at Martin Design, I took a management position with



Tim Brown and David Kresin, Manager, Plant Structures, Technical Service Center. Grand Coulee Dam, Washington.



Gillans Incorporated. Gillans was a full-service A-E firm. They had civil engineers, structural engineers, surveyors, architects, electricals, and mechanicals.

And then I got a call from John Baals at Reclamation, and he asked if I was considering ever coming back. I was working 60-hour weeks as a manager, and it was an opportunity to go back to technical work. In 2001, I was hired back with Reclamation. I've been here ever since.

Who have been your mentors?

I've been working with Dick LaFond for years. I watched him as a senior engineer, as a technical specialist, as a group manager, and as a division chief. He is the type of person that mentors by example. One of the strongest mentors I had was John Baals. He was the Seismic Safety Manager for Reclamation. The first three months of being back at Reclamation, he took time to sit down with me and go through all the steps in the program. He would bring me into meetings when I didn't have a role, but he wanted me to see how those conversations were held. He taught me how to plan, how to communicate, how to write.

When I became a group manager, Al Bernstein showed me how to get organized and stay organized.

Larry Hieb was a senior designer in the Plant Structures Branch when I was on rotation. Larry took me under his wing and showed me how to be a designer. How to do drafting standards, read specifications, read drawings. He was exactly what I needed at the time. Fortunately for me, Reclamation has a culture of training young folks so that they can carry on the knowledge.

How would you describe your role as Chief of Civil Engineering Services Division #1 in the TSC?

I have five group managers below me. My role is to provide the support they need to do their job. And that support comes at different levels. Project work. Personnel issues. Resource issues. How to improve workflows. Usually, a division chief doesn't get involved when things are going well. But when things are tough, that's when we get involved.

The other role division chiefs play is that they have to work well with the rest of the leadership team. I'm one of six division chiefs, with Dick LaFond as our director. We each play to our strengths and provide support for the organization as a whole. Division Chief is a leadership role. You've got to have vision. You have to lead.

What are the biggest challenges Civil Engineering Services faces?

Number one is workload management. It's been going on for 5-10 years. The difference now is there's so much Bipartisan Infrastructure Law (BIL) and drought relief funding. The TSC can't handle the amount of work that's coming in. We have to do a

better job managing that workload. How to bring in work that is in our wheelhouse and not overload folks. It's difficult. There are so many variables. Projects change, funding changes, needs change.

Another thing, and it's a TSC- and Reclamation-wide issue, is trying to retain and recruit top talent. Private industry is paying quite a bit for engineers.



Tim Brown and Benjamin Brown. Fox Hollow Golf Course, Colorado.

We're losing some of our senior staff, and as a government agency, it's hard to just give staff more money. But we do have great benefits, good work-life balance, and we do fun stuff. We're trying to grow the TSC by bringing in talent and keeping what we have.

Could you share some best practices for overseeing five different groups and coordinating Civil Engineering Services across the TSC?

I was fortunate in that I have worked in four of the five groups in my division. At the division level, a lot of our projects only involve folks from our division. But on some of the bigger projects, our workload spans divisions. We do a lot of work with the Electrical and Mechanical Engineering Division, especially if we're designing a pumping plant or water treatment plant. Good coordination and communication are key.

We have a straightforward design process, but we're also making adjustments on the fly at the division level. Division chiefs meet once a month to coordinate project milestones. We work with groups that are struggling to meet schedules. We try to coordinate resources.

Can you share a success story or two about projects you've been involved with?

I'm most proud of the Building Seismic Safety Program. We started looking at seismic vulnerabilities in Reclamation's building inventory. We eventually worked our way through all our evaluations, and worked ourselves out of a job. That program was successful in that we identified risk – seismic vulnerabilities, and then we mitigated them. The three notable buildings we did seismic mitigations on were the Provo Area Office building, Boulder City Admin and Annex buildings, and the Yuma Area Office building.

Another significant project I worked on was the upgrades to the Truckee Canal. It had a failure in 2008 and flooded the town of Fernley. That was a wakeup call for Reclamation on the issue of urban canals. We developed and identified the risks and then went to feasibility. In the planning phase, we used the risk analysis to limit the extent of the migration to save costs. Thanks to funding through BIL we completed final designs and are now in construction.

