BOLINAS COMMUNITY PUBLIC UTILITY DISTRICT PROFILE

BCPUD

Bolinas Community Public Utility District

Marin County Multi-Jurisdictional Hazard Mitigation Plan 2023

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ACKNOWLEDGEMENTS

The Bolinas Community Public Utility District and Preparative Consulting would like to thank those collaborators and partners who participated in the planning and development of this document.

The official Marin County hazard mitigation Steering Committee provided the oversight and dedication to this project that was required, and without their commitment, this project would not be possible.

As with any working plan, this document represents planning strategies and guidance as understood as of the date of this plan's release. This plan identifies natural hazards and risks and identifies the hazard mitigation strategy to reduce vulnerability and make the Bolinas Community Public Utility District more disaster resistant and sustainable.

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1.0 Introduction

1.1 Introduction

The Bolinas Community Public Utility District Profile has been prepared in conjunction with the Marin County Multi-Jurisdictional Hazard Mitigation Plan (MJHMP), establishing an inter-jurisdictional process for the development and implementation of effective hazard mitigation strategies in association with identified hazards that pose real or potential threats to the Bolinas Community Public Utility District.

1.2 Planning Process

The majority of Marin County consists of unincorporated, sparsely populated rural and protected lands. Most of the 262,000 county population is consolidated into the Eastern portion of the county. The Marin County MJHMP Steering Committee and broader Planning Team approached the development of the Marin County MJHMP and the associated jurisdictional and district profiles from a coordinated and collaborative planning and public engagement unity of effort.

The Steering Committee felt a unified effort, led by the County Office of Emergency Management (OEM), would be the most effective approach for this planning process. This approach allowed the small jurisdictions and special districts with limited staffing and resources to take advantage of the combined efforts of the County and other jurisdictions to reach a broader segment of each of their own populations and do so in a way to ensure greater equity and inclusion of the public in this planning process. Extensive and coordinated public outreach was done involving all participating jurisdictions and special districts with an eye towards equity, inclusion, openness, accessibility, and ensuring they meet the population where they live, work, or recreate to provide the public convenience of access and ease of participation in this planning process.

Marin County is very different from most California counties in that the populated portion of the County where the jurisdictions and special district's planning areas are located has the same climate, similar topography, and are exposed to many of the same hazards. Only three jurisdictions, Larkspur, Ross, and San Anselmo, are not coastal jurisdictions and are not impacted by Tsunami or Sea Level Rise.

This unity of effort approach allowed the Steering Committee to establish a more robust Planning Team representing local, countywide, regional, state, and federal stakeholders servicing the Marin County planning area. These stakeholders were in a unique position to provide informed and specific information and recommendations on hazard mitigation goals and actions, as well as population needs and social vulnerability for each of the jurisdictional and district planning areas. This united effort allowed the members of the Planning Team to attend fewer meetings than they would have been required to attend if they were required to attend separate meetings for each participating jurisdiction and special district. The reduced number of meetings allowed the Planning Team the opportunity and time to provide more detailed and thoughtful contributions to the planning effort.

In addition to providing representation on the coordinated Marin County Multi-Jurisdictional Hazard Mitigation Plan Steering Committee, the Bolinas Community Public Utility District involved additional internal planning team members to support the broader planning process. The Bolinas Community Public Utility District jurisdictional representatives for the coordinated

Marin County Multi-Jurisdictional Hazard Mitigation Plans Steering Committee and the Planning Team Members are represented below.

1.2.1 Steering Committee Members (District Representatives)

Primary Point of Contact
Jennifer Blackman, General Manager
Telephone: 415-868-1224
e-mail Address: Jblackman@bcpud.org

Alternate Point of Contact
Stephen Marcotte, Assistant Fire Chief
Telephone: 415-868-1566
e-mail Address: smarcotte@bolinasfire.org

This annex was developed by the primary point of contact with assistance from the members of the local mitigation planning team listed in Table 1.

This 2023 Marin County Operational Area (OA) MJHMP is a comprehensive update of the 2018 Marin County OA MJHMP. The planning area and participating jurisdictions and organizations were defined to consist of unincorporated Marin County, eleven incorporated jurisdictions, and five special districts, including the Bolinas Community Public Utility District. All participating jurisdictions and special districts are within the geographical boundary of Marin County and have jurisdictional authority within this planning area.

The Steering Committee led the planning process based on the contribution and input from the whole community stakeholders who identified the community's concerns, values, and priorities. The Steering Committee met and reviewed the mitigation recommendations and strategies identified within this plan. Each participating local jurisdiction and special district established a mechanism for the development and implementation of jurisdictional mitigation projects, as identified within this plan and associated locally specific supporting documents. As deemed necessary and appropriate, participating jurisdictions and special districts will organize local mitigation groups to facilitate and administer internal activities.

The Steering Committee assisted with the planning process in the following ways:

- Attending and participating in the Steering Committee meetings.
- Identifying potential mitigation actions.
- Updating the status of mitigation actions from the 2018 Marin County OA MJHMP.
- Collecting and providing other requested data (as available).
- Making decisions on plan process and content.
- Reviewing and providing comments on plan drafts; including annexes.
- Informing the public, local officials, and other interested stakeholders about the planning process and providing opportunity for them to be involved and provide comment.
- Coordinating, and participating in the public input process.
- Coordinating the formal adoption of the plan by the governing boards.

1.2.2 Steering Committee Planning Process

The Steering Committee met monthly to develop the plan. Email notifications were sent out to each Steering Committee member to solicit their participation in the Steering Committee meetings. The meetings were conducted using a Zoom platform videoconferencing. Meeting attendees signed in using the chat feature to record their attendance.

The Steering Committee agreed to make and pass plan-based general policy recommendations by a vote of a simple majority of those members present. The Steering Committee will also seek input on future hazard mitigation programs and strategies from the mitigation planning team by focusing on the following:

- Identify new hazard mitigation strategies to be pursued on a state and regional basis and review the progress and implementation of those programs already identified.
- Review the progress of the Hazard Mitigation program and bring forth community input on new strategies.
- Coordinate with and support the efforts of the Marin County OEM to promote and identify resources and grant money for implementation of recommended hazard mitigation Strategies within local jurisdictions and participating public agencies.

During the planning process, the Steering Committee communicated through videoconferencing, face-to-face meetings, email, telephone conversations, and through the County website. The County website included information for all stakeholders on the MJHMP update process. Hannah Tarling of the Marin County OEM and Preparative Consulting established a Microsoft 365 SharePoint folder which allowed the Steering Committee members and Marin OEM and Preparative Consulting to share planning documents and provide a format for the planning partners to submit completed documents and access other planning related documents and forms. Draft documents were also posted on this platform and the Marin County OEM website so that the Steering Committee members and the public could easily access and review them.

1.2.3 Coordination with Stakeholders and Agencies

Opportunities for involvement in the planning process must be provided to neighboring communities, local and regional agencies involved in hazard mitigation, agencies with authority to regulate development, businesses, academia, and other private and nonprofit interests (44 CFR, Section 201.6(b)(2)).

As detailed in 1.2 PLANNING PROCESS, the planning process enjoyed a robust unity of effort. Early in the process the Steering Committee determined that data collection, risk assessment analyses, mitigation strategy development, and plan approval would be greatly enhanced by inviting other local, state and federal agencies and organizations to participate in the process. Based on their involvement in hazard mitigation planning, and/or their interest as a neighboring jurisdiction, representatives from the following groups were invited to participate on the Planning Team:

Eighty-five planning partners participated in this update, as listed in Table1.

Table 1: 2023 MJHMP Local Planning Team Members

No.	Agency	Point of Contact	Title
1	Belvedere	Laurie Nilsen	Emergency Svs, Coord.
2	Belvedere	Rebecca Markwick	Planning Director
3	Belvedere	Samie Malakiman	Associate Planner
4	Bolinas Community PUD	Jennifer Blackman	General Manager
5	Bolinas Fire Protection Dist.	Stephen Marcotte	Assistant Fire Chief
6	Central Marin Fire District	Matt Cobb	Battalion Chief/Fire
7	Central Marin Fire District	Ezra Colman	Battalion Chief/Fire
8	Central Marin Fire District	Rubin Martin	Fire Chief
9	Corte Madera	RJ Suokko	Director of Public Works
10	Corte Madera	Chris Good	Senior Civil Engineer
11	Sanitary District No. 2	RJ Suokko	District Manager
12	Fairfax	Loren Umbertis	Public Works Director
13	Fairfax	Mark Lockaby	Building Official
14	Larkspur	Dan Schwarz	City Manager
15	Larkspur	Julian Skinner	Public Works Director/ City Engineer
16	Larkspur	Robert Quinn	Public Works Superintendent
17	Las Gallinas Valley Sanitary District	Dale McDonald	Administrative Services Mgr.
18	Las Gallinas Valley Sanitary District	Greg Pease	Safety Manager
19	County of Marin	Steven Torrence	OEM Director
20	County of Marin	Hannah Tarling	Emergency Management Coordinator
21	County of Marin	Chris Reilly	OEM Project Manager
22	County of Marin	Woody Baker-Cohn	Senior Emergency Management Coordinator
23	County of Marin	Leslie Lacko	Community Development Agency
24	County of Marin	Hannah Lee	Senior Civil Engineer
25	County of Marin	Felix Meneau	Project Mgr./ FCWCD
26	County of Marin	Julia Elkin	Department of Public Works
27	County of Marin	Beb Skye	Department of Public Works
28	County of Marin	Scott Alber	Battalion Chief, Marin County Fire Dept.
29	County of Marin	Lisa Santora	Deputy Public Health Officer, Marin Health & Human Services
30	County of Marin	Koblick, Kathleen	Marin Health & Human Services
31	County of Marin	Amber Davis	Public Health Preparedness
32	Mill Valley	Patrick Kelly	Department of Public Works
33	Mill Valley	Ahmed A Aly	Project Manager
34	Mill Valley	Jared Barrilleaux	Deputy Director of Engineering
35	Mill Valley	Daisy Allen	Senior Planner
36	Southern Marin Fire District	Tom Welch	Deputy Chief/South Marin Fire Dist.
37	Southern Marin Fire District	Marshall Nau	Fire Marshall/South Marin Fire Dist.
38	North Marin Water District	Eric Miller	Asst. General Manager
39	North Marin Water District	Tim Fuette	Senior Engineer
40	Novato	David Dammuller	Engineering Services Mgr.
41	Novato	Dave Jeffries	Consultant/JPSC

Table 1: 2023 MJHMP Local Planning Team Members			
No.	**Agency**	**Point of Contact**	**Title**
42	Ross	Richard Simonitch	Public Works Director
43	San Anselmo	Sean Condry	Public Works & Building Director
44	San Anselmo	Erica Freeman	Building Official
45	San Anselmo	Scott Schneider	Asst. PW Director
46	San Rafael	Quinn Gardner	Deputy Emergency Services Coord.
47	San Rafael	Cory Bytof	Sustainability
48	San Rafael	Joanna Kwok	Senior Civil Engineer
49	San Rafael	Kate Hagemann	Climate Adaptation & Resilience Planner
50	Sausalito	Andrew Davidson	Senior Engineer/ DPW
51	Sausalito	Kevin McGowan	Director of Public Works
52	Sausalito	Brandon Phipps	Planning Director
53	Tiburon	Sam Bonifacio	Assistant Planner
54	Tiburon	Dina Tasini	Director of Community Development
55	Tiburon	Laurie Nilsen	Emergency Svs, Coord.
Special Districts & Partner Agencies			
56	County of Marin Disability Access Program	Laney Davidson	Disability Access Manager/ ADA Coordinator
57	County of Marin Disability Access Program	Peter Mendoza	Disability Access Manager/ ADA Coordinator
58	Emergency Medical Services	Chris Le Baudour	EMS Authority
59	Fire Departments	Jason Weber	Fire Chiefs
60	Golden Gate Bridge, Highway & Transportation District	Daniel Rodriguez	Security, Emergency Management Specialist
61	Golden Gate Bridge, Highway & Transportation District	Dennis Mulligan	General Manager & CEO,
62	Marin City Climate Resilience and Health Justice	Terrie Green	Executive Director
63	Marin Center for Independent Living	Peter Mendoza	Director of Advocacy and Special Projects
64	Marin City Community Services District	Juanita Edwards	Interim General Manager
65	Marin County Community Development Agency	Leslie Lacko	Community Development Agency
66	Marin County Flood Control & Water Conservation District	Garry Lion	Advisory Board Member
67	Marin County Office of Education	Michael Grant	Director, Marin County Office of Education
68	Marin County Parks	Max Korten	General Manager and Director
69	PG&E	Mark Van Gorder	Government Affairs, North Bay
70	PG&E	Ron Karlen	PG&E Public Safety Specialist
71	Sonoma Marin Area Rail Transit (SMART)	Jennifer McGill	Chief of Police
72	Transportation Authority of Marin (TAM)	Anne Richmond	Executive Director
73	Willow Creek School	Itoco Garcia	Superintendent

Table 1: 2023 MJHMP Local Planning Team Members			
No.	**Agency**	**Point of Contact**	**Title**
State Partners			
74	Cal OES - ESC	Sarah Finnigan	Cal OES Emergency Services Coordinator
75	Cal OES, Division of Safety of Dams	Danielle Jessup	Coordinator/ Dam Safety Planning Division
76	California Department of Public Health	Svetlana Smorodinsky	Disaster Epidemiologist/ Environmental & Occupational Emergency Preparedness Team
77	California Department of Public Health	Patrice Chamberlain	Health Program Specialist II
78	California Department of Water Resources	Julia Ekstrom, PhD	Supervisor, Urban Unit Water Use Efficiency Branch
79	Caltrans	Trang Hoang	Senior Transportation Engr/ Office of Advance Planning
80	Caltrans	Markus Lansdowne	Caltrans D4 Emergency Coordinator
Federal Partners			
81	Army Corps of Engineers	Jessica Ludy	Flood Risk Management, Equity, and Environmental Justice
82	National Park Service	Stephen Kasierski	OneTam
83	US Coast Guard	LT Tony Solares	Sector SF Waterways Safety Branch
84	US Coast Guard	MST1 Brandon M. Ward	Emergency Management Specialist
85	US Coast Guard	LT William K. Harris	USCG SEC San Francisco

Table 1: 2023 MJHMP Planning Team Members

Several opportunities were provided for the groups listed above to participate in the local planning process. At the beginning of the planning process, invitations were extended to these groups to actively participate on the Planning Team. Participants from these groups assisted in the process by attending several videoconferencing meetings where hazard vulnerability and risk were discussed along with hazard mitigation strategies and actions. Planning Team members provided data and other applicable information directly as requested in meetings, emails, telephone calls, videoconferencing, worksheets, or through data contained on their websites or as maintained by their offices. This information was used to develop hazard vulnerability and risk profiles along with mitigation actions.

Further as part of the public outreach process, all planning areas engaged in public outreach and education by providing information on their website or though press releases directing the public to the main Marin County OEM website that provided coordinated and detailed public information of the planning process and how the public could participate. All planning areas were invited to attend the public meetings and to review and comment on the plan prior to submittal to Cal OES and FEMA. Additional public outreach action is detailed in the 1.2.4 PUBLIC ENGAGEMENT section of this annex.

The following planning meetings were held with the planning team:

Table 2: Bolinas Community Public Utility District & Marin County MJHMP Planning Meetings

No.	Date	Attendees	Meeting	Planning Meeting Objectives
1	10/26/22	Steering Committee	Project Overview Meeting	• Plan Overview – Steps and Timeline • Planning Process • Steering Committee Role
2	11/9/22	Steering Committee	Steering Committee Kickoff Meeting	• Hazard Mitigation and Emergency Management Overview • Plan Overview – Steps and Timeline • Community Overview • Planning Process • Hazard Identification and Risk Assessment • Stakeholders and Planning Team Identification
3	12/6/22	Steering Committee, Planning Team	Planning Team Kickoff Meeting	• Hazard Mitigation and Emergency Management Overview • Plan Overview – Steps and Timeline • Community Overview • Planning Process • Hazard Identification and Risk Assessment
4	02/07/23	Steering Committee	Steering Committee Hazard Profile Meeting	• Jurisdictional Letter of Commitment • Identify Planning Team Members • Hazard Risk Ranking Worksheets • Jurisdictional Profiles • Jurisdictional/ District Capability Assessment • 2018 Hazard Mitigation Project Status Update
5	03/07/23	Steering Committee/ Planning Team	Planning Team Public Outreach Strategy Meeting	• Planning Goals and Objectives • Hazard Risk Ranking Worksheets • Jurisdictional Profiles • Jurisdictional/ District Capability Assessment • 2018 Hazard Mitigation Project Status Update • Public Outreach Strategy
6	04/04/23	Steering Committee	Steering Committee Meeting	• HMGP (DR-4683) Funding Timeline • Public Outreach • Planning Goals and Objectives • Jurisdictional Hazard Vulnerability Maps

Table 2: Bolinas Community Public Utility District & Marin County MJHMP Planning Meetings

No.	Date	Attendees	Meeting	Planning Meeting Objectives
				• Jurisdictional Profiles • Jurisdictional/ District Capability Assessment • 2018 Hazard Mitigation Project Status Update
7	04/13/23	General Public, Steering Committee, Planning Team	Public Outreach Town Hall Meeting #1 (In-person and virtual on Zoom) Thursday, 6:00 pm to 7:30 pm Marin County BOS Chambers	• Meeting translated live in Spanish with 29 language subtitle capability for virtual participants. • Meeting also interpreted in American Sign Language • Meeting recorded and posted on Hazard Mitigation website. • Hazard Mitigation and Emergency Management Overview • Planning Process • Hazard Identification and Risk Assessment • Planning Goals and Objectives • Hazard Mitigation Projects • Community Input
8	04/29/23	General Public, Steering Committee, Planning Team	Public Outreach Town Hall Meeting #2 (In-person and virtual on Zoom) Saturday, 10:00 am to 11:30 am Marin County Health and Wellness Center	• Meeting translated live in Spanish with 29 language subtitle capability for virtual participants. • Meeting also interpreted in American Sign Language • Meeting recorded and posted on Hazard Mitigation website. • Hazard Mitigation and Emergency Management Overview • Planning Process • Hazard Identification and Risk Assessment • Planning Goals and Objectives • Hazard Mitigation Projects • Community Input
9	05/31/23	Steering Committee	Steering Committee Hazard Ranking Meeting	• HMGP (DR-4683) Funding Timeline • Public Outreach Status • Jurisdictional Hazard Vulnerability Maps • OEM Overview of Hazard Maps and Marin Maps • Marin Co. MJHMP Risk Assessment Tool Overview

Table 2: Bolinas Community Public Utility District & Marin County MJHMP Planning Meetings				
No.	**Date**	**Attendees**	**Meeting**	**Planning Meeting Objectives**
				• 2018 Hazard Mitigation Project Status Update • Hazard Working Groups
10	06/27/23	Steering Committee, Planning Team	Marin County Planning Team Meeting	• HMGP (DR-4683) & BRIC Grant Funding Timeline • Public Outreach Status • Jurisdictional Hazard Risk Assessment Tool • OEM Overview of Hazard Maps and Marin Maps • Marin County Hazards over the Last 5-Years • 2018 Hazard Mitigation Project Status Update • 2023 Hazard Mitigation Projects/Capital Improvement Projects • Hazard Working Groups
11	07/01/23-09/01/23	Steering Committee Members	Steering Committee Members Plan Development Sessions	• Individual phone or conference calls with planning jurisdictions and districts to answer specific questions and assist them in developing their profile annex.
12	11/27/23	Steering Committee, Planning Team	Marin County Planning Team Meeting	• Presentation and review of the Draft Marin County OA MJHMP and Jurisdictional/District Annexes
13	11/28/23	General Public	Public Outreach Presentation on Marin County Office of Emergency Management Website	• Presentation and review of the Draft Marin County OA MJHMP and Jurisdictional/District Annexes. • Opportunity for public comment and questions and answers.

