



Via U.S. Certified Mail & Email (grandjury@marincounty.org)

September 11, 2023

The Honorable Judge Kelly V. Simmons
Marin County Superior Court
P.O. Box 4988
San Rafael, CA 94913-4988

Rod Kerr, Foreperson
Marin County Civil Grand Jury
3501 Civic Center Drive, Room #275
San Rafael, CA 94903

Re: 2022-2023 Marin County Civil Grand Jury Report- “Dam and Reservoir Safety: Water May Save Us – Water May Drown Us”

Honorable Judge Simmons and Foreperson Kerr:

Pursuant to Penal Code Section 933.05, below please find the Marin Municipal Water District’s (District) responses to the findings and recommendations set forth in the 2022-2023 Marin County Civil Grand Jury’s report entitled, “Dam and Reservoir Safety: Water May Save Us – Water May Drown Us”. The District appreciates the effort of the 2022-2023 Marin County Civil Grand Jury in developing this report as well as the opportunity to provide a response.

I. Responses to Findings

F1. Climate change is increasing the atmospheric rivers’ strength and frequency which impacts communities across Marin County. Failure to include and recognize these growing threats underestimates current dam safety risks and possible preventive strategies.

The District partially disagrees with this finding.

The Marin Municipal Water District (MMWD) agrees that climate change is having an effect on the strength and frequency of weather events, including the larger storm events that are referred to as atmospheric rivers. MMWD staff have been actively participating in webinars and updates from the California-Nevada Drought Early Warning System for the last few years to better understand the timing and severity of these events. In addition, as a member of the Sonoma County Water Agency’s Technical Advisory Committee, MMWD is very familiar with atmospheric river forecasting and Forecast Informed Reservoir Operations (FIRO). MMWD is not aware, however, of any published scientific findings that the atmospheric river events associated with climate change pose a threat to dam safety. In terms of preventative strategies,

MMWD is currently performing spillway condition and capacity assessments related to atmospheric river events to ensure that MMWD facilities are adequately sized to accommodate the potential for larger storm events. See response to F2 regarding what MMWD is currently doing regarding dam safety.

F2. MMWD and NMWD are in full compliance with both state DOSD (sic.), as well as all federal regulations. However, dam safety analysis and reporting would be enhanced by including current data on probable maximum precipitation (basis for risk analysis) numbers.

The District partially disagrees with this finding.

As stated in this finding, MMWD is in full compliance with all state and federal regulations and according to DSOD, all MMWD dams are determined safe for continued use. It is, however, important to distinguish between safety and risk. As MMWD continues to evaluate its dams and spillways, it will also consider storm-induced scenarios to adequately assess risks. MMWD is not aware of any published findings that point to increased risks to dam safety due to an increase in atmospheric river events.

With respect to probable maximum precipitation (PMP), MMWD will need to review available data to determine the extent to which this data would, in fact, enhance its analysis and reporting and help to inform decision making and mitigate risks. Further, MMWD will also need to do additional research, as it is not clear what “current data,” in general or specific to MMWD’s watersheds, is available and would be included in a PMP analysis. MMWD will continue to follow the relevant work done by the National Academies of Sciences, Engineering and Medicine’s ad hoc committee project “Modernizing Probable Maximum Precipitation Estimation” and subsequent studies planned by the National Oceanic and Atmospheric Administration (NOAA) on these issues.

F3. MMWD and NMWD hazard mitigation plans fail to incorporate the latest scientific studies on climate change. They use DOSD and FEMA climate models that were last updated in 2012. This eleven-year gap may lead to an underestimation of current and future risks.

The District partially disagrees with this finding.

MMWD has a Hazard Mitigation Plan (HMP) that was adopted in 2022. This plan has a section on climate change and specifically dam failures as it relates to climate change (See section 15.4, Marin Municipal Water District Hazard Mitigation Plan). MMWD plans to update the HMP in 2024 to incorporate recommendations from its recently completed Strategic Water Supply Assessment. It is anticipated that the updated plan will also review the sections pertaining to dam safety and climate change to ensure that the latest information is incorporated into the HMP.

F4. FEMA and National Flood Insurance maps may not have entirely incorporated the most recent dam inundation maps and are not available on the MMWD and NMWD websites.