How does your work intersect with O&M? Do you have suggestions for successful O&M of facilities?

Designers and O&M folks don't interact much. If you design something and it doesn't work, a lot of times, the feedback doesn't get back to designers. Reclamation can do better at that. Like the O&M workshops. Designers don't participate much in those, and they probably should. There are a lot of interactions with O&M that designers could learn from.

Throughout my career, I've been involved in O&M. However, that is not the norm. Designers don't usually get involved until something fails, like with the Truckee Canal. Designers see what the problem is and then try to find a solution. Asset managers do their inventory, figure out how Reclamation manages inventories, and then work with O&M and Asset Management to improve that data and identify issues and try to fix them. We have the same goals; we just have different approaches to the solution that are not always coordinated. Having a better understanding of each other's needs would help.

What advice can you share for those starting careers in Reclamation?

My number one advice is to keep learning. If you're in a learning environment, you're growing. Number two is that, in Reclamation specifically, you've got to know the people. Who they are and what they do. At some point, you're going to need something, and you'll know who exactly to go to. Developing those relationships is key. My last advice is to understand your short- and long-term goals. Make decisions based on those goals. Take charge. Be proactive.

What are you most looking forward to with your retirement?

More free time. I love to travel. Being able to take a trip and not worry about what's going on at work. Not taking your phone on vacation. All that stuff. Spending time with my family. I have grandkids, so taking care of them. And equally important, improving my golf game.

Updates & Due Dates

Spring Trainings

Spring 2023 was a busy season of training and workshops for Dam Safety and Infrastructure. The following trainings were organized, fully or in part, by Directorate personnel:

Review of Operation and Maintenance Workshop

April 11-13, 2023, Seattle, Washington

- Tailored to operations and maintenance personnel and inspectors responsible for Bureau of Reclamation dams and associated facilities.

Safety Evaluation of Existing Dams Seminar

May 1-5, 2023, Lakewood, Colorado

- Provides information and instruction in dam safety surveillance, including review of pertinent records, visual examination, and monitoring of instrumentation.

Land Resources Training

May 8-12, 2023, Boise, Idaho

- Covers the Land Management and Realty, Recreation Management, and Wildland Fire Management Programs.

Department of the Interior Dam Safety Training

May 16-18, 2023, Johnson City, Tennessee

- Enables attendees to implement best practices that allow their agencies to effectively and efficiently reduce risks posed by Department of the Interior dams.

Water Rights Information Management System

The Water Rights Information Management System (WRIMS) Team met with Upper Colorado Basin Region (UCB) water rights subject matter experts May 16-18, 2023, in Salt Lake City, Utah. The purpose of the meeting was to discuss and upload UCB's water rights inventory. The meeting consisted of a walkthrough of WRIMS, the UCB

inventory, and the data management processes for validation and verification. The team successfully identified a total of 818 water rights records and uploaded the information into WRIMS.



Aging Infrastructure Account

Pub. L. 116-260 added a new subsection to Pub. L. 111-11 (43 USC 510b(d)), creating the Aging Infrastructure Account (AIA) “to provide funds to and provide for the extended repayment of funds by” eligible applicants. Eligible applicants are transferred works operating entities and project beneficiaries responsible for reimbursable Operation, Maintenance, and Replacement costs. Once the applications are approved by the Secretary and reported to Congress, applicants may enter repayment contracts to receive aging infrastructure funding allocations to complete extraordinary maintenance (XM) work on Reclamation-owned assets.



Benefits

Because funding awards from the AIA are repaid into it, using the AIA for present XM needs helps ensure future funding. Congress appropriated \$3.2 billion to the AIA to be made available through the application process over a 5-year period. \$680 million will be made available in the fiscal year (FY) 2024 application cycle. This unprecedented investment of Federal funding is an opportunity for operators to apply for funds for aging infrastructure and extended repayment when there are few alternative sources of funding.



Key Dates

The FY 2024 application period opens October 2, 2023, and closes on December 1, 2023. Please work with a Reclamation regional representative to apply.

For future application planning, the fourth application period, for FY 2025, is anticipated to open summer 2024. More information will follow from the Asset Management Division in spring 2024.



Fish Passage Facility, Cle Elum Dam, Yakima Project, Washington, as seen at the April 2023 Review of Operation and Maintenance Workshop.