Table 2: BCPUD & Marin County MJHMP Planning Meetings

1.2.4 Public Engagement

Early discussions with the Marin County OEM established the initial plan for public engagement to ensure a meaningful and inclusive public process with a focus on equity and accessible to the whole community. The Public Outreach efforts mirrored the Planning Team approach with a unified effort, led by the County OEM, involving all participating jurisdictions and special districts. Public outreach for this plan update began at the beginning of the plan development process with a detailed press release informing the community of the purpose of the hazard mitigation planning process for the Marin County planning area and to invite the public to participate in the process.

Public involvement activities for this plan update were conducted by the County and all participating jurisdictions and special districts and included press releases; website postings; a community survey; stakeholder and public meetings; and the collection of public and stakeholder comments on the draft plan which was posted on the County website. Information provided to the public included an overview of the mitigation status and successes resulting from implementation of the 2018 plan as well as information on the processes, new risk assessment data, and proposed mitigation strategies for the plan update.

Equity and Whole Community Approach

Early discussions with the Marin County OEM established the initial plan for public engagement to ensure a meaningful and inclusive public process with a focus on equity and accessible to the whole community. The Public Outreach efforts mirrored the Planning Team approach with a unified effort, led by the County OEM, involving all participating jurisdictions and special districts. Public outreach for this plan update began at the beginning of the plan development process with a detailed press release informing the community of the purpose of the hazard mitigation planning process for the Marin County OA planning area and to invite the public to participate in the process.

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Equity and Whole Community Approach

The Marin County OEM and the Steering Committee prioritized equity and engagement of the whole community in the development of the Marin County OA MJHMP by establishing a framework with key actions for each step of the planning process. Elements of the equity approach included:

Engaging hard-to-reach populations

This effort was to ensure the greatest equity and access to the public to enable participation in the process. The Marin County OEM outreach strategy is to “meet people where they are.” The Town Hall meetings were conducted at different familiar locations within the county where people could easily access them and were conducted on both a weekday and weekend, and in the evening and during the daytime. The meetings were offered in-person with a virtual broadcast using Zoom videoconferencing and streamed live on Marin County OEM Facebook account. After the meeting, Marin County OEM uploaded the recorded meeting to their website to allow the public on demand access to the meeting.

Translation and Interpretation Services

The survey and outreach materials were provided in both English and Spanish to improve accessibility among populations with limited English proficiency. The website uses Google Translate for accessibility in multiple languages. Interpretation services were offered for both town hall meetings. Each town hall meeting included live Spanish translation and subtitles, Live American Sign Language (ASL/CDI) interpretation, the ability for the Zoom videoconferencing attendee to activate subtitles in 29 different languages, and vision accessible PowerPoint slide.

Three stakeholder and public meetings were held, two at the beginning of the plan development process and one prior to finalizing the updated plan. Where appropriate, stakeholder and public comments and recommendations were incorporated into the final plan, including the sections that address mitigation goals and strategies. Specifically, public comments were obtained during the plan development process and prior to plan finalization.

All press releases and website postings are on file with the Marin County OEM. Public meetings were advertised in a variety of ways to maximize outreach efforts to both targeted groups and to the public at large. Advertisement mechanisms for these meetings and for involvement in the overall MJHMP development process include:

- Development and publishing of an MJHMP public outreach article
- Providing press releases to local newspapers and radio stations
- Posting meeting announcements on the local County MJHMP website
- Email to established email lists
- Personal phone calls

The public outreach activities were conducted with participation from and on behalf of all jurisdictions participating in this plan.

The Steering Committee has made the commitment to periodically bring this plan before the public through public meetings and community posting so that citizens may make input as strategies and implementation actions change. Public meetings will continue to be held twice a year after the first and third MJHMP meetings. Public meetings will continue to be stand-alone meetings but may also follow a council meeting or other official government meeting. The public will continue to be invited to public meetings via social media messaging, newspaper invitations, and through the website for each jurisdiction participating in the plan. Each jurisdiction is responsible for assuring that their citizenry is informed when deemed appropriate by the Steering Committee.

WEBSITE

At the beginning of the plan update process, Marin County OEM established a hazard mitigation website https://emergency.marincounty.org/pages/lhmp on behalf of all the planning areas to ensure consistent messaging and information, to keep the public posted on plan development milestones, and to solicit relevant input. The website also provided information on signing up for Alert Marin, provided detailed information about the hazard mitigation process and plan development, provided a URL and QR code link to the survey in both English and Spanish, and provided information about upcoming town hall meetings. (See Figure 1)

The site's address was publicized in all press releases, surveys and public town hall meetings. Each planning partner also established a link on their own agency website.

Information on the plan development process, the Steering Committee, a link to the Hazard Mitigation survey, and drafts of the plan were made available to the public on the site. Marin County intends to keep a website active after the plan's completion to keep the public informed about successful mitigation projects and future plan updates.

Figure 1: Marin County OEM MJHMP Website

PUBLIC MEETINGS

Two separate Marin County MJHMP Public Town Hall Meeting were conducted at different locations within the County, on different days of the week and during different times of the day. This effort was to ensure the greatest equity and access by the public to enable participation in the process. The Marin County OEM outreach strategy is to "meet people where they are." Each Town Hall Meeting included, live Spanish translation and subtitles, Live American Sign Language (ASL/CDI) interpretation, the ability for the Zoom videoconferencing attendee to activate subtitles in 29 different languages, and vision accessible PowerPoint slide.

The first Town Hall Meeting was conducted on Thursday, April 13, 2023, from 6:00 pm to 7:30 pm, at the Marin County Board of Supervisors Chambers, Marin County Civic Center, 3501 Civic Center Drive, Room #330 San Rafael, CA 94903. The in-person meeting was also broadcast virtually using Zoom videoconferencing and streamed live on Marin County OEM Facebook account. Each of the jurisdictions participating in the MJHMP released a Press Release on their respective websites announcing the Public Town Hall Meeting and providing the date, time, and URL link to the Zoom Meeting for the public to log in and attend the Zoom Meeting. Marin County OEM also posted a notice for the Public Town Hall Meeting on their Facebook account. At the conclusion of the presentation, a question and answer session was held to answer questions from the attendees.

The second Town Hall Meeting was conducted on Saturday, April 29, 2023, from 10:00 am to 11:30 am, at the Marin County Health and Wellness Center, 3240 Kerner Ave. Rooms

#109 and #110 San Rafael, CA. 94903. The meeting followed the same format as the first and hosted the same access level of equity and accessibility.

The Marin County MJHMP Public Town Hall Meeting was recorded and downloaded from Zoom and made available to all of the jurisdictions and districts to place on their websites and local Access TV for the public to view.

Meeting participants were also invited to complete the Hazard Mitigation Survey and were provide the URL link to the Survey Monkey website to complete the survey.

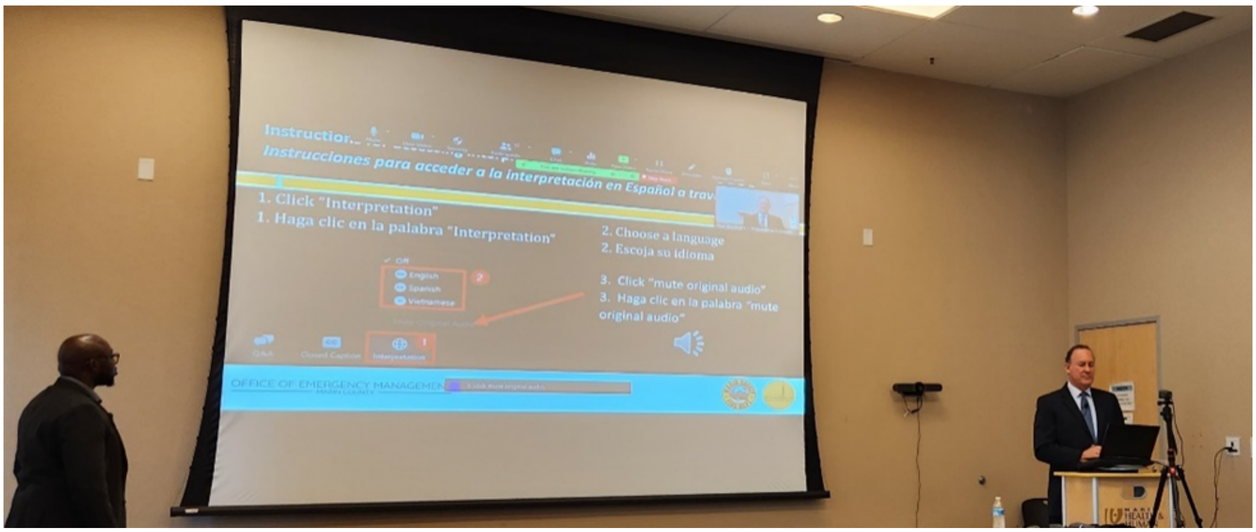


Figure 2: Marin County OEM MJHMP Public Town Hall Meeting

SOCIAL MEDIA

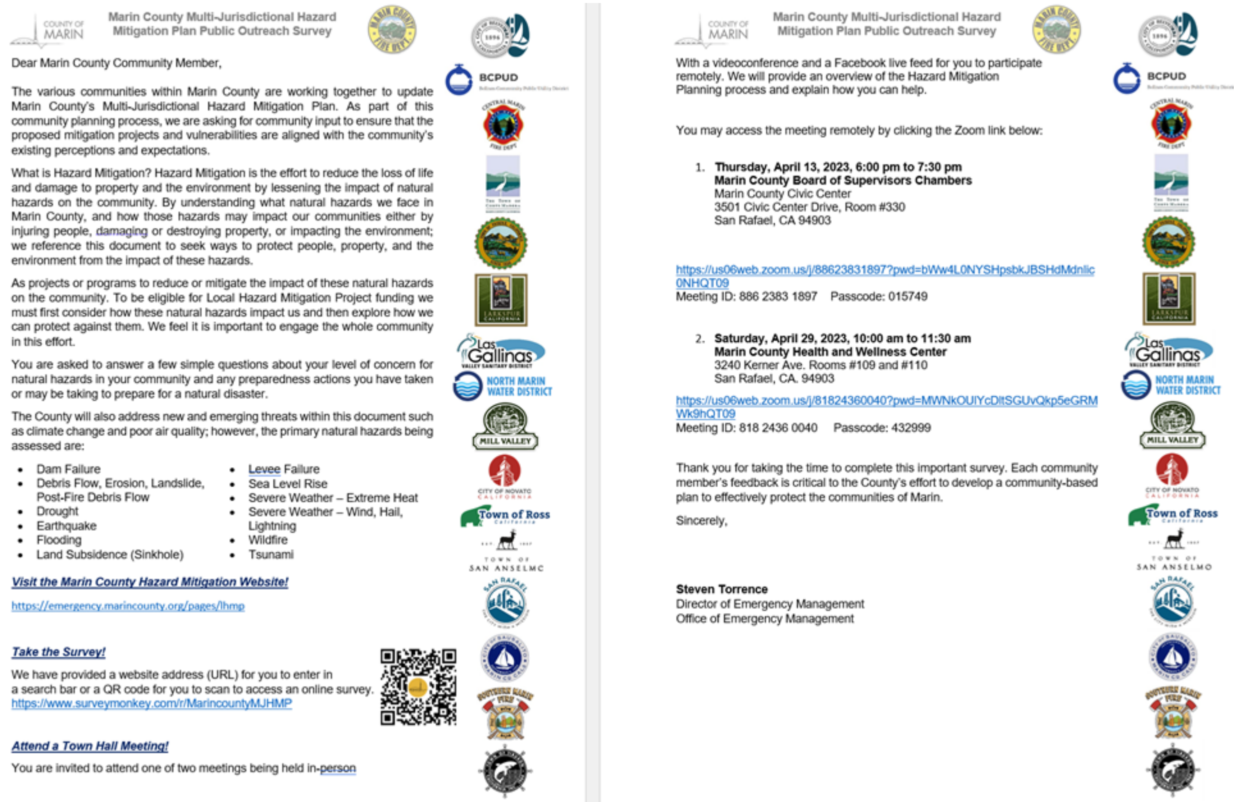
Marin County and its participating jurisdictions utilized several forms of social media to reach residents and customers. Information about the Hazard Mitigation Planning process was communicated to the public via Facebook, Twitter, and local access TV. Residents and customers were invited to complete the Hazard Mitigation Plan survey which was accessible via an attached URL or QR Code and provide feedback on potential hazard mitigation projects or programs.

The results of the survey were provided to each of the planning partners and used to support the jurisdictional annex process. Each planning partner was able to use the survey results to help identify actions as follows:

- Gauge the public's perception of risk and identify what citizens are concerned about.
- Identify the best ways to communicate with the public.
- Determine the level of public support for different mitigation strategies.
- Understand the public's willingness to invest in hazard mitigation.

PRESS RELEASES

Press releases were distributed over the course of the plan's development as key milestones were achieved and prior to each Marin County MJHMP Public Town Hall Meeting. All press releases were made available to the community in both English and Spanish.



Marin County Multi-Jurisdictional Hazard Mitigation Plan Public Outreach Survey

Dear Marin County Community Member,

The various communities within Marin County are working together to update Marin County's Multi-Jurisdictional Hazard Mitigation Plan. As part of this community planning process, we are asking for community input to ensure that the proposed mitigation projects and vulnerabilities are aligned with the community's existing perceptions and expectations.

What is Hazard Mitigation? Hazard Mitigation is the effort to reduce the loss of life and damage to property and the environment by lessening the impact of natural hazards on the community. By understanding what natural hazards we face in Marin County, and how those hazards may impact our communities either by injuring people, damaging or destroying property, or impacting the environment; we reference this document to seek ways to protect people, property, and the environment from the impact of these hazards.

As projects or programs to reduce or mitigate the impact of these natural hazards on the community. To be eligible for Local Hazard Mitigation Project funding we must first consider how these natural hazards impact us and then explore how we can protect against them. We feel it is important to engage the whole community in this effort.

You are asked to answer a few simple questions about your level of concern for natural hazards in your community and any preparedness actions you have taken or may be taking to prepare for a natural disaster.

The County will also address new and emerging threats within this document such as climate change and poor air quality; however, the primary natural hazards being assessed are:

- Dam Failure
- Debris Flow, Erosion, Landslide, Post-Fire Debris Flow
- Drought
- Earthquake
- Flooding
- Land Subsidence (Sinkhole)
- Levee Failure
- Sea Level Rise
- Severe Weather – Extreme Heat
- Severe Weather – Wind, Hail, Lightning
- Wildfire
- Tsunami

Visit the Marin County Hazard Mitigation Website!

https://emergency.marincounty.org/pages/lhmp

Take the Survey!

We have provided a website address (URL) for you to enter in a search bar or a QR code for you to scan to access an online survey.
https://www.surveymonkey.com/r/MarincountyMJHMP

Attend a Town Hall Meeting!

You are invited to attend one of two meetings being held in-person

Marin County Multi-Jurisdictional Hazard Mitigation Plan Public Outreach Survey

With a videoconference and a Facebook live feed for you to participate remotely. We will provide an overview of the Hazard Mitigation Planning process and explain how you can help.

You may access the meeting remotely by clicking the Zoom link below:

1. **Thursday, April 13, 2023, 6:00 pm to 7:30 pm**
   Marin County Board of Supervisors Chambers
   Marin County Civic Center
   3501 Civic Center Drive, Room #330
   San Rafael, CA 94903

https://us06web.zoom.us/j/88623831897?pwd=bWw4L0NYSHpsbkJBSHdMdnlic0NHQT09
Meeting ID: 886 2383 1897 Passcode: 015749

2. **Saturday, April 29, 2023, 10:00 am to 11:30 am**
   Marin County Health and Wellness Center
   3240 Kerner Ave. Rooms #109 and #110
   San Rafael, CA. 94903

https://us06web.zoom.us/j/81824360040?pwd=MWNkOUlYcDltSGUvQkp5eGRMWk9hQT09
Meeting ID: 818 2436 0040 Passcode: 432999

Thank you for taking the time to complete this important survey. Each community member's feedback is critical to the County's effort to develop a community-based plan to effectively protect the communities of Marin.

Sincerely,

Steven Torrence
Director of Emergency Management
Office of Emergency Management

Figure 3: Hazard Mitigation Plan Public Outreach Press Release

SURVEY

A hazard mitigation plan survey (see Figure 4) was developed by the Steering Committee and made available to the public in both English and Spanish. The survey was used to gauge household preparedness for natural hazards and the level of knowledge of tools and techniques that assist in reducing risk and loss from natural hazards. This survey was designed to help identify areas vulnerable to one or more natural hazards. The answers to its ten questions helped guide the Steering Committee in defining our hazards, and selecting goals, objectives, and mitigation strategies. The survey was available on the hazard mitigation plan website, advertised in press releases, and at town hall meetings. Finally, the survey and the process of public input was advertised throughout the course of the planning process. The survey was available to the public on March 13, 2023, and closed on June 12, 2023. At the conclusion of the planning process over 293 surveys were completed by the public.

Figure 4: Hazard Mitigation Plan Survey

PUBLIC COMMENT ON THE PLAN

To solicit public feedback on the draft plan, Marin OEM engaged in a multi-faceted approach intended to reach as many Marin residents as possible, including members of the community who are under-served and under-represented. All members of the community had the opportunity to provide initial comments on the plan during a two-week period from Wednesday, December 4, 2023, to Wednesday, December 18, 2023. Although the initial comment period was listed as two weeks, the public could submit comments indefinitely via the County's website to support the County's continuous improvement efforts. The base plan, as well as city, town and special district annexes, were available for download on emergency.marincounty.org (include photos). The website additionally asked for feedback in a survey in English and Spanish (include photos), the survey was designed to establish where that person lives or works, their top hazards of concern, elicit feedback on the plan and offer a place for them to share projects to reduce risk in their community. The survey collected responses from the community in English and in Spanish.