The District partially disagrees with this finding.

The FEMA Flood Insurance Rate Maps (FIRM) and the companion Flood Insurance Study (FIS) maintained by Marin County do not include dam inundation mapping. These flood risk products are instead based on flooding from various hydrologic scenarios and used for flood insurance purposes. Marin County may inquire with FEMA directly about the mapping criteria and other significant information that should be included in those products.

The MMWD website does provide inundation maps at marinwater.org/DamSafetyProgram (see “Inundation Maps” link). On this web page there are links pointing directly to the Department of Water Resources (DWR) Division of Safety of Dams’ (DSOD) inundation mapping portal. MMWD feels this is the most appropriate public user interface for dam inundation mapping and is the repository of the most current “approved” mapping for the District’s dams. MMWD’s website also provides a link to the County of Marin’s Marin Map website, which hosts the latest FEMA flood insurance rate maps (FIRMs). A link to these maps is housed on the MMWD’s website at marinwater.org/DamSafetyProgram (see “Marin Map webpage” link).

F5. The advancement of dam safety is greatly enhanced with the expertise of scientific institutions. They use a range of tools and practices such as FIRO, flyovers, weather balloons, radar along the coast, and collaborations between dam owners and scientific institutions. These practices, used by other water districts, serve as an example from which MMWD and NMWD can benefit.

The District partially disagrees with this finding.

It is important to note that Forecast Informed Reservoir Operations (FIRO) is only fully practiced at one dam in California: Lake Mendocino¹. It is considered a pilot program and being studied at three other locations: Lake Oroville, New Bullards Bar, and the Prado Reservoir. Lake Mendocino is a dual-purpose reservoir, providing both water supply storage and flood control storage. FIRO practices at this dam provides better storage management within these two distinct volumes within the reservoir. Unlike the reservoirs to be served by FIRO, MMWD reservoirs are not managed for releases related to flood response, but rather are served by spillways utilized to allow overflow when the reservoirs have reached maximum holding capacity, and therefore, FIRO, though an important management tool, would not serve the same purpose at MMWD.

MMWD has been monitoring the progress of the Advanced Quantitative Precipitation Information (AQPI)² system development in the region through its partnerships with Sonoma Water as well as Marin County. As part of that project, a series of new X-band radars have been installed in the Bay Area and a new C-band radar is planned for a site in Marin County. As the project progresses MMWD will continue to evaluate its role and level of future participation. It is anticipated that AQPI may have a benefit for MMWD in regards to dam operations.

¹ Overall dam safety and the flood control operation of this dam is the responsibility of the US Army Corps of Engineers, not Sonoma Water.

² <https://www.sonomawater.org/aqpi/>

MMWD will continue to follow the guidance of state and federal agencies responsible for developing engineering criteria for dam safety. These agencies have the expertise and funding for those efforts as well as existing partnerships with other state and federal agencies with a scientific mission that allows vetted and verified scientific research to be applied to engineering criteria. MMWD anticipates that these science-based agencies will utilize the tools and practices noted in the Report's findings.

Additionally, MMWD staff have been actively participating in webinars and email updates from the California-Nevada Drought Early Warning System for the last several years. MMWD is also exploring a future collaboration with Center for Western Weather and Water Extremes Water Affiliates Group likely in a joint effort with other Marin County agencies including NMWD. The Center for Western Weather and Water Extremes (CW3E) is the preeminent organization involved with the science of atmospheric rivers. See explanations for R1 and R6 below for more information on this topic.

II. Responses to Recommendations

R1. By March 15, 2024, MMWD and NMWD should establish a Climate Change and atmospheric rivers working group to consider, and begin to develop, new hazard mitigation actions. These should be based on the current scientific projections regarding atmospheric rivers and other extreme precipitation events.

This recommendation requires further analysis.

The benefit of forming such a working group as compared to participation in existing groups engaged in the same issues is unclear. Examples of existing groups include the California Extreme Precipitation Symposium, the CW3E Water Affiliates Group, and the Association of State Dam Safety Officials. In addition, climate change isn't only impacting the two main water suppliers in Marin County but also local cities, the County and other special districts. Therefore, if forming a local group is prudent, one with broader participation would likely make more sense.

