



# Oregon

Tina Kotek, Governor

## Water Resources Department

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## MEMORANDUM

**TO:** Water Resources Commission

**FROM:** Tony Janicek, State Engineer and Dam Safety Program Manager  
Dave Curtis, Senior Vice President at WEST Consultants; and  
Luciana Kindl Da Cunha, Vice President at WEST Consultants

**SUBJECT:** Agenda Item D, September 28, 2023  
Water Resources Commission

### **Analysis of Extreme Atmospheric River Precipitation Potential for Oregon**

#### **I. Introduction**

This report provides an update on engineering analysis work to determine extreme precipitation due to atmospheric rivers in Oregon.

#### **II. Integrated Water Resources Strategy Recommended Actions**

- 5.5B - Plan and Prepare for Flood Events
- 7.C - Ensure public safety/dam safety

#### **III. Background**

Funding for this project is provided through House Bill 5006 and Senate Bill 5545 in the 2021 Legislative Session. The purpose of this project is to develop an understanding of the extreme precipitation possible in Oregon and how this precipitation can change with specific climate related and measurable factors. The outcome of this project is a procedure for determining extreme precipitation in Oregon.

Extreme precipitation associated with atmospheric rivers has been responsible for most of the widespread flood events that Oregon has experienced. This includes the floods of 1964 and 1996, and the more recent and localized flood emergencies around Pendleton and in the southern Willamette Valley. Current methods in Oregon for determining precipitation that leads to extreme flooding, do not consider atmospheric river meteorology. These current methods are decades-old, and pre-date understanding of and research on atmospheric rivers on the west coast. This contrasts with the much better understanding of tropical storms and hurricanes on the east coast.

This project is critical for safety of Oregonians that could be affected by changes in extreme flooding. The analysis will improve our understanding of the mechanics of precipitation in an

extreme atmospheric river event. In addition, the information is used to determine the accuracy of and the need to update the National Weather Service's (NWS) Hydrometeorological Report 57 (HMR 57), a document used to determine extreme precipitation in Pacific Northwest states. In the context of dam safety, HMR 57 is the document used to determine the Probable Maximum Precipitation that should be applied to a reservoir drainage basin for determining the Probable Maximum Flood when analyzing the capacity of a spillway for a high hazard dam. The spillway is the most important safety feature of a dam and an updated procedure for determining the Probable Maximum Precipitation is critical to ensuring public safety.

#### **IV. Scope of Work**

There are two phases to this project, each under separate contracts. The first phase of the work, which was completed in June of 2023, determined how extreme precipitation is influenced by ocean and air temperature, and other factors, especially those that could be measured over time for change. The first phase also included a review of NWS HMR 57. The second phase of this work will provide an updated procedure for determining extreme precipitation in Oregon and guidance on how that precipitation could result in flooding. The updated procedure will be consistent with current understanding of atmospheric river meteorology. The contract for Phase 2 is under development and work is planned to begin in October 2023.

#### **V. Deliverables**

##### **Phase 1**

This project produced an interim Phase 1 report and proposed a plan for completion of the project in Phase 2. The Phase 1 report includes:

- Atmospheric river precipitation mechanics which can be understood by water resource managers and engineers.
- Methods used to analyze maximum potential precipitation by location. This included rainfall intensities, durations, and geographic extent.
- The effect of changes in air or ocean temperature or other directly measurable factors, and what locations are critical for these measurements.
- An initial review of HMR 57 for consistency with these atmospheric river related mechanisms.
- A scope of final work for determination of probable maximum precipitation associated with an atmospheric river by location within the study area.

##### **Phase 2**

This project will produce a report that provides a procedure for determining extreme precipitation in Oregon and will include the following:

- A database of extreme storms and climatologies
- A procedure for determining atmospheric river based Probable Maximum Precipitation
- Guidance for determining the Probable Maximum Flood

- An independent review of the work by a group of experts in extreme precipitation determination

## **VI. Conclusion**

This project, once complete, will provide the Dam Safety Section staff with better information to evaluate the Probable Maximum Flood potential when assessing new and existing dams and ensuring proper design in order to prevent dam failures. The Department anticipates that Phase 2 of this work will be completed by the end of 2024.

Tony Janicek

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