The website and survey were shared through traditional and social media (photos) The Marin Independent Journal (Marin IJ) used the press release to write an article. Social media accounts were updated four times with an initial ask, two reminders, and a closing announcement. The Marin OEM Public Information Officer coordinated with the Marin County Public Information Officers (MAPIO) working group to distribute information to partner jurisdictions (city, town, and special districts) to share this information on their social media sites and with the communities in the area.

To reach those who may not be engaged digitally, the planning team worked with Marin County Community Response Teams, (CRTs are a collaboration of non-profit organizations supporting underrepresented communities in four zones) to conduct outreach with half-sheet flyers in English and Spanish to share in the 4 CRT zones (southern Marin, north Marin, west Marin, San Rafael). These half sheets were also shared county-wide at libraries, including in areas not covered by CRTs, like at the Fairfax library. CRTs are designed to reach Marin's traditionally underserved and underrepresented communities, so by conducting outreach through this method, we were able to inform residents who may not have been engaged otherwise, including residents in Marin City, West Marin, and the Canal District of San Rafael.

The 14-day public comment period gave the public an opportunity to comment on the draft plan update prior to the plan's submittal to Cal OES. Comments received on the draft plan are available upon request. All comments were reviewed by the planning team and incorporated into the draft plan as appropriate.

1.3 Overview and History

The Bolinas Community Public Utility District ("BCPUD") was formed in 1967 pursuant to a resolution of the Marin County Board of Supervisors which consolidated two previously existing districts: the Bolinas Beach Public Utility District (formed in 1927 to serve the Big Mesa) and the Bolinas Public Utility District (formed in 1935 to serve the Little Mesa and downtown areas).

As a public utility district, the BCPUD's governance authority is codified in the California Public Utilities Act of 1913, which empowers the district to provide a range of municipal services. The district is governed by a five-member Board of Directors, who are elected by registered voters (or appointed in-lieu of a contested election) to staggered four-year terms, and managed by a General Manager who supervises of staff of four shift operators and one administrative assistant. At present, the BCPUD directly or indirectly provides water, sewer, solid waste, drainage, and parks and recreation services within its boundaries.

1.4 Service Area

The BCPUD is located in unincorporated western Marin County, immediately to the south of the Point Reyes National Seashore and to the west of the Golden Gate National Recreation Area. The BCPUD has a jurisdictional boundary of approximately 2.6 square miles and covers 1,649 acres of unincorporated Marin County, as depicted in the map below. Approximately one-fifth of that acreage (350 acres) is part of the Point Reyes National Seashore. In total there are 1,168 legal parcels encompassed within BCPUD's boundary.

Figure 5: Map of the Bolinas Community Public Utility District
Source: Marin County OEM

Figure 6 on the next page illustrates the Bolinas Community Public Utility District service area in Salmon and the jurisdictional boundaries of the Cities and Towns within Marin County.

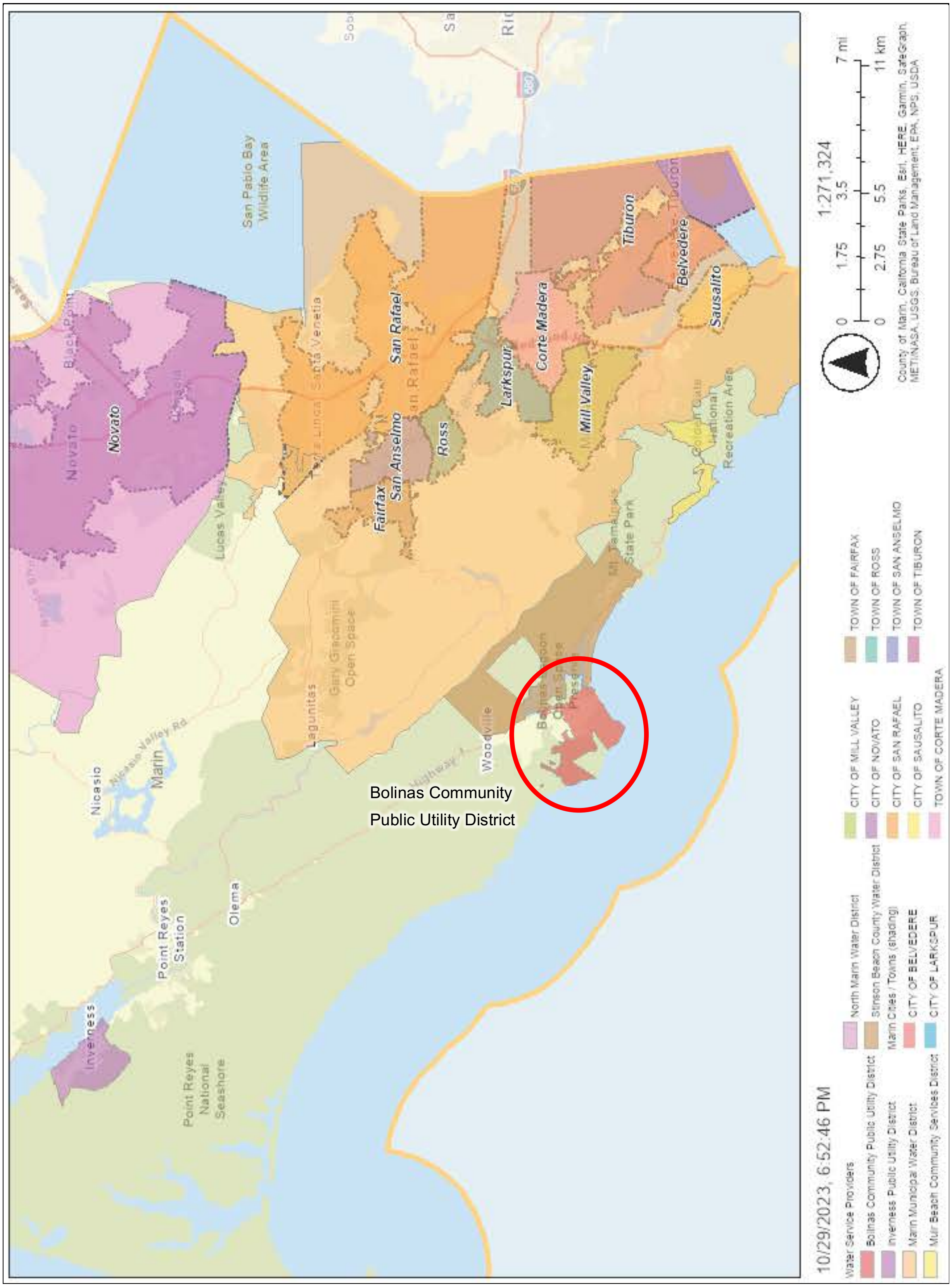


Figure 6: Map of the Bolinas Community Public Utility District and Jurisdictions
Source: Marin County OEM

Water Service

The BCPUD provides potable water services through its own supply, transmission, treatment, storage, and distribution facilities to 587 homes and businesses in the community of Bolinas. The BCPUD serves a population of approximately 1,500 full-time residents and an additional 1,000 seasonal or part time residents. All water diverted by BCPUD from its surface water sources receives treatment via inline coagulation and low-pressure microfiltration at its Woodrat Water Treatment Plant, constructed in 1995.

The majority of the BCPUD's distribution infrastructure was constructed prior to World War II by its two predecessor agencies, the Bolinas Beach Public Utility District and the Bolinas Public Utility District. The distribution system is comprised of approximately 19 miles of water mains which are gravity-fed from the District's two treated water storage tanks, the West Tank and the East Tank, which store a combined volume of 860,000 gallons of treated water.

The District's water is obtained from surface sources – the Arroyo Hondo Creek and two small emergency reservoirs supplied by unnamed streams -- contained within a 2 square mile watershed area of the Point Reyes National Seashore. In combination with the District's permitted diversions, these sources provide the BCPUD with an estimated maximum available annual yield of 167 acre-feet of water. Due to the limited nature of the BCPUD's surface water supplies, the BCPUD Board of Directors in 1971 declared a water shortage emergency and enacted a moratorium on new connections to the water system which remains in effect today. Water conservation is a way of life in Bolinas, with most households using less than 100 gallons of water per day

In 2021, the BCPUD received approval from the State Water Resources Control Board ("SWRCB") to add two existing groundwater wells as emergency sources to its water system to provide some resilience for the district in times of drought. The district applied to the California Department of Water Resources ("DWR") Small Communities Drought Relief Program for grant funding to install the treatment facilities and infrastructure needed to connect the wells to the district's distribution system. The DWR approved the funding in September 2022 and a funding agreement was finalized in September 2023. The BCPUD currently is in the process of applying for coastal permits to install the new facilities.

Wastewater Service

The BCPUD is the successor agency to the Marin County Sanitary District #3, organized in 1908. The District's sewer service area encompasses approximately three square miles with a collection system of pipelines stretching approximately three linear miles and consisting of pipes ranging in size from two inches to six inches. The collection system was constructed in two phases prior to and immediately after World War I and serves 162 connections (residential and business) in the downtown area of the community of Bolinas, as well as one additional connection on the Bolinas Mesa.

In 1975, responding to an order from the State of California to cease and desist disposing of the system's effluent in the channel of the Bolinas Lagoon, the BCPUD constructed a pump station, force main and treatment facility. The treatment facility is an integrated pond system which uses no chemicals in the treatment process, relying instead on a biological process of methane fermentation, with aeration and recirculation for odor control, and with ultimate disposal through pond evaporation and spray disposal on 45 acres of grasslands.

In 1990, the BCPUD completed an infiltration and inflow ("I&I") correction project to eliminate unwanted storm runoff and seawater intrusion into the collection system. While the project reduced I&I by 70%, the district continues to experience capacity problems in years when rainfall exceeds 50 inches. As a result, the district has continued a moratorium on new service connections enacted in 1985 as a requirement for state funding.

The BCPUD's sewer system is regulated by the Regional Water Quality Control Board for the San Francisco Bay Region ("Regional Board"). Since 1988, the district's sewer treatment facility has been subject to Waste Discharge Order 88-100. In 2021, Regional Board staff notified the district this permit is outdated and the Regional Board intends to transition to district's treatment facility to either the statewide General Order for Small Domestic Wastewater Treatment Systems (SWRCB Order WQ 2014-0153-DWQ) or an updated facility-specific permit. Among other things, the district will be required to upgrade its treatment facility in order to meet the requirement of the updated permit.

Drainage Service

The majority of residences within the District's jurisdictional boundaries are located on the Big Mesa and served by on-site wastewater treatment systems (septic systems). In the early 1990's the BCPUD hired Todd Engineering to prepare a set of drainage improvement maps with the objective of providing a high-level integrated approach to improving drainage on the Big Mesa by lowering the water table and improving septic system functioning via a series of projects to be executed by residents (or groups of residents) and their contractors over time. BCPUD provides project consultation services to District residents who are interested in implementing surface drainage projects on the Big Mesa. The District also provides culverts for project implementation "at cost" for those that are eligible.

Parks and Recreation

BCPUD does not have direct involvement in day-to-day parks and recreation activities within the District's jurisdictional boundaries. While the district owns the property on which Mesa Park (12-acres) is located and which has been improved with a parking lot, soccer field, baseball field, basketball court, playground and skate park, the land and the activities programmed there are managed by the Fire House Community Park Agency ("FHCPA"). FHCPA is a joint powers authority (JPA) whose member agencies include BCPUD and the Bolinas-Stinson Union School District. The JPA was created on January 21, 1985, with the stated intention of providing recreational opportunities to the taxpayers and residents of the area and to the students of the school and their families. FHCPA is a separate special district and receives no direct funding from BCPUD but rather receives revenue by way of Measure A funds and ad valorem property taxes.

Solid Waste Disposal Services

BCPUD provides residential and commercial properties within the District with weekly solid waste disposal, recycling and organic waste collection services pursuant to a franchise agreement with Recology Sonoma Marin.

1.4 Administration

The BCPUD has a five-member board that is elected to staggered four-year terms. All directors are required to be registered voters within the District's jurisdictional boundaries. The Board of Directors meets regularly on the 3rd Wednesday of each month at 7:30 p.m. at the BCPUD's Administrative Building located at 270 Elm Road in Bolinas, and holds special meetings as needed. The Board has a President, a Vice-President and three directors; the district's General Manager serves as Secretary to the Board. The Board also has several standing committees including Finance, Legal, Personnel, and Operations. Full time employees include the General Manager, Administrative Assistant, Chief Operator and three Shift Operators; the addition of an Assistant General Manager position is planned for 2024. The Board of Directors appoints the General Manager, who serves on an at-will basis, to oversee all District activities and implement the policies established by the Board of Directors. The Board provides policy direction to the General Manager on matters within the authority of the Board by majority vote of the Board members present during duly convened public meetings.

1.5 Weather and Climate

The Bolinas Community Public Utility District sits within an elevation range of 36 - 170 feet above sea level. The summers are long, comfortable, arid, and mostly clear and the winters are short, cold, wet, and partly cloudy. Over the course of the year, the temperature typically varies from 42°F to 77°F and is rarely below 41°F or above 78°F. The difference in precipitation between the driest month and the wettest month is 8 inches. The BCPUD records and average annual rainfall of 32 inches. The month which sees the most rainfall is December. The driest month of the year is July.

Climate data for Bolinas, California [hide]													
Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Average high °F (°C)	55.2 (12.9)	59.6 (15.3)	63.0 (17.2)	66.1 (18.9)	69.8 (21.0)	74.1 (23.4)	76.7 (24.8)	77.1 (25.1)	77.0 (25.0)	72.1 (22.3)	62.6 (17.0)	55.3 (12.9)	67.4 (19.7)
Daily mean °F (°C)	48.8 (9.3)	52.2 (11.2)	54.5 (12.5)	56.8 (13.8)	55.8 (13.2)	59.9 (15.5)	65.4 (18.6)	65.8 (18.8)	65.4 (18.6)	61.7 (16.5)	54.8 (12.7)	49.1 (9.5)	57.5 (14.2)
Average low °F (°C)	42.3 (5.7)	44.7 (7.1)	45.9 (7.7)	47.4 (8.6)	50.0 (10.0)	52.7 (11.5)	54.0 (12.2)	54.4 (12.4)	53.8 (12.1)	51.3 (10.7)	47.0 (8.3)	42.9 (6.1)	48.9 (9.4)
Average precipitation inches (mm)	7.7 (200)	7.8 (200)	5.5 (140)	2.2 (56)	1.3 (33)	0.3 (7.6)	0 (0)	0.1 (2.5)	0.3 (7.6)	1.9 (48)	5.3 (130)	8.3 (210)	40.7 (1,034.7)
Source: Bestplaces.net[18]													

Figure 7: The BCPUD Precipitation and Monthly Temperatures
Source: En.Climate-Data.org

1.6 Social Vulnerability and Risk

The California Governor's Office of Emergency Services (Cal OES) has initiated the "Prepare California" grant program focused on building community resilience amongst vulnerable individuals living in the areas of the state most susceptible to natural disasters. The Prepare California Initiative is aimed at reducing long-term risks from natural disasters by investing in local capacity building and mitigation projects designed to protect communities.

Prepare California leverages funds approved in Governor Gavin Newsom's 2021-22 State Budget and is designed to unlock federal matching funds for community mitigation projects that vulnerable communities would otherwise be unable to access. This program is intended for communities that are the most socially vulnerable and at the highest risk for future natural hazard events. The state identified communities by prioritizing California census tracts according to their estimated hazard exposures and social vulnerability.

The National Risk Index is a dataset and online tool to help illustrate the United States communities most at risk for 18 natural hazards: Avalanche, Coastal Flooding, Cold Wave, Drought, Earthquake, Hail, Heat Wave, Hurricane, Ice Storm, Landslide, Lightning, Riverine Flooding, Strong Wind, Tornado, Tsunami, Volcanic Activity, Wildfire, and Winter Weather.

For purposes of this plan the following National Risk Index (NRI) hazards are profiled in support of eight of the twelve Marin County MJHMP Hazards. NRI data was not available for Dam Failure, Land Subsidence, Levee Failure, or Sea Level Rise.

Table 3: NRI Hazards and Marin County MJHMP Hazards

NRI Hazards	Marin County MJHMP Hazards
Earthquake	Earthquake
Riverine Flooding	Flooding
Coastal Flooding	Flooding
Wildfire	Wildfire
Landslide	Debris Flow
Drought	Drought
Heat Wave	Severe Weather -Extreme Heat
Tsunami	Tsunami
Strong Wind	Severe Weather – Wind, Tornado

Table 3: NRI Hazards and Marin County MJHMP Hazards
Source: FEMA National Risk Index 2023

The National Risk Index leverages available source data for Expected Annual Loss due to these 18 hazard types, Social Vulnerability, and Community Resilience to develop a baseline relative risk measurement for each United States county and Census tract. These measurements are calculated using average past conditions, but they cannot be used to predict future outcomes for a community. The National Risk Index is intended to fill gaps in available data and analyses to better inform federal, state, local, tribal, and territorial decision makers as they develop risk reduction strategies.

Calculating the Risk Index

Risk Index scores are calculated using an equation that combines scores for Expected Annual Loss due to natural hazards, Social Vulnerability and Community Resilience:

Risk Index = Expected Annual Loss × Social Vulnerability ÷ Community Resilience

Hazard Type Risk Index

Hazard type Risk Index scores are calculated using data for only a single hazard type, and reflect a community's Expected Annual Loss value, community risk factors, and the adjustment factor used to calculate the risk value.

The following Tables and Figures illustrates the NRI Hazard Type Risk Index and the Social Vulnerability Map for the Bolinas Community Public Utility District for the various Census Tracts within its service area.