Timeframe: MMWD expects to evaluate this recommendation within the next six months (December 15, 2023).

R2. By December 31, 2023, the two water districts should begin work to expand their respective hazard mitigation plans, which should include a new section dedicated to climate change, and a discussion of atmospheric rivers and their accelerating potential threats to dam and reservoir safety.

This recommendation has not yet been implemented.

As noted in F3, MMWD has a Hazard Mitigation Plan (HMP) that was adopted in 2022. This plan has a section on climate change and specifically a subsection on dam failure as it relates to climate change. The District currently has plans to update the HMP in 2024 to incorporate

recommendations from its Strategic Water Supply Assessment. It is anticipated that the updated plan will also review the climate change and dam safety sections to ensure that the latest information, including a discussion on atmospheric rivers and their potential threats to dam and reservoir safety, will be incorporated into the HMP.

Timeframe: MMWD anticipates this will occur prior to December 31, 2024.

R3. By January 1, 2026, the water districts (at the time of their next dam inspections, and when their hazard mitigation plans are revised) should provide the public with new information about the updated plans. This information needs to ensure that they effectively consider flood risks in light of the new science, thus ensuring that the public is aware of this.

This recommendation has not yet been implemented.

When a final draft of the updated MMWD HMP is ready, it will be presented to the MMWD Board of Directors at a public meeting for consideration and discussion. The MMWD website does provide information on its dam safety program: marinwater.org/DamSafetyProgram as well as a web page that tracks current lake levels, marinwater.org/WaterWatch (see individual links for specific reservoir levels). To the extent that additional monitoring equipment is installed in the future to measure the effects of atmospheric river events on dam safety, a summary of that data would be included in annual dam instrumentation reports that are submitted to DSOD.

Timeframe: MMWD anticipates this will occur prior to January 1, 2026.

R4. By September 30, 2023, both water districts should update their websites to include links to the inundation and FEMA maps. They should also provide links to the National Flood Insurance Program.

This recommendation has been implemented.

MMWD provides links to inundation maps at marinwater.org/DamSafetyProgram (see “Inundation Maps” link). This web page links directly to the Department of Water Resources (DWR) Division of Safety of Dams’ (DSOD) inundation mapping portal. MMWD feels this is the most appropriate public user interface for dam inundation mapping and is the repository of the most current “approved” mapping for its dams.

The website also provides a link to the County of Marin’s Marin Map website which hosts the latest FEMA flood insurance rate maps (FIRMs), marinwater.org/DamSafety-Program (see “Marin Map webpage” link). The FEMA FIRMs do not integrate dam inundation mapping nor do FIRMs include levee failure inundation mapping. These maps are solely based on creek and overland flooding resulting from hydrologic events and any changes to that approach should be addressed to FEMA directly. As the lead agency for flood control, the County of Marin may inquire with FEMA directly about the appropriate mapping criteria and information that should be included in those products.

MMWD participates and coordinates with the County of Marin emergency response planning and mitigation efforts, including those related to dam inundation.

R5. By December 31, 2023, dam owners should provide the public with easily accessible information on flood risks, as FEMA and National Flood Insurance may not have entirely incorporated the most recent dam inundation maps.

This recommendation has been implemented.

See explanation to R4 above regarding inundation mapping and FEMA flood mapping.

R6. By December 2023, both water districts should begin to explore collaborations with scientific institutions to learn from, expand their toolkit of mitigation strategies, and thus augment the safety of their dams in light of growing risks posed by atmospheric rivers.

This recommendation has not yet been implemented.

MMWD is considering participation with the Center for Western Weather and Water Extremes (CW3E), which is the preeminent organization involved with the science of atmospheric rivers. There are currently only 14 water providers in California that are active members of CW3E's Water Affiliates Group (WAG). MMWD is exploring a future collaboration with CW3E's WAG, likely in a joint effort with other Marin County organizations including NMWD. Additionally, MMWD currently participates in webinars and email updates from the California-Nevada Drought Early Warning System, and has participated for the last few years.

Timeframe: MMWD anticipates this will occur by December 31, 2023.

Sincerely,



Bennett Horenstein
District General Manager

cc: Board of Directors, Marin Municipal Water District