Table 4: NRI Hazard Type Risk Index Census Tract 1321.00						
Hazard Type	**EAL Value**	**Social Vulnerability**	**Community Resilience**	**CRF**	**Risk Value**	**Score**
Earthquake	$1,334,090	Very Low	Very High	0.79	$1,051,384	91.6
Riverine Flooding	$296,155	Very Low	Very High	0.79	$233,397	92.5
Landslide	$25,977	Very Low	Very High	0.79	$20,472	98.3
Coastal Flooding	$19,189	Very Low	Very High	0.79	$15,122	91.1
Wildfire	$11,259	Very Low	Very High	0.79	$8,873	83.3
Tsunami	$4,427	Very Low	Very High	0.79	$3,489	98.3
Tornado	$2,307	Very Low	Very High	0.79	$1,818	4.4
Drought	$1,339	Very Low	Very High	0.79	$1,055	84.1
Heat Wave	$316	Very Low	Very High	0.79	$249	16.9
Strong Wind	$122	Very Low	Very High	0.79	$96	4.5

Table 4: NRI Hazard Type Risk Index for Census Tract 1321.00
Source: FEMA National Risk Index 2023

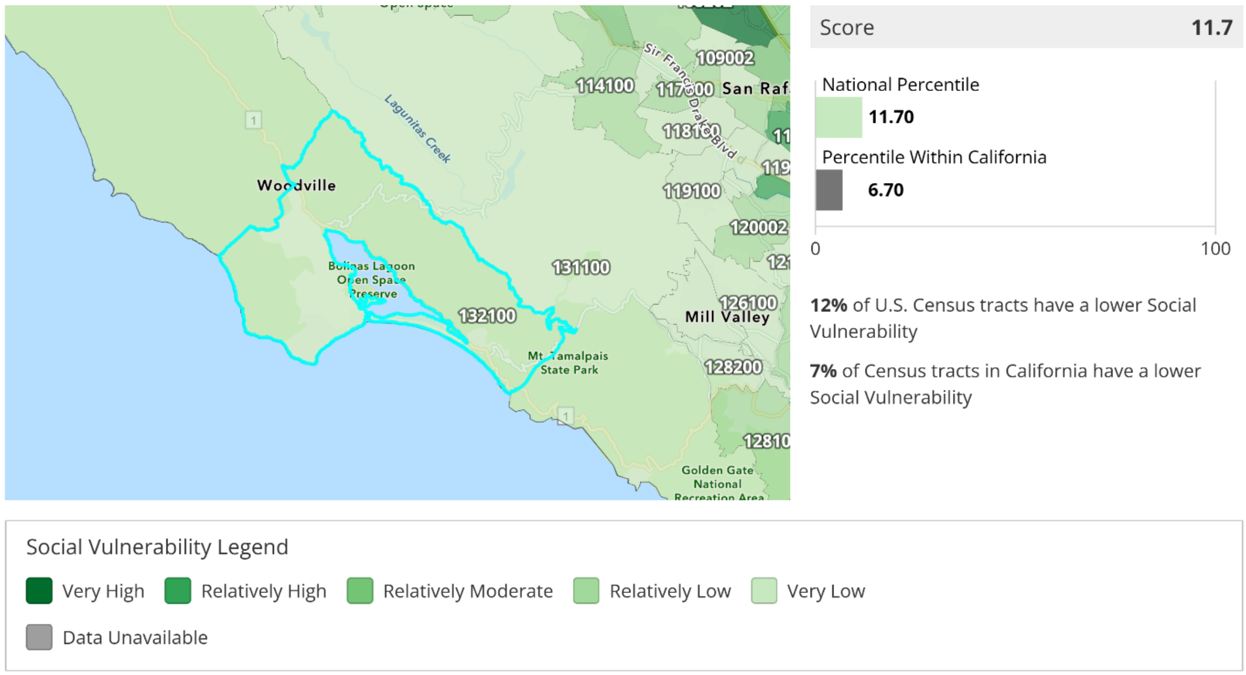


Figure 8: BCPUD Social Vulnerability Map Census Tract 1321.00
Source: FEMA National Risk Index 2023

Social Vulnerability in Marin County and the Bolinas Community Public Utility District

Most socially vulnerable residents in Marin County reside in parts of Novato, parts of San Rafael, including in and around the Canal District, the Greenbrae neighborhood of Larkspur, and the unincorporated areas of Marin City and Santa Venetia. This aligns with what the County knows about Marin residents. However, discrepancy lies in the western, more rural area of the County. West Marin is comprised of seven villages, including Bolinas[1], and other populated areas, that are distanced from the centralized resources in the eastern part of the county. At three local elementary schools in West Marin (2022-2023 school year), including Bolinas, students eligible for free and reduced lunch program are, 62%, 41%, and 52%, a reflection of the financial capacity of local families. West Marin is home to many farms that may employ and house underrecognized workers that may not have taken part in a census survey, what the SVI is calculated from. In the fourth quarter of FY 2021/22 the bus routes traveling to West Marin (Rural Routes) were the only service category to have increased in ridership since pre-COVID (increase 0.1%; Marin Transit, 2022) showing the reliance of West Marin residents on public transportation; however, this data continues to adjust based upon the increase in alternate methods of mass transportation. Considering this, the County of Marin acknowledges that unique social factors in West Marin require different approaches than other parts of the County.

[1] Bolinas is categorized as a "low income community" by California Air Resources Board's Community Investments: https://www.arb.ca.gov/cc/capandtrade/auctionproceeds/communityinvestments.htm

Looking to the community resilience index (CRI) results, the data is only calculated at the county-level and compared across the nation. As a whole, Marin County is considered to have a "very high" ability to prepare for anticipated natural hazards, adapt to changing conditions, and withstand and recover rapidly from disruptions when compared to the rest of the U.S. Unfortunately, this metric does not give us the distinct experiences of the diverse communities across Marin.

When the Estimated Annual Loss Index, Social Vulnerability Index, and Community Resilience Index are aggregated as one, final results of the National Risk Index show Marin County as a whole to have "Relatively High" risk, this is due to the financial implications a disaster may have on the county. When broken out by census tract, five tracts are in the highest category ("Very High Risk"), this matches generally with the same tracts that are ranked in as higher social vulnerability; parts of Novato, parts of San Rafael, including in and around the Canal District, the Greenbrae neighborhood of Larkspur, and unincorporated areas of Santa Venetia.

Customers within the Bolinas Community Public Utility District service area reside within census tracts that have a Social Vulnerability Index of "Very Low". However, BCPUD residents have only one way in and out of their community (Olema-Bolinas Road) and this road floods frequently, making it unsafe to cross and rendering the residents unable to access their workplaces, groceries or medical resources. The Bolinas Community Public Utility District's scope of service to this community is limited to the water, sewer, solid waste, drainage, and parks and recreation services it provides within its jurisdictional boundaries. The district's influence may be realized during an emergency by ensuring the continued delivery of water, sewer, and solid waste services which are considered a community lifeline. The district may also work with these impacted customers to provide fee relief through local, state, and or federal programs where appropriate. The majority of socially vulnerable population services are provided through the county, state, and federal government or other non-governmental or volunteer agencies or organizations.

1.9 Critical Facilities

The following list of facilities has been determined to be critical to the ability of the Bolinas Community Public Utility District to fulfill the requirements of its mission during an emergency:

Table 5: Bolinas Community Public Utility District Critical Facilities

	Category	Name	Address	Fire Severity Zone	Flood Zone
1.	**Dams**	Woodrat 1 Reservoir	400 Mesa Road, Bolinas	Moderate	None
2.	**Dams**	Woodrat 2 Reservoir	450 Mesa Road, Bolinas	Moderate	None
	Critical Infrastructure				
3.	**Water/Wastewater Facilities**	Administrative Building	270 Elm Road, Bolinas	Moderate	None
4.	**Water Facilities**	Corporation Yard and Shop Buildings	270 Elm Road, Bolinas	Moderate	None
5.	**Water Facilities**	Woodrat Water Treatment Plant	400 Mesa Road, Bolinas	Moderate	None

6.	**Water Facilities**	West Tank (potable water storage)	390 Mesa Road, Bolinas	Moderate	None
7.	**Water Facilities**	East Tank (potable water storage)	390 Mesa Road, Bolinas	Moderate	None
8.	**Water Facilities**	Booster Pump Station	390 Mesa Road, Bolinas	Moderate	None
9.	**Water Facilities**	Water distribution system (serves residents with potable water)	BCPUD jurisdictional boundary	Moderate	None
10	**Water Facilities**	Water transmission system (conveys raw water to treatment plant)	Arroyo Hondo watershed, Point Reyes National Seashore	Moderate	None
11	**Water Facilities**	Upper Impoundment (fixed concrete structure)	Arroyo Hondo Creek, Point Reyes National Seashore	Moderate	None
12	**Water Facilities**	Lower Impoundment (radial gate structure)	Arroyo Hondo Creek, Point Reyes National Seashore	Moderate	None
13	**Water Facilities**	Pump house (conveys water from Woodrat 2 reservoir to treatment plant)	510 Mesa Road, Bolinas	Moderate	None
14	**Wastewater Facilities**	Laboratory	101 Mesa Road, Bolinas	Moderate	None
15	**Wastewater Facilities**	Wharf Road Sewer Lift Station	51 Wharf Road, Bolinas	Moderate	None
16	**Wastewater Facilities**	Force Main	Wharf Road, Olema-Bolinas Road to Treatment Ponds at 101 Mesa Road, Bolinas	Moderate	None
17	**Wastewater Facilities**	Wastewater Treatment Ponds Facility (integrated ponds/levees, disposal fields, seepage ponds and groundwater wells)	101 Mesa Road, Bolinas	Moderate	None
18	**Wastewater Facilities**	Wastewater Irrigation Pump Station	101 Mesa Road, Bolinas	Moderate	None
19	**Wastewater Facilities**	Wastewater collection system (serves customers on sanitary sewer system)	BCPUD jurisdictional boundary	Moderate	None
20	**Electrical Power Facilities**	Solar PV System	400 Mesa Road (water treatment plant)	Moderate	None
21	**Electrical Power Facilities**	Solar PV System	101 Mesa Road, Bolinas (wastewater treatment plant)	Moderate	None

Table 5: Bolinas Community Public Utility District Critical Facilities
Source: Bolinas Community Public Utility District

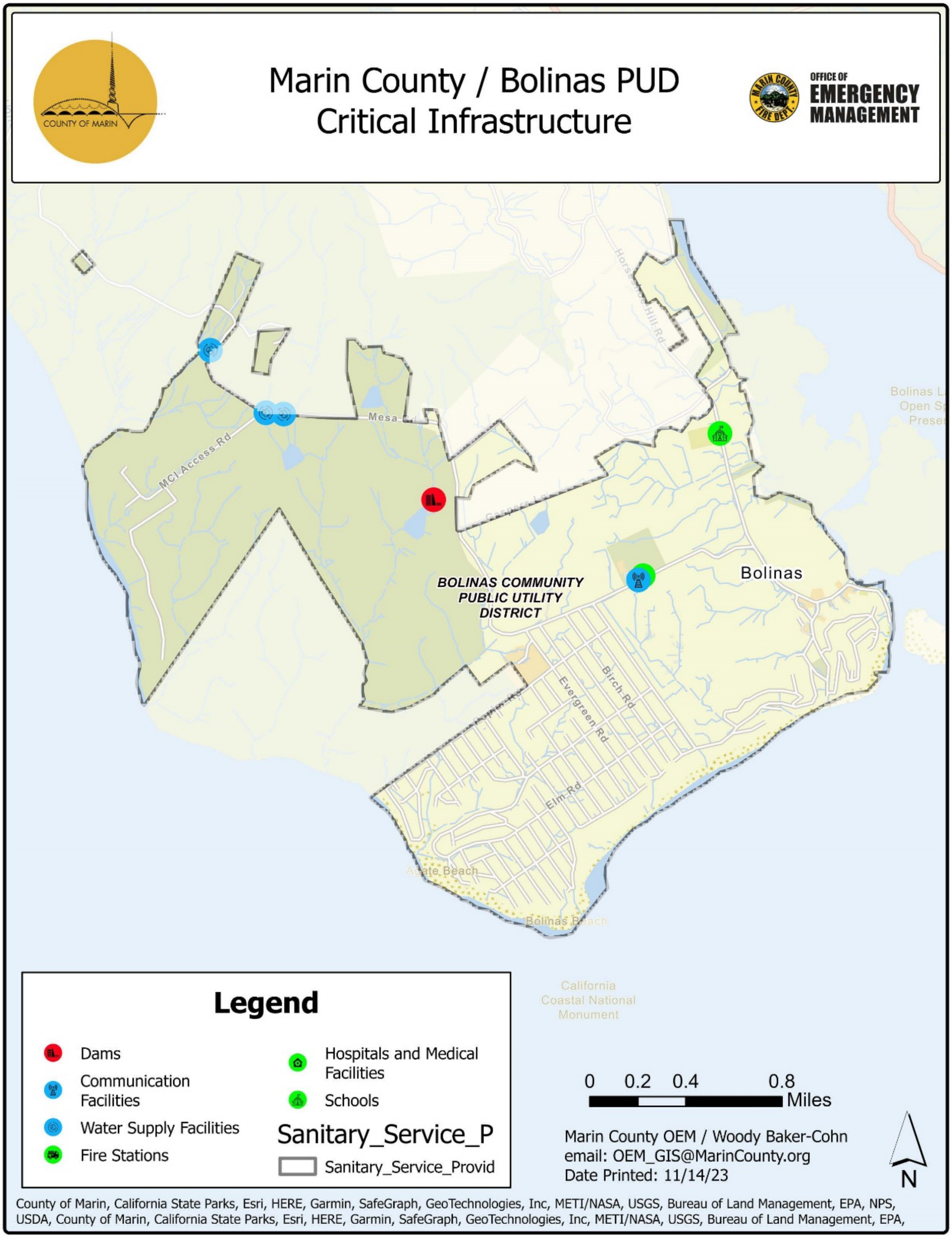


Figure 9: Bolinas Community Public Utility District Critical Facilities
Source: Marin County OEM

2.0 HAZARD IDENTIFICATION AND RISK ASSESSMENT

The Bolinas Community Public Utility District identified hazards that affect the District and developed natural hazard profiles based upon the countywide risk assessment, past events and their impacts. Figure 10 shows the top hazards that the Jurisdiction is at risk from according to the hazard mitigation Steering Committee.

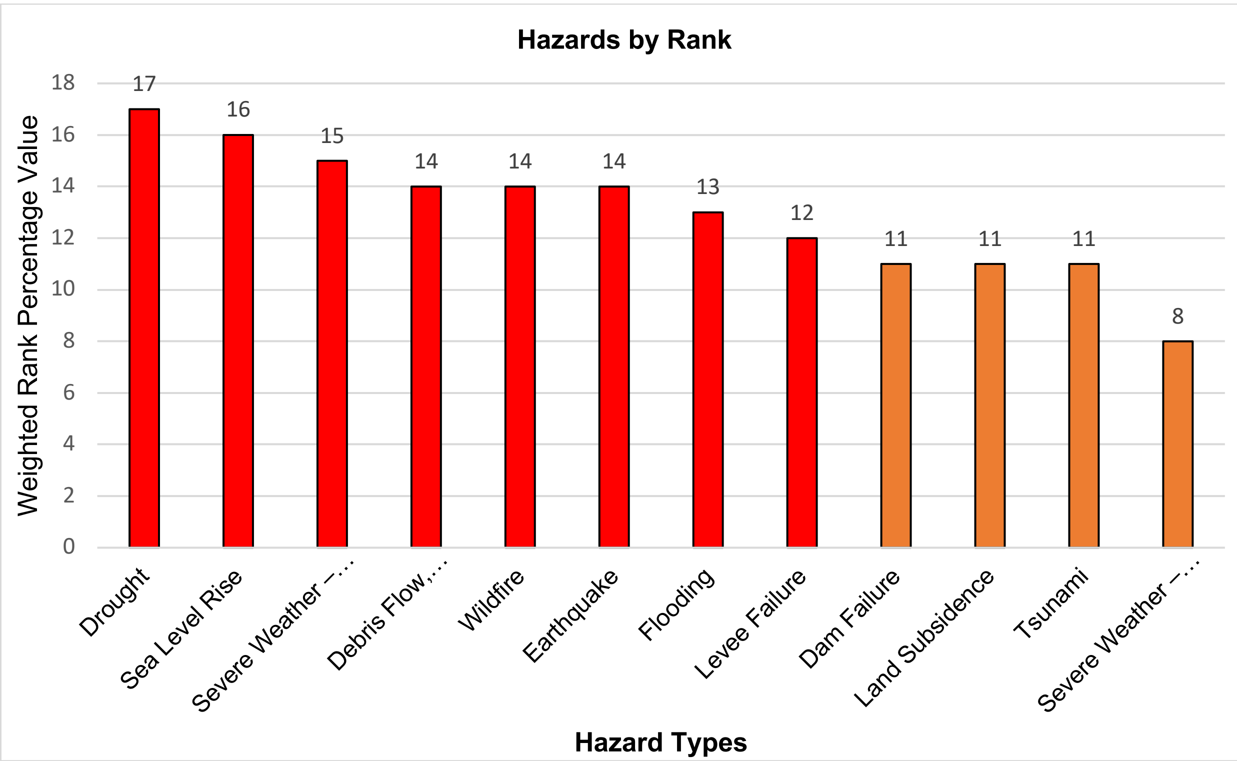


Figure 10: BCPUD Risk Assessment – Planning Team Top Hazards

Figure 11: Risk Rank Categorization	
Risk Level	Risk Numerical Score
High Risk	**12 - 18**
Serious Risk	**8 - 11**
Moderate Risk	**4 - 7**
Low Risk	**1 - 3**

Figure 11: Hazard Risk Categorization

Each Marin County MJHMP participating jurisdiction and special district reviewed and approved the Top Hazards identified by the Planning Team. Each participating jurisdiction and special district then completed a more complex assessment tool to further develop their hazard assessment and prioritization.

The planning process used the available FEMA tools to evaluate all the possible threats faced. The primary tool selected was the Hazard Assessment and Prioritization Tool. This matrix allowed the participating jurisdiction or special district to assess their own level of vulnerability and mitigation capability. Each participating Jurisdiction and special district assessed the top hazards for:

- Probability/ Likelihood of Future Events
- Geographic Extent
- Magnitude/ Severity
- Climate Change Influence
- Significance

Probability/ Likelihood of Future Events

- **Unlikely:** Occurs in intervals greater than 100 years - Less than 1% probability of occurrence in the next year or a recurrence interval greater than 100 years.
- **Occasional:** Occurring every 11 to 100 years - 1-10% probability of occurrence in the next year or a recurrence interval of 11 to 100 years.
- **Likely:** Occurring every 1 to 10 years - 10-90% probability of occurrence in the next year or recurrence interval of 1 to 10 years.
- **Highly Likely:** Occurring almost every year - 90-100% probability of occurrence in the next year or a recurrence interval of less than 1 year.

Geographic Extent

- **Negligible:** Less than 10% of the planning area
- **Limited:** 10-25% of the planning area
- **Significant:** 25-75% of planning area
- **Extensive:** 75-100% of planning area

Magnitude/ Severity

- **Weak:** Limited classification on scientific scale, slow speed of onset or short duration of event, resulting in little to no damage.
- **Moderate:** Moderate classification on scientific scale, moderate speed of onset or moderate duration of event, resulting in some damage and loss of services for days.
- **Severe:** Severe classification on scientific scale, fast speed of onset or long duration of event, resulting in devastating damage and loss of services for weeks or months.
- **Extreme:** Extreme classification on scientific scale, immediate onset or extended duration of event, resulting in catastrophic damage and uninhabitable conditions.

Table 6: Select Hazards Magnitude and Severity Scale

Hazard	Scale/Index	Weak	Moderate	Severe	Extreme
Drought	Palmer Drought Severity Index	+1.99 to -1.99	-2.00 to -2.99	-3.00 to -3.99	-4.00 and below
Earthquake	Modified Mercalli	I to IV	V to VII	VIII	IX to XII
	Richter Magnitude	2,3	4,5	6	7,8
Tornado	Fujita Tornado Damage Scale	FO	F1, F2	F3	F4, F5

Table 6: Select Hazards Magnitude/ Severity Scale or Index

Climate Change Influence

- **Low:** Minimal potential impact
- **Medium:** Moderate potential impact
- **High:** Widespread potential impact

Significance

- **Low:** Minimal potential impact - Two or more criteria fall in lower classifications, or the event has a minimal impact on the planning area. This rating is sometimes used for hazards with a minimal or unknown record of occurrences or for hazards with minimal mitigation potential.
- **Medium:** Moderate potential impact - The criteria fall mostly in the middle ranges of classifications and the event's impacts on the planning area are noticeable but not devastating. This rating is sometimes used for hazards with a high extent rating but very low probability rating.
- **High:** Widespread potential impact - The criteria consistently fall in the high classifications and the event is likely/highly likely to occur with.

2.1 Climate Change

The County of Marin and associated jurisdictions profiled jointly recognize that the earth's climate is forcibly being augmented due to humans' reliance on fossil fuels and non-natural resources which pose negative impacts on the earth's climate. Reliance on fossil fuels and non-natural products results in the climate shifting to include unseasonable temperatures, more frequent and intense storms, prolonged heat and cold events, and a greater reliance on technological advancements to maintain the wellbeing of community members and balance of the environment. The forced adaptation to climatic shifts is necessary for the County and jurisdictions to understand and include with these assessments.

Locally to Marin, drought and rain events have already had devastating impacts to critical infrastructure, agriculture, and water resources; and globally, unseasonable temperatures have been identified as the cause for enhanced wildfires, severe droughts, ice sheets and glaciers disappearing, and persons emigrating from their countries due to a lack of sustainable, local resources. Melting land ice contributes additional water to the oceans and as ocean temperatures rise the water expands, both of which contribute to increase rates of sea level rise. Marin is bordered on the west by the Pacific Ocean and on the east by San Francisco Bay, making it particularly vulnerable to flooding and erosion caused by sea level rise.

The cause of current climate change is largely human activity, burning fossil fuels, natural gas, oil, and coal. Burning these materials releases greenhouse gases into Earth's atmosphere. Greenhouse gases trap heat from the sun's rays inside the atmosphere causing Earth's average temperature to rise. This rise in the planet's temperature was formerly called, "global warming", but climate change has shown to include both intense heat and cold shifts. The warming of the planet impacts local and regional climates. Throughout Earth's history, climate has continually changed; however, when occurring naturally, this is a slower process that has taken place over hundreds and thousands of years. The human influenced climate change that is happening now is occurring at an abnormally faster rate with devastating results.

GLOBAL OBSERVED AND PROJECTED IMPACTS AND RISKS
Source: Intergovernmental Panel on Climate Change, Headline Statements from the Summary for Policymakers, 2022

- Human-induced climate change, including more frequent and intense extreme events, has caused widespread adverse impacts and related losses and damages to nature and people, beyond natural climate variability.
- Global warming, reaching 1.5°C in the near-term, would cause unavoidable increases in multiple climate hazards and present multiple risks to ecosystems and humans.
- Beyond 2040 and depending on the level of global warming, climate change will lead to numerous risks to natural and human systems.
- The magnitude and rate of climate change and associated risks depend strongly on near-term mitigation and adaptation actions, and projected adverse impacts and related losses and damages escalate with every increment of global warming.
- Multiple climate hazards will occur simultaneously, and multiple climatic and non-climatic risks will interact, resulting in compounding overall risk and risks cascading across sectors and regions.

FUTURE TRENDS/ IMPACTS
Source: Study Confirms Climate Models are Getting Future Warming Projections Right – Climate Change: Vital Signs of the Planet (nasa.gov)

Global Warming

- If global warming transiently exceeds 1.5°C in the coming decades or later, then many human and natural systems will face additional severe risks.
- An estimated 60% of today's methane emissions are the result of human activities. The largest sources of methane are agriculture, fossil fuels, and decomposition of landfill waste.
- The concentration of methane in the atmosphere has more than doubled over the past 200 years. Scientists estimate that this increase is responsible for 20 to 30% of climate warming since the Industrial Revolution (which began in 1750).
- According to the most recent National Climate Assessment, droughts in the Southwest and heat waves (periods of abnormally hot weather lasting days to weeks) are projected to become more intense, and cold waves less intense and less frequent.
- The last eight years have been the hottest years on record for the globe.

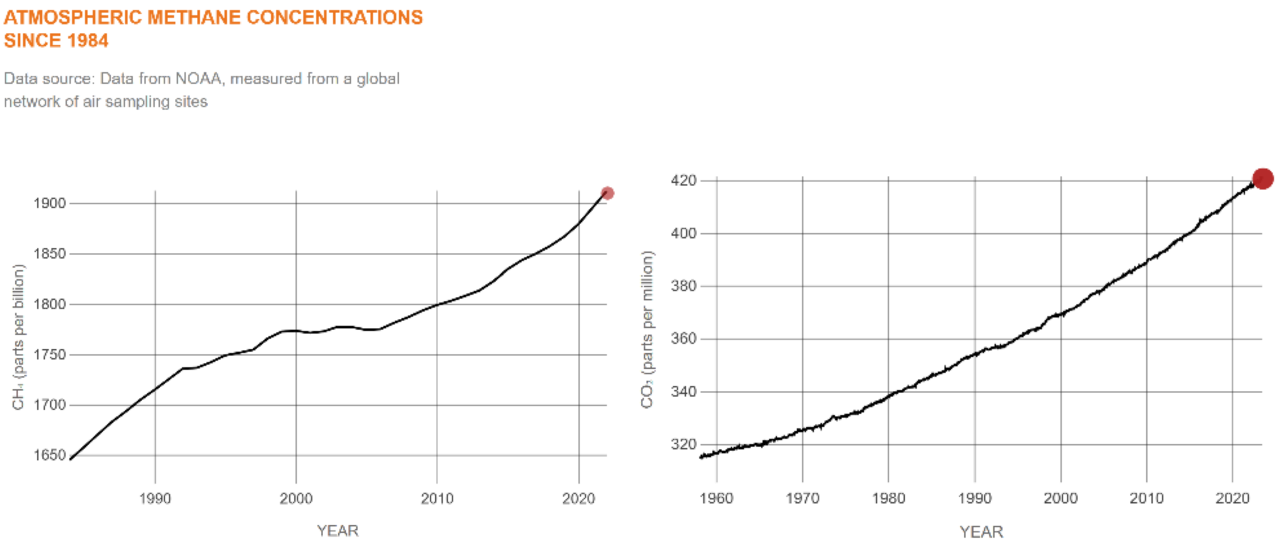


Figure 12: NASA Global Temperature Change CO2 Gas
Source: NASA Global Climate Change, 2022

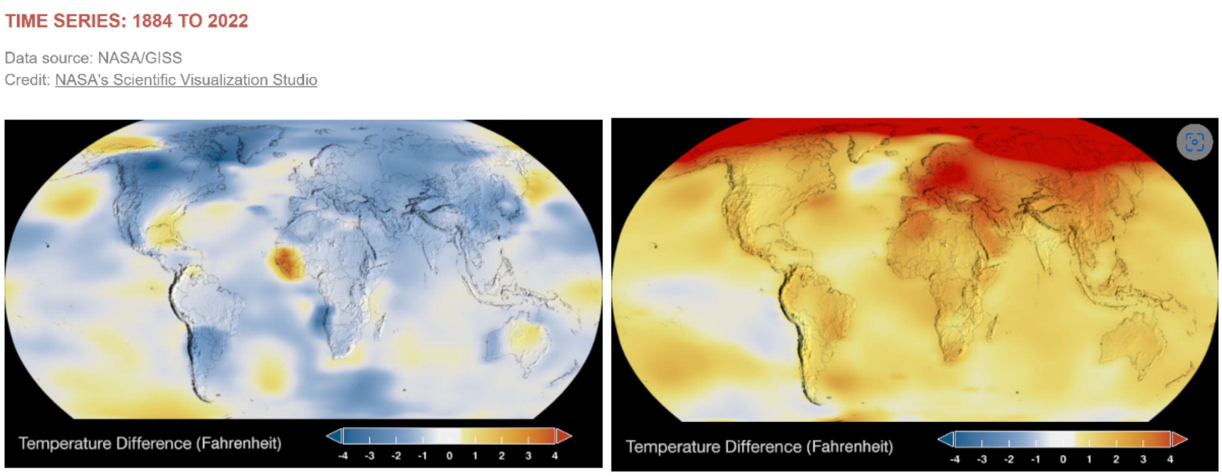


Figure 13: NASA Global Temperature Change 1884 to 2022
Source: NASA Global Climate Change, 2022

Drought

- A NASA-led study in 2022 concluded that the 22-year-long megadrought in southwestern US was the driest the territory had experienced in at least 1,200 years and was expected to persist through at least 2022.

Sea Level Rise

- Global sea levels are rising as a result of human-caused global warming, with recent rates being unprecedented over the past 2,500-plus years.

- U.S. Sea Level Likely to Rise 1 to 6.6 Feet by 2100.
- Global sea level has risen about 8 inches (0.2 meters) since reliable record-keeping began in 1880. By 2100, scientists project that it will rise at least another foot (0.3 meters), but possibly as high as 6.6 feet (2 meters) in a high-emissions scenario.
- Sea ice cover in the Arctic Ocean is expected to continue decreasing, and the Arctic Ocean will very likely become essentially ice-free in late summer if current projections hold. This change is expected to occur before mid-century.
- An indicator of changes in the Arctic sea ice minimum over time. Arctic sea ice extent both affects and is affected by global climate change.

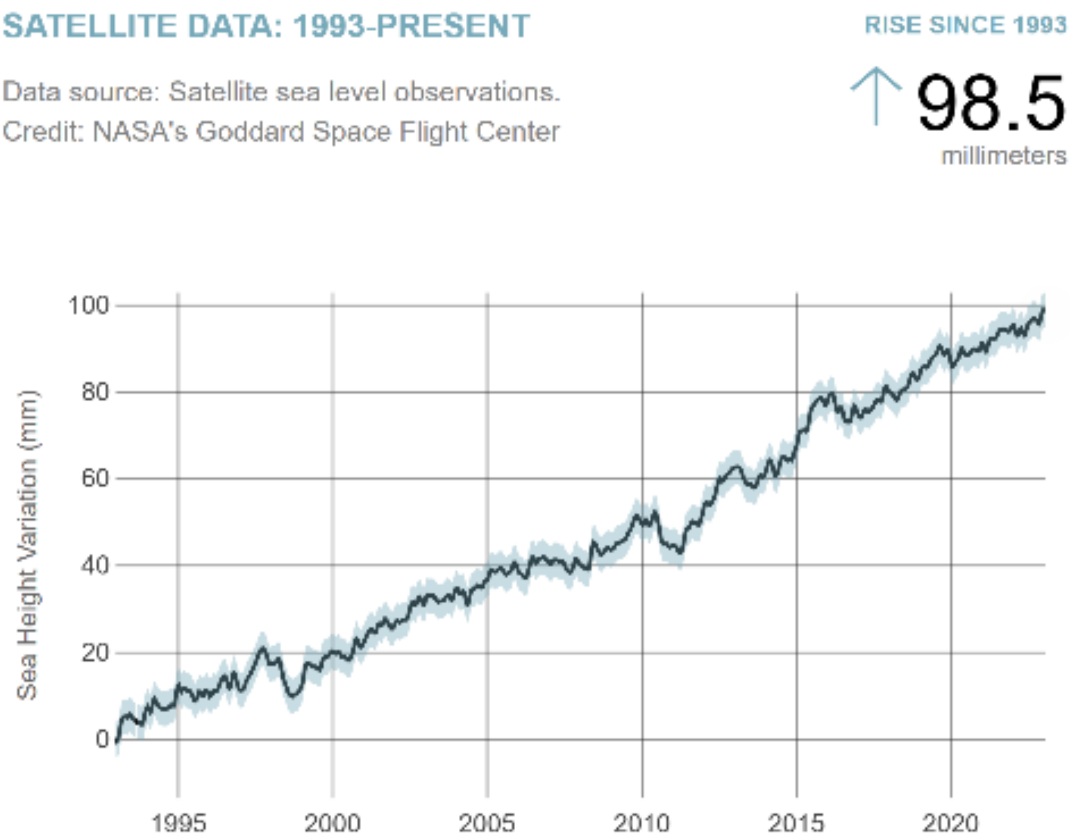


Figure 14: NASA Global Temperature Change Sea Level
Source: NASA Global Climate Change, 2022

<u>Wildfire</u>

- Warming temperatures have extended and intensified wildfire season in the West, where long-term drought in the region has heightened the risk of fires.
- Scientists estimate that human-caused climate change has already doubled the area of forest burned in recent decades. By around 2050, the amount of land consumed by wildfires in Western states is projected to further increase by two to six times.
- Even in traditionally rainy regions like the Southeast, wildfires are projected to increase by about 30%.

Flooding (Precipitation)

- Climate change is having an uneven effect on precipitation (rain and snow) in the United States, with some locations experiencing increased precipitation and flooding, while others suffer from drought.
- On average, more winter and spring precipitation is projected for the northern United States, and less for the Southwest, over this century.
- Projections of future climate over the U.S. suggest that the recent trend toward increased heavy precipitation events will continue. This means that while it may rain less frequently in some regions (such as the Southwest), when it does rain, heavy downpours will be more common.

Extreme Cold

- The length of the frost-free season, and the corresponding growing season, has been increasing since the 1980s, with the largest increases occurring in the western United States.

According to the California Natural Resource Agency (CNRA), climate change is already affecting California and is projected to continue to do so well into the foreseeable future. Current and projected changes include increased temperatures, sea level rise, a reduced winter snowpack, altered precipitation patterns, and more frequent storm events. Over the long term, reducing greenhouse gases can help make these changes less severe, but the changes cannot be avoided entirely. Unavoidable climate impacts result in a variety of secondary consequences including detrimental impacts on human health and safety, economic continuity, ecosystem integrity and provision of basic services. Climate change is being profiled in the 2023 Marin County Hazard Mitigation Plan as a standalone hazard while addressing each of the other natural hazards. Marin County is considering climate change issues when identifying future mitigation actions.

California is experiencing a climate crisis that is increasingly taking a toll on the health and well-being of its people and on its unique and diverse ecosystems. Every Californian has suffered from the effects of record high temperatures, dry winters, prolonged drought, and proliferating wildfires in recent years. California's biodiversity is threatened as alterations to habitat conditions brought about by a changing climate are occurring at a pace that could overwhelm the ability of plant and animal species to adapt.

Indicators of Climate Change in California

Source: 2022 Report: Indicators of Climate Change in California | OEHHA

- Since 1895, annual average air temperatures in California have increased by about 2.5 degrees Fahrenheit (°F). Warming occurred at a faster rate beginning in the 1980s.
- Recent years have been especially warm: Eight of the ten warmest years on record occurred between 2012 and 2022; 2014 was the warmest year on record.
- Of all the Western states, California endured the hottest temperatures for the longest time, driving the average statewide temperature to the second warmest over the past 128 years.

- Extreme heat ranks among the deadliest of all climate-driven hazards in California, with physical, social, political, and economic factors effecting the capacity of individuals, workers, and communities to adapt, and with the most severe impacts often on communities who experience the greatest social and health inequities.
- Glaciers have essentially disappeared from the Trinity Alps in Northern California
- In 2020, wildfire smoke plumes were present in each county for at least 46 days.
- The 2022 fire season saw more fires than the previous fire season along with continued extreme drought and heat conditions.
- The drought, begun in 2019, was the third statewide drought declared in California since 2000.
- This drought has been marked by extreme swings; the state received record-breaking amounts of precipitation in October and December 2021 that were offset by the driest January, February, and March 2022 dating back more than 100 years. The year 2023 opened with California simultaneously managing both drought and flood emergencies.
- A series of storms in late December 2022 and early January 2023 broke rural levees, disrupted power, flooded roads, downed trees, and eroded coastal land.
- Sea level rise accelerates coastal erosion, worsens coastal flooding during large storms and peak tidal events, and impacts important infrastructure positioned along our state's 1,100-mile coast.
- The western drought which impacted all of California and the western United States was nearly lifted due to unseasonably heavy rains in late 2022 and early 2023.

The graph below shows the relative change, in millimeters, in sea levels at Crescent City (1933-2020), San Francisco (1900-2020), and La Jolla (1925-2020).

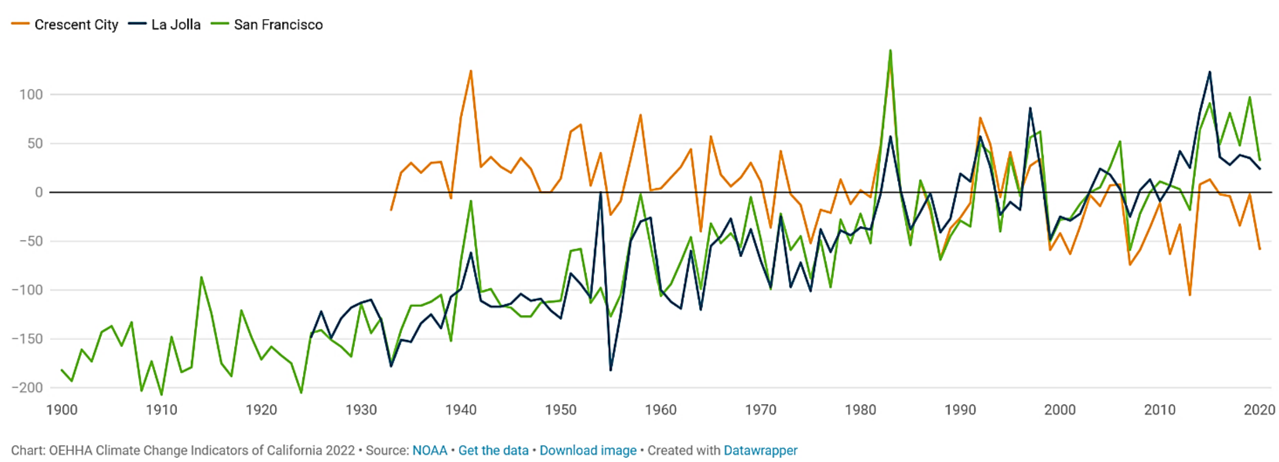


Figure 15: Annual Mean Sea Level Trends
Source: 2022 Report: Indicators of Climate Change in California | OEHHA

Climate Change in the Marin County Operational Area

Climate change is already having significant impacts across California. Temperatures are warming, heat waves are more frequent, and precipitation has become increasingly variable. The annual average daily high temperatures in California are expected to rise by 2.7°F by 2040, 5.8°F by 2070, and 8.8°F by 2100 compared to observed and modeled historical conditions[2]. At the current rate, annual average temperatures in the San Francisco Bay Area will likely increase by approximately 4.4 degrees by 2050 and 7.2 degree by the end of the century unless significant efforts are made to reduce greenhouse emotions according to California's latest climate change assessment.

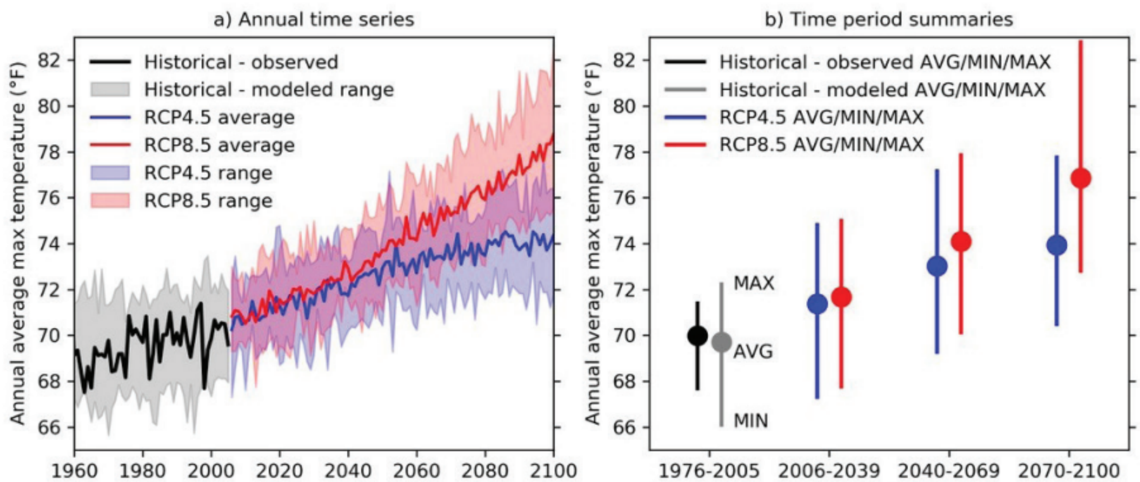


Figure 16: Annual Average Temperatures in the San Francisco Bay Area, 2000-2100
Source: California Climate Change Assessment (Fourth Edition)

Sea level rise in the San Francisco Bay Area is projected to increase by eight inches MHW in 2050 and could reach 4.5 to eight feet by 2021 if greenhouse gas emissions aren't reduced. Marin Shoreline Sea Level Rise Vulnerability Assessment: https://www.marincounty.org/-/media/files/departments/cd/planning/slr/baywave/vulnerability-assessment-final/final_allpages_bvbconsulting_reduced.pdf?la=en

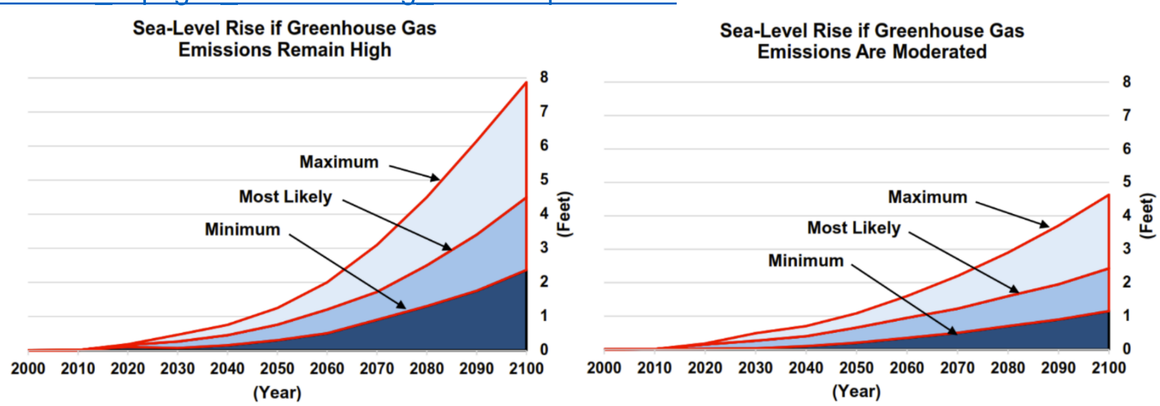


Figure 17: Projections of Sea Level Rise in the San Francisco Bay Area, 2000-2100
Source: 2019–2020 Marin County Civil Grand Jury, Climate Change:, How Will Marin Adapt?

[2] California Adaptation Planning Guide

Climate change will continue to alter Marin County OA ecosystems as a result of rising temperatures, changes in precipitation, and sea level rise, which will increase the severity and occurrence of natural hazards across the Marin County OA well into the future. Coastal cooling processes that keep temperatures down, such as fog, will continue to decrease. Rising temperatures will exacerbate drought conditions and raise the potential for significant wildfires and associated smoke as vegetation becomes drier and tree mortality increases. Forested woodlands that play a major role in carbon reduction will gradually transition into chaparral and shrublands. There will be more extreme storms and weather events, including expanded heat waves and increased rain events with changes in precipitation. Significant rain events will lead to an increase in flooding and the potential for severe landslides. Shoreline communities will become inundated with sea level rise and high tide events. Marshlands and wetlands that act as natural storm barriers will disappear as they transition into open water.

Notable impacts from climate change that are already evident in the Marin County OA and surrounding region as identified in a 2020 Marin County Civil Grand Jury Report include:

- From 1895-2018, the average temperature in Marin County increased by 2.3 degrees Fahrenheit.
- Over the past century, sea level rise in the San Francisco Bay Area rose by eight inches and has accelerated rapidly since 2011.
- The threat of wildfires in 2019 was so severe that Pacific Gas and Electric shut off electric power to the County for multiple days

Climate change will continue to affect homes, businesses, infrastructure, utilities, transportation systems and agriculture across the Marin County OA. The risk to socially vulnerable populations will increase as they feel the immediate impacts of climate change more significantly and are less able to adapt to climate changes and recover from its impacts.

The Marin County OA has adopted numerous planning initiatives and mitigation measures to help combat the effects of climate change across the OA. The Marin Climate Energy Partnership (MCEP), which is a partnership program of Marin County jurisdictions, the County, and Marin County regional agencies, adapted a model Climate Action Plan (CAP) that is intended to support countywide implementation efforts and is currently being used to update additional climate action plans for other jurisdictions in Marin County. The CAP supports the Climate Action Plan for the unincorporated County, which was completed in 2020. The MCEP also collects data and report on progress in meeting each County jurisdictions' individual greenhouse gas emission targets. In June 2023, the County published the Greenhouse Gas Inventory for Unincorporated Community Emissions for the Year 2021. Marin County OA jurisdictions have already met their greenhouse reduction goals for 2020 and are about halfway to meeting the statewide goal to reduce emissions 40% below 1990 levels by the year 2030. Marin County also formed a Sea Level Marin Adaptation Response Team in 2018 and had a Sea Level Rise Vulnerability Assessment and associated Adaptation Report completed for the County and each of its jurisdictions in 2017 as part of their Bay Waterfront Adaptation and Vulnerability Evaluation. Additional Marin County OA climate change mitigation initiatives include Marin Clean Energy, Electrify Marin, the Marin Solar Project, the Marin Energy Watch Partnership, Resilient Neighborhoods, and Drawdown: Marin.

2.2 Hazards

Of the hazards profiled in the Marin County MJHMP, those noted in the table are specific for the Bolinas Community Public Utility District as per the planning team.

Table 7: Bolinas Community PUD Hazard Risk Assessment

Hazard	Probability/ Likelihood of Future Events	Geographic Extent	Magnitude/ Severity	Climate Change Influence	Significance	Risk Score
Dam Failure	Unlikely	Limited	Extreme	High	Medium	**11.00**
Debris Flow, Erosion, Landslide, Post-Fire Debris Flow	Highly Likely	Limited	Moderate	High	High	**14.00**
Drought	Highly Likely	Extensive	Severe	High	High	**17.00**
Earthquake	Likely	Extensive	Extreme	None	High	**14.00**
Flooding	Likely	Significant	Moderate	High	Medium	**13.00**
Land Subsidence (Sinkhole)	Likely	Limited	Moderate	Medium	Medium	**11.00**
Levee Failure	Unlikely	Limited	Extreme	High	Medium	**12.00**
Sea Level Rise	Likely	Extensive	Severe	High	High	**16.00**
Severe Weather – Extreme Heat	Unlikely	Extensive	Weak	Low	Low	**8.00**
Severe Weather – Wind, Tornado	Highly Likely	Extensive	Moderate	High	High	**15.00**
Tsunami	Occasional	Limited	Severe	Low	High	**11.00**
Wildfire	Occasional	Extensive	Severe	High	Medium	**14.00**

Table 7: Bolinas Community PUD Hazard Risk Assessment
Source: Bolinas Community Public Utility District

Omitted Hazards: Dam Inundation - The Bolinas Community Public Utility District is not within any classified Dam inundation zones. Although, the Bolinas Community Public Utility District maintains small private dams or reservoirs, these facilities are not certified by the California Department of Water Resources, Division of Safety of Dams and are not known to pose potential downstream impacts to life and private property.

Table 8: County of Marin Hazard Risk Assessment						
Hazard	Probability/ Likelihood of Future Events	Geographic Extent	Magnitude/ Severity	Climate Change Influence	Significance	Risk Score
Dam Failure	Unlikely	Negligible	Extreme	Low	Medium	**9.00**
Debris Flow	Occasional	Extensive	Severe	Medium	Medium	**13.00**
Drought	Highly Likely	Extensive	Moderate	High	High	**16.00**
Earthquake	Highly Likely	Extensive	Extreme	None	High	**15.00**
Flooding	Highly Likely	Limited	Severe	High	Medium	**14.00**
Land Subsidence	Occasional	Limited	Moderate	Medium	Medium	**10.00**
Levee Failure	Unlikely	Negligible	Moderate	Medium	High	**9.00**
Sea Level Rise	Highly Likely	Limited	Extreme	High	High	**16.00**
Severe Weather – Extreme Heat	Highly Likely	Extensive	Moderate	High	Medium	**15.00**
Severe Weather – Wind, Tornado	Highly Likely	Extensive	Moderate	High	Medium	**15.00**
Tsunami	Highly Likely	Limited	Extreme	Medium	High	**15.00**
Wildfire	Highly Likely	Significant	Severe	High	High	**16.00**

Table 8: County of Marin Hazard Risk Assessment
Source: Marin County

2.2.1 Dam Failure

Dams are manmade structures built for a variety of uses including flood protection, power generation, agriculture, water supply, and recreation. When dams are constructed for flood protection, they are usually engineered to withstand a flood with a computed risk of occurrence. For example, a dam may be designed to contain a flood at a location on a stream that has a certain probability of occurring in any one year. If prolonged periods of rainfall and flooding occur that exceed the design requirements, that structure may be overtopped and fail. Overtopping is the primary cause of earthen dam failure in the United States.

Dam failure is the uncontrolled release of impounded water from behind a dam. Flooding, earthquakes, blockages, landslides, lack of maintenance, improper operation, poor construction, vandalism, and terrorism can all cause a dam to fail. Dam failure causes downstream flooding that can affect life and property. Dam failures can result from any one or a combination of the following causes:

- Earthquake
- Inadequate spillway capacity resulting in excess overtopping flows
- Internal erosion caused by embankment or foundation leakage, or piping or rodent activity
- Improper design
- Improper maintenance
- Negligent operation
- Failure of upstream dams on the same waterway

Water released by a failed dam generates tremendous energy and can cause a flood that is catastrophic to life and property. A catastrophic dam failure could challenge local response capabilities and require evacuations to save lives. Impacts to life safety will depend on the warning time and the resources available to notify and evacuate the public. Major loss of life could result as well as potentially catastrophic effects to roads, bridges, and homes. Electric generating facilities and transmission lines could also be damaged and affect life support systems in communities outside the immediate hazard area. Associated water supply, water quality and health concerns could also be an issue. Factors that influence the potential severity of a full or partial dam failure are the amount of water impounded; the density, type, and value of development and infrastructure located downstream; and the speed of failure.

In general, there are three types of dams: concrete arch or hydraulic fill, earth and rockfill, and concrete gravity. Each type of dam has different failure characteristics. A concrete arch or hydraulic fill dam can fail almost instantaneously, where the flood wave builds up rapidly to a peak then gradually declines. An earth-rockfill dam fails gradually due to erosion of the breach, where a flood wave will build gradually to a peak and then decline until the reservoir is empty. A concrete gravity dam can fail instantaneously or gradually with a corresponding buildup and decline of the flood wave.

The California Department of Water Resources (DWR) Division of Safety of Dams (DSOD) has jurisdiction over impoundments that meet certain capacity and height criteria. Embankments that are less than six feet high and impoundments that can store less than 15 acre-feet are non-jurisdictional. Additionally, dams that are less than 25 feet high can impound up to 50 acre-feet without being jurisdictional. The Cal DWR DSOD assigns hazard ratings to large dams within the State. The following two factors are considered when assigning hazard ratings: existing land use and land use controls (zoning) downstream of the dam. Dams are classified in three categories that identify the potential hazard to life and property:

- **High hazard** indicates that a failure would most probably result in the loss of life
- **Significant hazard** indicates that a failure could result in appreciable property damage
- **Low hazard** indicates that failure would result in only minimal property damage and loss of life is unlikely

Since 1929, the state has supervised all non-federal dams in California to prevent failure for the purpose of safeguarding life and protecting property. Supervision is carried out through the state's Dam Safety Program under the jurisdiction of DWR. The legislation requiring state supervision was passed in response to the St. Francis Dam failure and concerns about the potential risks to the general populace from a number of water storage dams. The law requires:

- Examination and approval or repair of dams completed prior to August 14, 1929, the effective date of the statute.
- Approval of plans and specifications for and supervision of construction of new dams and the enlargement, alteration, repair, or removal of existing dams.
- Supervision of maintenance and operation of all dams under the state's jurisdiction.

The 1963 failure of the Baldwin Hills Dam in Southern California led the Legislature to amend the California Water Code to include within state jurisdiction both new and existing off-stream storage facilities.

Dams and reservoirs subject to state supervision are defined in California Water Code §6002 through §6004, with exemptions defined in §6004 and §6025. In administering the Dam Safety Program, DWR must comply with the provisions of the California Environmental Quality Act (CEQA). As such, all formal dam approval and revocation actions must be preceded by appropriate environmental documentation.

In 1972, Congress moved to reduce the hazards from the 28,000 non-federal dams in the country by passing Public Law 92-367, the National Dam Inspection Act. With the passage of this law, Congress authorized the U.S. Army Corps of Engineers (USACE) to inventory dams located in the United States. The action was spurred by two disastrous earthen dam failures during the year, in West Virginia and South Dakota, that caused a total of 300 deaths.

The Water Resources Development Act of 1986 (P.L 99-662) authorized USACE to maintain and periodically publish an updated National Inventory of Dams (NID). The Water Resources Development Act of 1996 (P.L. 104-303), Section 215, re-authorized periodic updates of the NID by USACE.

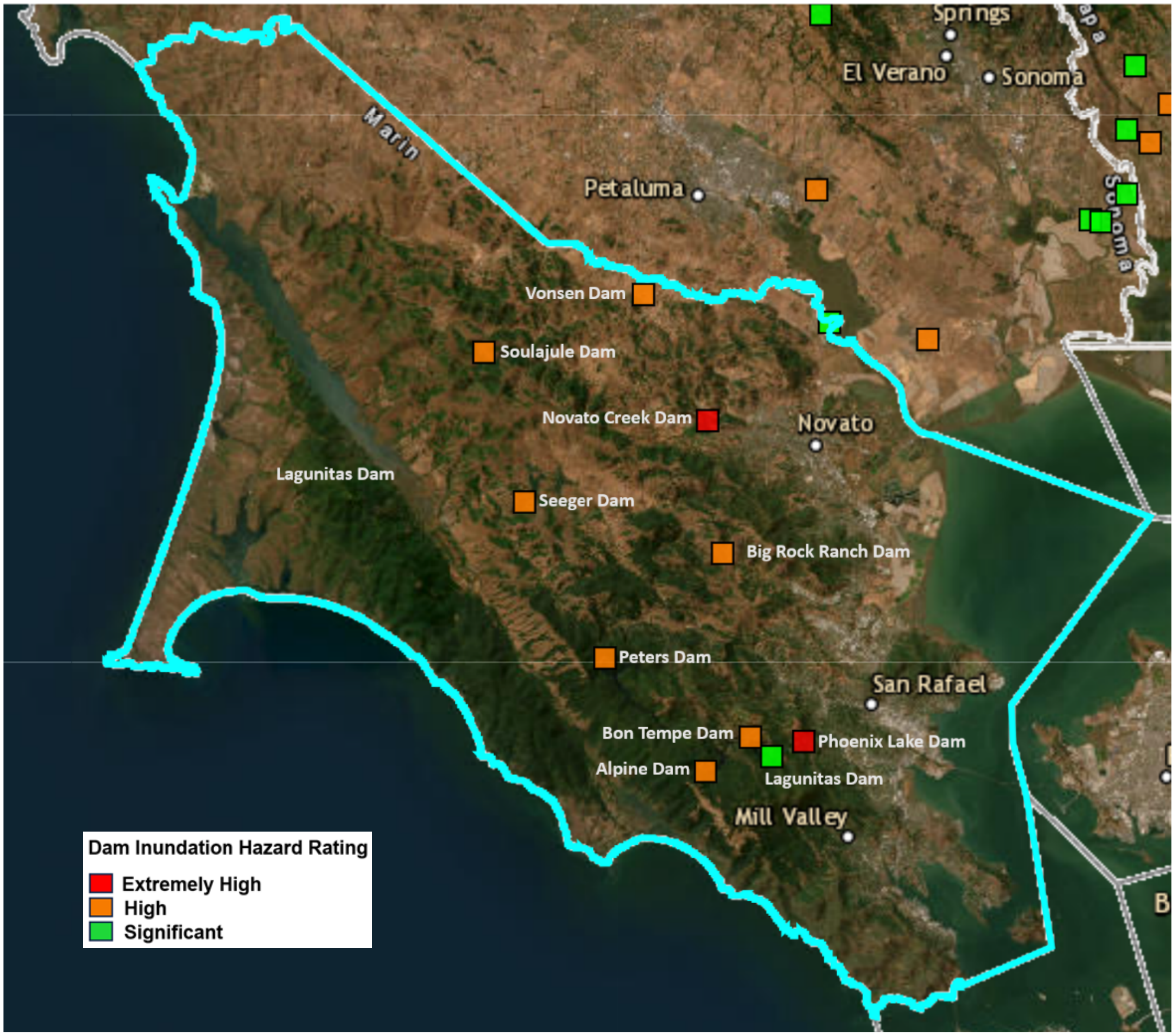


Figure 18: Dams in and around the Marin County OA
Source: Cal OES, Department of Water Resources, DSOD

Figure 19 illustrates the Dam Failure risk to Marin County.

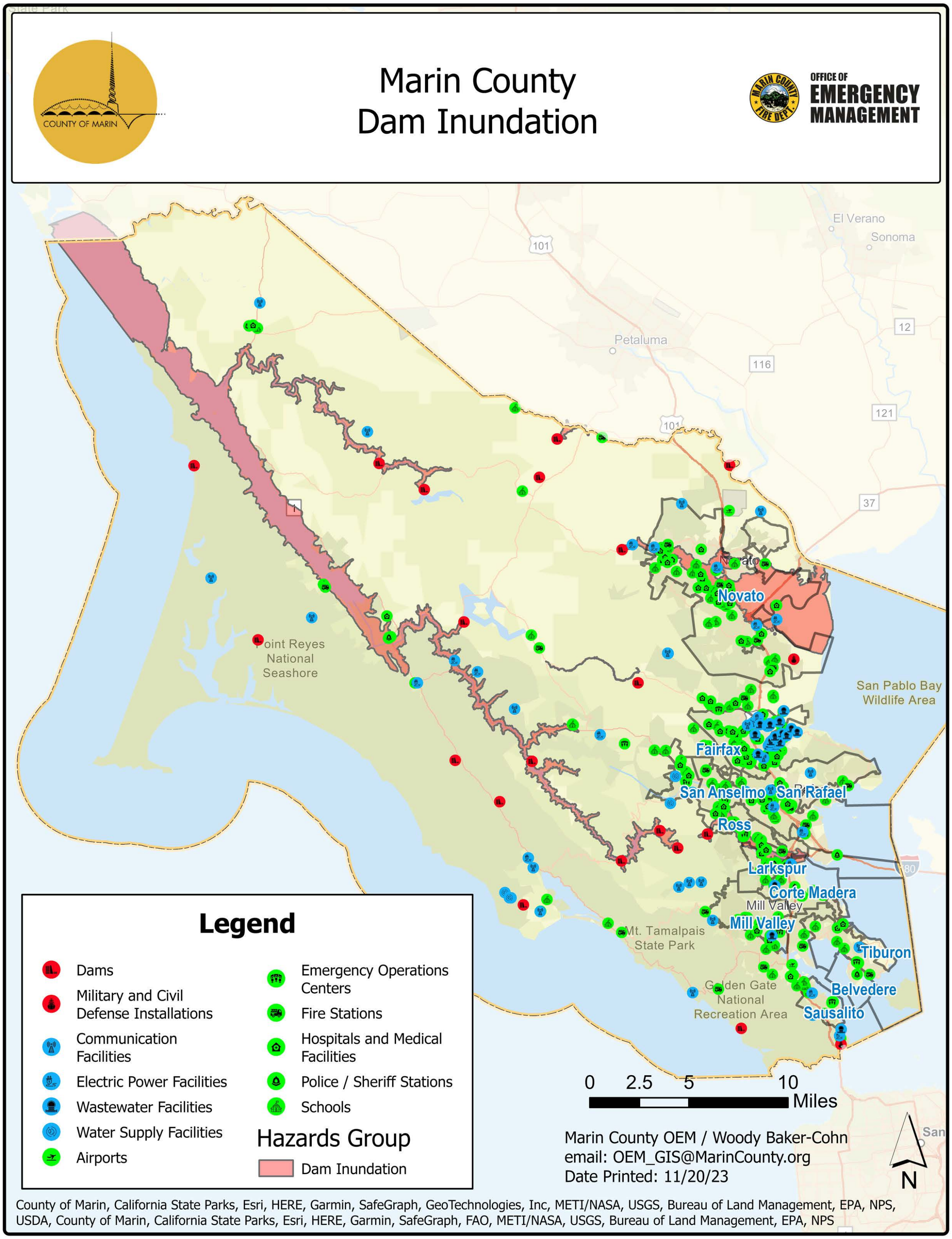


Figure 19: Marin County Dam Inundation Susceptibility to Critical Facilities
Source: Marin County OEM

The Bolinas Community Public Utility District is not within any classified Dam inundation zones. Although, the Bolinas Community Public Utility District maintains small private dams or reservoirs, these facilities are not certified by the California Department of Water Resources, Division of Safety of Dams and are not known to pose potential downstream impacts to life and private property.

The Bolinas Community Public Utility District maintains the Woodrat 1 Reservoir, which is directly behind their treatment plant. The treatment plant is a small building with an ajacent solar array and may be at risk of damage should the reservoir flood control structure fail.

The image in Figure 20 shows the proximity of the Woodrat 1 Reservoir to the BCPUD Treatment Plant.

Figure 20: Woodrat 1 Reservoir and BCPUD Treatment Plant
Source: Bolinas Community Public Utility District

2.2.2 Debris Flows – Erosion, Landslide, Post-Fire Debris Flow

For the purposes of the Marin County OA MJHMP, debris flows are classified as landslides (including rockslides) and mud flows.

A landside is the breaking away and gravity-driven downward movement of hill slope materials, which can travel at speeds ranging from fractions of an inch per year to tens of miles per hour depending on the slope steepness and water content of the rock/soil mass. Landslides range from the size of an automobile to a mile or more in length and width and, due to their sheer weight and speed, can cause serious damage and loss of life. The rate of a landslide is affected by the type and extent of vegetation, slope angle, degree of water saturation, strength of the rocks, and the mass and thickness of the deposit. Some of the natural causes of this instability are earthquakes, weak materials, stream and coastal erosion, and heavy rainfall. In addition, certain human activities tend to make the earth materials less stable and increase the chance of ground failure. These activities include extensive irrigation, poor drainage or groundwater withdrawal, removal of stabilizing vegetation and over-steepening of slopes by undercutting them or overloading them with artificial fill. These activities can cause slope failure, which normally produce landslides.

Landslide material types are often broadly categorized as either rock or soil, or a combination of the two for complex movements. Rock refers to hard or firm bedrock that was intact and in place prior to slope movement. Soil, either residual or transported material, means unconsolidated particles. The distinction between rock and soil is most often based on interpretation of geomorphic characteristics within landslide deposits but can also be inferred from geologic characteristics of the parent material described on maps or in the field. Landslide movements are also based on the geomorphic expression of the landslide deposit and source area, and are categorized as falls, topples, spreads, slides, or flows. Falls are masses of soil or rock that dislodge from steep slopes and free fall. Topples move by the forward pivoting of a mass around an axis below the displaced mass. Lateral spreads move by horizontal extension and shear or tensile fractures. Slides displace masses of material along one or more discrete planes and can either be rotational or transitional. Flows mobilize as a deforming, viscous mass without a discrete failure plane.

Natural conditions that contribute to landslide include the following:

- Degree of slope
- Water (heavy rain, river flows, or wave action)
- Unconsolidated soil or soft rock and sediments
- Lack of vegetation (no stabilizing root structure)
- Previous wildfires and other forest disturbances
- Earthquake

In addition, many human activities tend to make the earth materials less stable and, thus, increase the chance of ground movement. Human activities contribute to soil instability through grading of steep slopes or overloading them with artificial fill, by extensive irrigation, construction of impermeable surfaces, excessive groundwater withdrawal, and removal of stabilizing vegetation.

Another hazard related to landslide and erosion is the fall of a detached mass of rock from a cliff or down a very steep slope (rockfall). Weathering and decomposition of geological materials produce conditions favorable to rockfalls. Other causes include ice wedging, root growth, or ground shaking (earthquake). Destructive landslides and rockfalls usually occur very suddenly with little or no warning time and are short in duration.

Landslide susceptibly can be characterized by looking at both slope class and rock strength. Landslide susceptibility classes express the generalization that on very low slopes, landslide susceptibility is low even in weak rock, and that landslide susceptibility increases with slope and in weaker rocks. Very high landslide susceptibility includes very steep slopes in hard rocks and moderate to very steep slopes in weak rocks. Figure 21 shows landslide susceptibility classes.

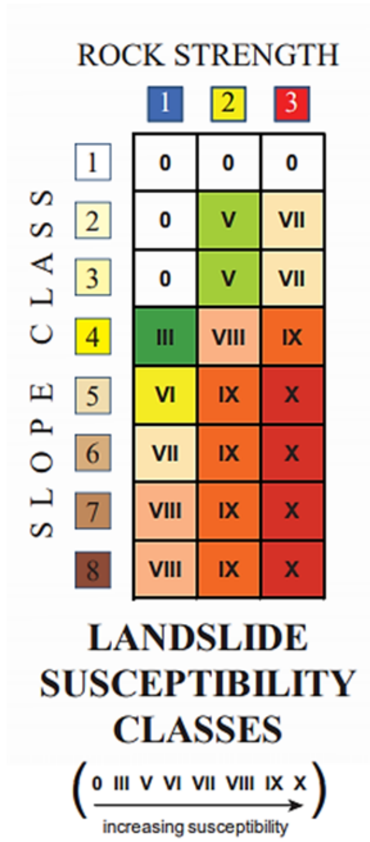


Figure 21: Landslide Susceptibility Classes
Source: USGS

A mud flow is a general term for a mass-movement landform and process characterized by a flowing mass of fine-grained earth material with a high degree of fluidity. Heavy rainfall, snowmelt, or high levels of groundwater flowing through cracked bedrock may trigger a movement of soil or sediments. Floods and debris flows may also occur when strong rains on hill or mountain slopes cause extensive erosion and/or what is known as "channel scour". Some broad mud flows are rather viscous and therefore slow; others begin very quickly and continue like an avalanche. Mud flows are composed of at least 50% silt and clay-sized materials and up to 30% water.

The point where a muddy material begins to flow depends on its grain size and the water content. Fine grainy material or soil has a smaller friction angle than a coarse sediment or a debris flow, but falling rock pieces can trigger a material flow, too. When a mud flow occurs it is given four named areas, the 'main scarp', in bigger mud flows the 'upper and lower shelves', and the 'toe'. See Figure 22 for the typical areas of a mud flow, with shelves (right) and without (left). The main scarp will be the original area of incidence, the toe is the last affected area(s). The upper and lower shelves are located wherever there is a large dip (due to mountain or natural drop) in the mud flow's path. A mud flow can have many shelves.

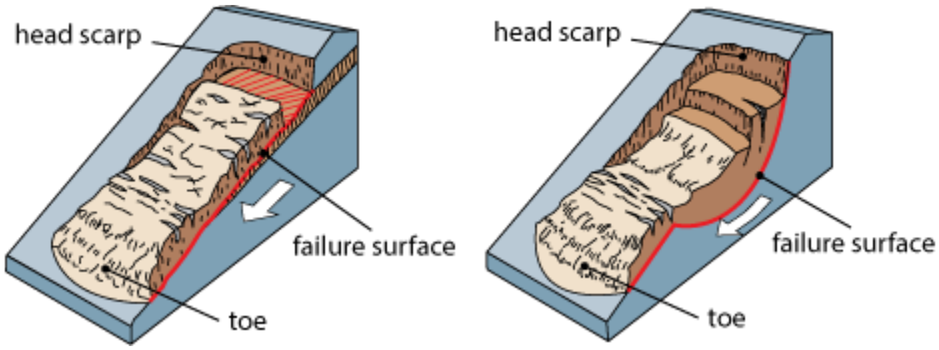


Figure 22: Mud Flow Areas
Source: Washington Department of Natural Resources

If large enough, mud flows can devastate villages and country-sides. Mud flows are common in mountain areas prone to wildfire, where they have destroyed many homes built on hillsides without sufficient support after fires destroy vegetation holding the land. The area most generally recognized as being at risk of a dangerous mud flow are:

- Areas where wildfires or human modification of the land have destroyed vegetation
- Areas where landslides have occurred before
- Steep slopes and areas at the bottom of slopes or canyons
- Slopes that have been altered for construction of buildings and roads
- Channels along streams and rivers
- Areas where surface runoff is directed

A landslide in the BCPUD would most likely occur in any of the open spaces throughout the District where the terrain is steeper and is more susceptible to movement of hill slope materials; in general, this characterizes the areas of the community on the edge of the coastal bluffs (i.e., the Little Mesa (downtown), the Francisco Mesa (downtown) and the Big Mesa). Landslides on the coastal bluffs directly threaten portions of the BCPUD's water distribution system and portions of its wastewater collection system, as well as critical egress roads. In 2004, the BCPUD relocated a critical pressurized water main off of Terrace Avenue at the intersection with Overlook on the Big Mesa due to its proximity to the coastal bluff. In 2011, there was a major landslide at this location that heavily damaged/closed Terrace Avenue, one of only two egress roads off of the Big Mesa. The County of Marin's Department of Public Works installed an extensive repair and reopened Terrace Avenue the following year. In 2013, the BCPUD relocated another critical pressurized water main off of Terrace Avenue near Surfer's Overlook due to its proximity to the coastal bluff; a gravity sewer collection main currently remains at this location. In addition, the BCPUD has relocated several other smaller water mains as and when it determined coastal bluff erosion threatened these facilities.

Additional BCPUD critical facilities are susceptible to landslides, including the Woodrat 1 Reservoir/dam, the Woodrat 2 Reservoir/dam, the Woodrat Water Treatment Plant, the Solar

Arrays at the Woodrat Water Treatment Plant, its raw water transmission line from the Arroyo Hondo Creek to the Woodrat Water Treatment Plant, and the BCPUD's two impoundments on the Arroyo Hondo Creek, all of which lie in areas of non-coastal bluff related landslide susceptibility. The BCPUD experienced significant impacts from the 1982-83 winter storms resulting in landslides that caused damage to its critical facilities and infrastructure, including but not limited to its impoundment structures and its raw water transmission line from the Arroyo Hondo Creek to the Woodrat Water Treatment Plant.

A landslide having major impacts on any of the roads in the Bolinas area could affect the ability of District employees to reach District facilities or infrastructure. An earthquake has the potential to cause landslides throughout this area. A wildfire and subsequent rain event in any of the open spaces could potentially contribute to debris flows within the District. There are several creeks that flow directly into the BCPUD that could contribute to a debris flow, particularly from the mountainous areas in the western part of Marin County. There have been no recorded debris flows in BCPUD.

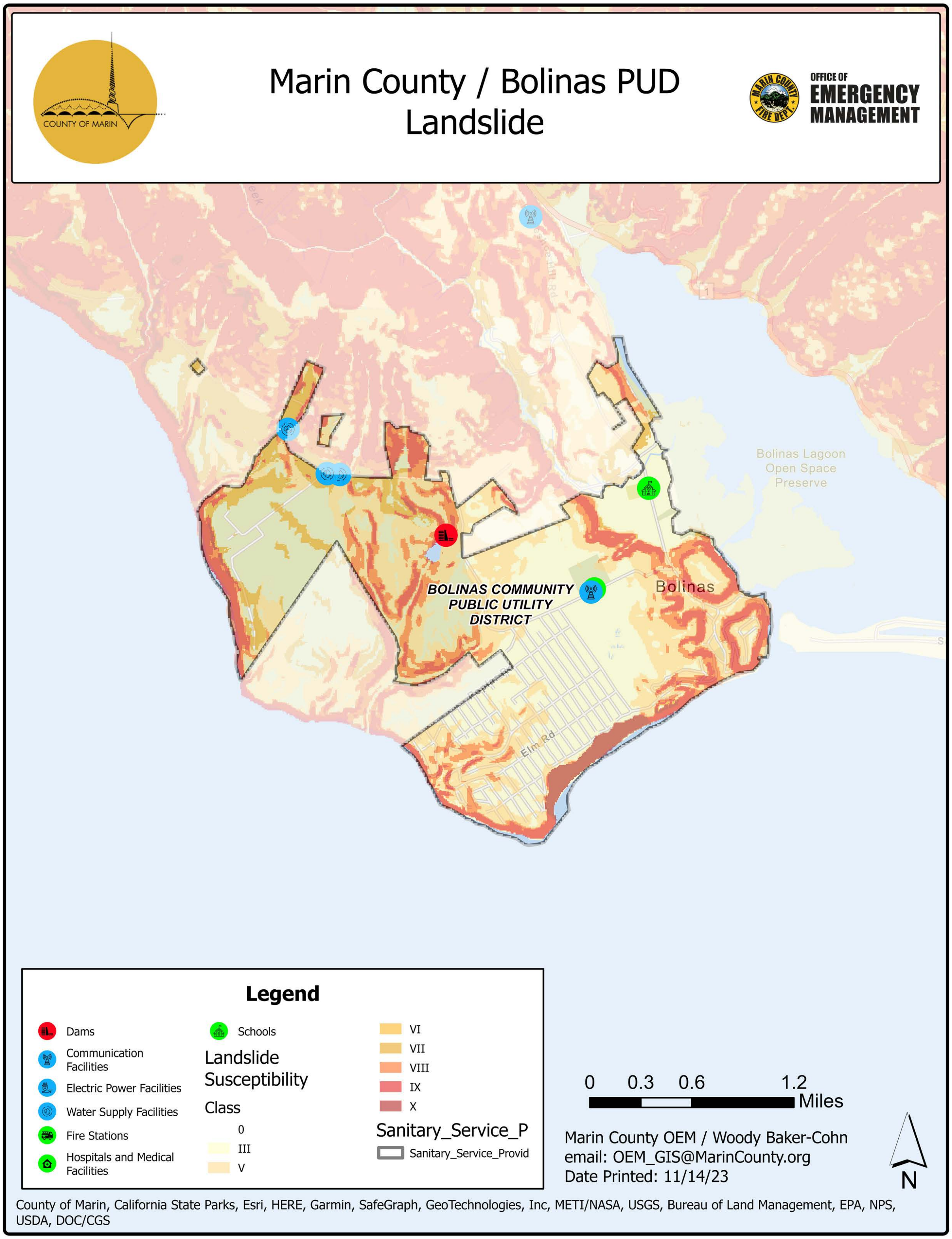


Figure 23: BCPUD Debris Flow Critical Facilities and Infrastructure
Source: Marin County OEM

2.2.3 Drought

A drought is a deficiency in precipitation over an extended period, usually a season or more, resulting in a water shortage causing adverse impacts on vegetation, animals, and/or people. It is a normal recurrent feature of climate that occurs in virtually all climate zones, from very wet to very dry. Drought is a temporary aberration from normal climatic conditions and can thus vary significantly from one region to another. Droughts occur slowly, over a multi-year period, and it is often not obvious or easy to quantify when a drought begins and ends. Drought is a complex issue involving many factors—it occurs when a normal amount of moisture is not available to satisfy an area's usual water-consuming activities.

There are several types of drought which can often be defined regionally based on its effects:

- Meteorological drought is usually defined by a period of below average water supply, based on the degree of dryness (in comparison to normal or average) and the duration of the dry period. Drought onset generally occurs with a meteorological drought.
- Agricultural drought occurs when there is an inadequate water supply to meet the needs of the state's crops and other agricultural operations such as livestock. Agricultural drought links various characteristics of meteorological (or hydrological) drought to agricultural impacts, focusing on precipitation shortages, soil water deficits, reduced ground water or reservoir levels needed for irrigation.
- Hydrological drought is defined as deficiencies in surface and subsurface water supplies. It is generally measured as stream flow, snowpack, and as lake, reservoir, and groundwater levels. Hydrological drought usually occurs following periods of extended precipitation shortfalls.

Socioeconomic drought occurs when a drought impacts health, well-being, and quality of life, or when a drought starts to have an adverse economic impact on a region.

Drought regularly occurs in all areas of the BCPUD and has a profound effect on the delivery of potable water service to the approximately 1,500 full-time residents and an additional 1,000 seasonal or part time residents served by the district. The BCPUD currently obtains its raw water exclusively from surface water sources -- the Arroyo Hondo Creek in the Point Reyes National Seashore and two small emergency reservoirs. Due to the limited nature of the BCPUD's surface water supplies, the BCPUD Board of Directors in 1971 declared a water shortage emergency and enacted a moratorium on new connections to the water system which remains in effect today. Drought quickly reduces the surface water flows in the BCPUD's primary water source, the Arroyo Hondo Creek, as well as the amount of water stored in the BCPUD's two emergency reservoirs, the Woodrat 1 and 2 Reservoirs, reducing the available supply potable water to customers and for fire suppression purposes, which also reduces revenue for the district which is used to operate the water delivery systems to these customers and renders the district more at risk in a wildfire. In 2009 and in 2021, in response to prolonged drought conditions, the BCPUD implemented mandatory conservation measures (i.e., rationing) to ensure the reliability of the water supply for public health, safety and fire suppression purposes.

Drought conditions throughout the district would also be felt in the mountainous areas just outside the District boundaries (in the Point Reyes National Seashore) where the risk of wildfire would increase and threaten BCPUD's facilities, particularly the Woodrat Water Treatment Plant. There have been two fires in the Point Reyes National Seashore in recent years: the Vision Fire in 1995 and the Woodward Fire in 2020. The wetland areas of the District, particularly the marshlands along the Bolinas Lagoon, could become drier during prolonged period of drought and experience marshland fires that could impact the District's critical facilities. Dry trees in public spaces adjacent to public roads, such as the eucalyptus grove to the east of the BCPUD's sewer treatment plant, can become a safety hazard to the public due to falling limbs or tree failure.

2.2.4 Earthquake

Earthquakes are sudden rolling or shaking events caused by movement under the earth's surface. Earthquakes happen along cracks in the earth's surface, called fault lines, and can be felt over large areas, although they usually last less than one minute.

The amount of energy released during an earthquake is usually expressed as a magnitude and is currently measured by seismologists on the Moment Magnitude (Mw Scale). The Mw Scale was developed to succeed the previously used Richter Scale and is measured on a scale of zero to ten with increasing values reflecting increasing intensity.

The other commonly used measure of earthquake severity is intensity, which is an expression of the amount of shaking at any given location on the ground service. Intensity is most commonly measured on the Modified Mercalli Intensity (MMI) Scale (see Figure 24).

Intensity	Shaking	Description/Damage
I	Not felt	Not felt except by a very few under especially favorable conditions.
II	Weak	Felt only by a few persons at rest,especially on upper floors of buildings.
III	Weak	Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibrations similar to the passing of a truck. Duration estimated.
IV	Light	Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motor cars rocked noticeably.
V	Moderate	Felt by nearly everyone; many awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop.
VI	Strong	Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight.
VII	Very strong	Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken.
VIII	Severe	Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned.
IX	Violent	Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations.
X	Extreme	Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent.

Figure 24: Modified Mercalli Intensity Scale
Source: USGS

Figure 25 gives intensities (measured on the MMI scale) that are typically observed at locations near the epicenter or earthquakes of different magnitudes.

Richter Magnitude Scale	Typical Maximum Modified Mercalli Intensity Scale
1.0 – 2.9	I
3.0 – 3.9	II – III
4.0 – 4.9	IV – V
5.0 – 5.9	VI – VII
6.0 – 6.9	VII – IX
7.0 or higher	VIII or higher

Figure 25: Mercalli Scale vs. Magnitude
Source: USGS

The extent of ground shaking also depends in large part on how soft the underlying soil is. Soft soils amplify ground shaking (see Figure 26). This was observed during the 1989 Loma Prieta Earthquake when the most significant damages experienced in San Francisco were in the Marina District, which was built on fill.

Soil type A	Vs > 1500 m/sec	Includes unweathered intrusive igneous rock. Occurs infrequently in the bay area. We consider it with type B (both A and B are represented by the color blue on the map). Soil types A and B do not contribute greatly to shaking amplification.
Soil type B	1500 m/sec > Vs > 750 m/sec	Includes volcanics, most Mesozoic bedrock, and some Franciscan bedrock. (Mesozoic rocks are between 245 and 64 million years old. The Franciscan Complex is a Mesozoic unit that is common in the Bay Area.)
Soil Type C	750 m/sec > Vs > 350 m/sec	Includes some Quaternary (less than 1.8 million years old) sands, sandstones and mudstones, some Upper Tertiary (1.8 to 24 million years old) sandstones, mudstones and limestone, some Lower Tertiary (24 to 64 million years old) mudstones and sandstones, and Franciscan melange and serpentinite.
Soil Type D	350 m/sec > Vs > 200 m/sec	Includes some Quaternary muds, sands, gravels, silts and mud. Significant amplification of shaking by these soils is generally expected.
Soil Type E	200 m/sec > Vs	Includes water-saturated mud and artificial fill. The strongest amplification of shaking due is expected for this soil type.

Figure 26: Soil Types
Source: USGS

An earthquake fault is defined as “a fracture or fracture zone in the earth’s crust along which there has been displacement of the sides relative to one another.” For the purpose of planning there are two types of faults, active and inactive. Active faults have experienced displacement in historic time, suggesting that future displacement may be expected. Inactive faults show no evidence of movement in recent geologic time, suggesting that these faults are dormant.

Two types of fault movement represent possible hazards to structures in the immediate vicinity of the fault: fault creep and sudden fault displacement. Fault creep, a slow movement of one side of a fault relative to the other, can cause cracking and buckling of sidewalks and foundations even without perceptible ground shaking. Sudden fault displacement occurs during an earthquake event and may result in the collapse of buildings or other structures that are found along the fault zone when fault displacement exceeds an inch or two. The only protection against damage caused directly by fault displacement is to prohibit construction in the fault zone.

An earthquake could occur anywhere in and around BCPUD due to the number of active faults within and near Marin County, most notably the San Andreas and San Gregorio-Hosgri faults.

The BCPUD is located directly between the San Andreas and Hayward faults. A moderate to extreme earthquake originating from either of these major faults or any of the other faults in the region could have major impacts to the District. There is increased risk of shaking and liquefaction in the District from an earthquake, particularly in the central and eastern lowland areas where superficial deposits and fill are more prevalent. All the BCPUD critical facilities lie in these areas and have a moderate susceptibility to earthquake shaking. Vulnerable structures include District infrastructure and facilities that have not undergone major seismic retrofitting. Utility infrastructure throughout the District could be impacted by an earthquake, disrupting service to District customers.

Earthquakes could also cause landslides in the western areas of Bolinas with steeper terrain, causing damage to homes and roads as a result of shifting soils.

The BCPUD has not experienced a major earthquake. Marin County was sparsely populated at the time of the 1906 San Francisco Earthquake, and the effects across the County were relatively minimal. Likewise, the 1989 Loma Prieta Earthquake caused minimal impacts across Marin County as the epicenter of the quake was further south in Santa Cruz County. Smaller earthquakes with minimal to no impacts are routinely felt in the District.

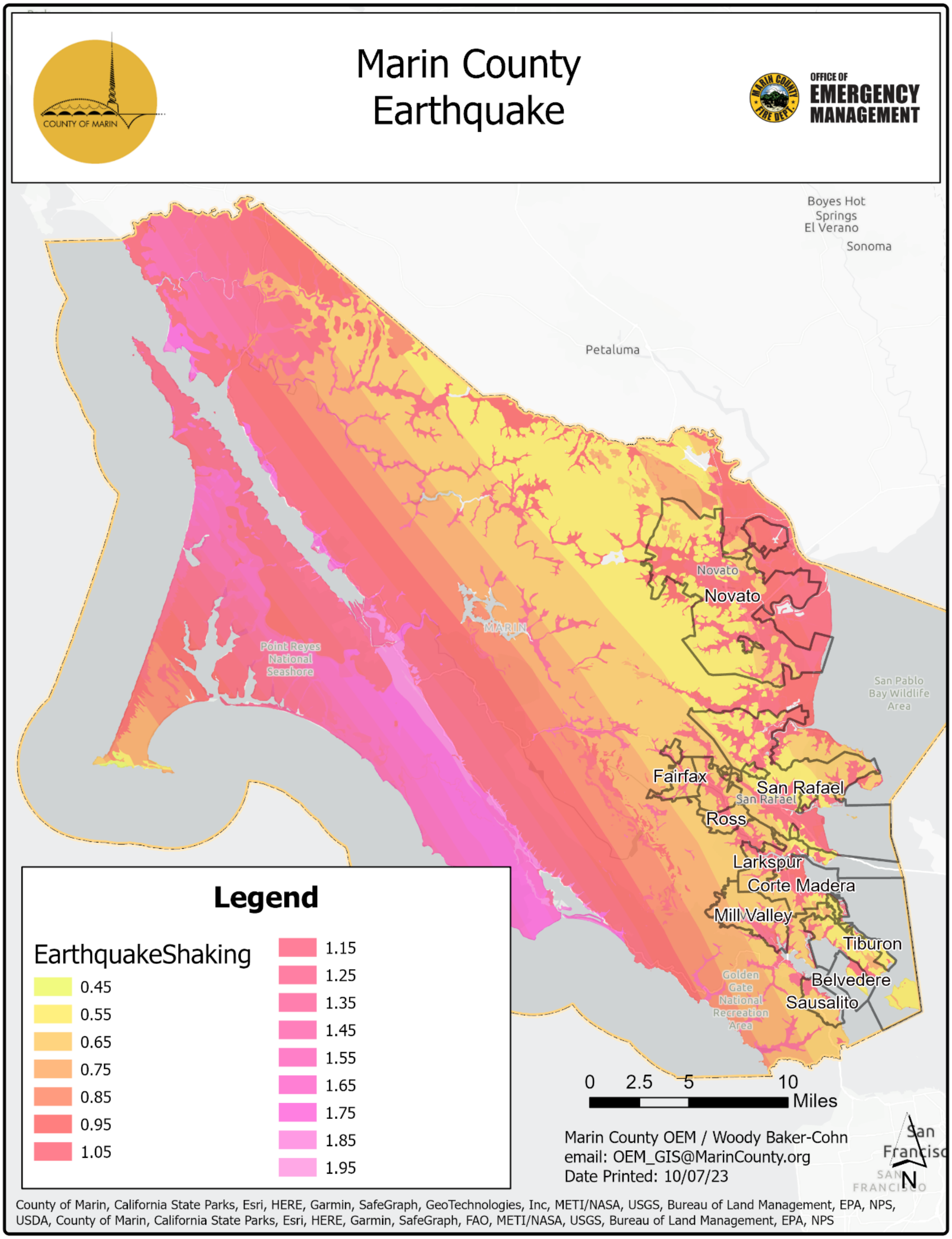


Figure 27: Marin County Earthquake Impact
Source: Marin County OEM

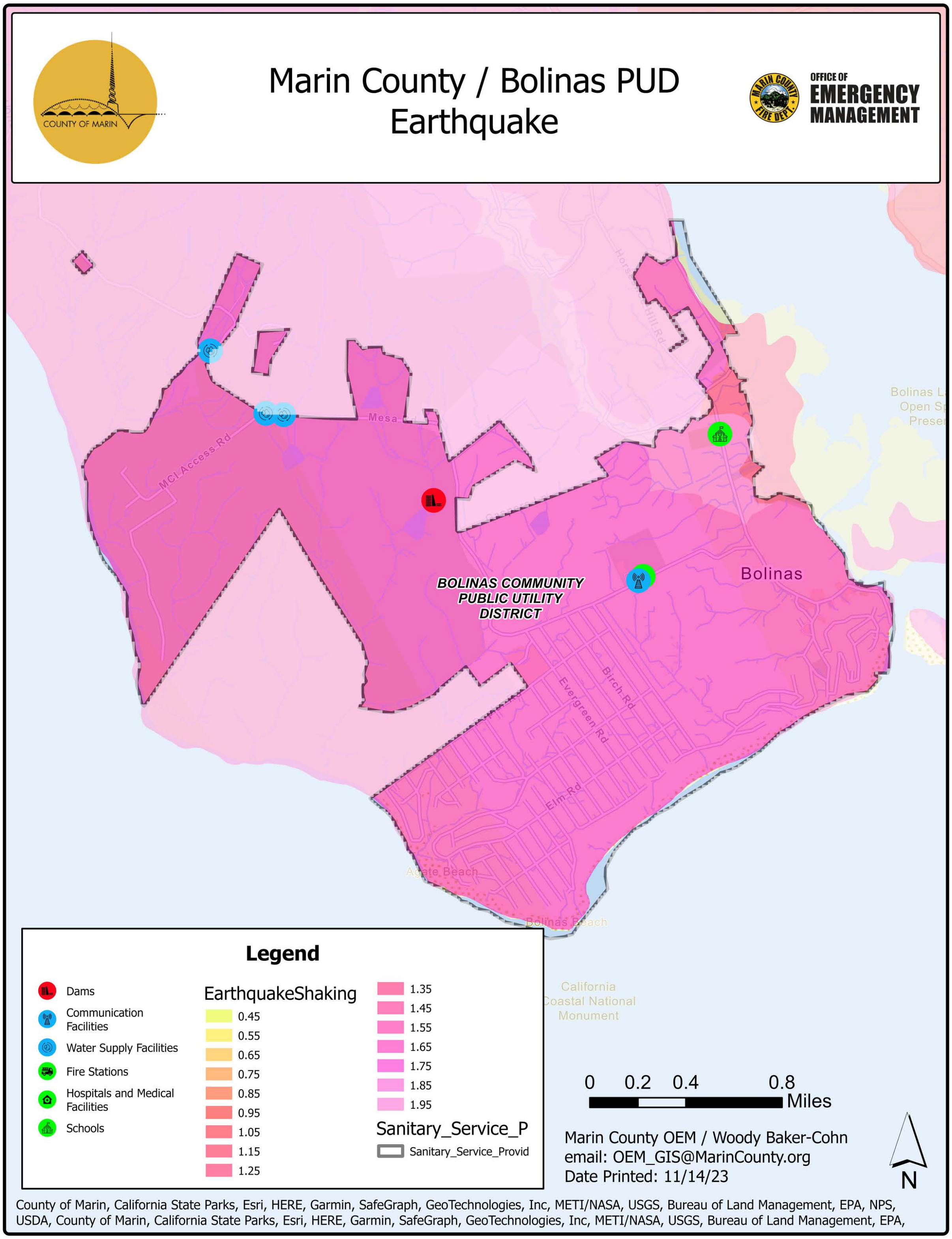


Figure 28: BCPUD Earthquake Critical Facilities and Infrastructure
Source: Marin County OEM

2.2.5 FLOODING

Flooding is the rising and overflowing of a body of water onto normally dry land. Floods are among the costliest natural disasters in terms of human hardship and economic loss nationwide. The area adjacent to a channel is the floodplain. Floodplains are illustrated on inundation maps, which show areas of potential flooding and water depths. In its common usage, the floodplain most often refers to that area that is inundated by the 100-year flood, the flood that has a one percent chance in any given year of being equaled or exceeded. The 100-year flood is the national minimum standard to which communities regulate their floodplains through the National Flood Insurance Program. The 200-year flood is one that has 0.5% chance of being equaled or exceeded each year. The 500-year flood is the flood that has a 0.2 percent chance of being equaled or exceeded in any given year. The potential for flooding can change and increase through various land use changes and changes to land surface, which result in a change to the floodplain. A change in environment can create localized flooding problems inside and outside of natural floodplains by altering or confining natural drainage channels. These changes are most often created by human activity such as construction of bridges or channels. In areas where flow contains high sediment load, such as Easkoot Creek in Stinson Beach (due to an active landslide upstream), or Pine Gulch Creek in Bolinas, the flow carrying capacity of the channel may be reduced dramatically during a single flood event. Coastal floodplains may also change over time as waves and currents alter the coastline (especially wetlands) and sea levels rise.

Flooding can occur in several ways:

Riverine flooding – Riverine flooding, defined as when a watercourse exceeds its “bank-full” capacity, generally occurs as a result of prolonged rainfall, or rainfall that is combined with snowmelt and/or already saturated soils from previous rain events. This type of flood occurs in river systems whose tributaries may drain large geographic areas and include one or more independent river basins. The onset and duration of riverine floods may vary from a few hours to many days and is often characterized by high peak flows combined with a large volume of runoff. Factors that directly affect the amount of flood runoff include precipitation amount, intensity and distribution, the amount of soil moisture, seasonal variation in vegetation, snow depth, and water-resistance of the surface due to urbanization. In the Marin County OA, riverine flooding can occur anytime from November through April and is largely caused by heavy and continued rains, sometimes combined with snowmelt, increased outflows from upstream dams, and heavy flow from tributary streams. These intense storms can overwhelm the local waterways as well as the integrity of flood control structures. Flooding is more severe when antecedent rainfall has resulted in saturated ground conditions. The warning time associated with slow rise riverine floods assists in life and property protection.

Flash flooding – Flash flooding describes localized floods of great volume and short duration. This type of flood usually results from a heavy rainfall on a relatively small drainage area. Precipitation of this sort usually occurs in the winter and spring. Flash floods often require immediate evacuation within the hour and thus early threat identification and warning is critical for saving lives.

Localized/Stormwater flooding – Localized flooding problems are often caused by flash flooding, severe weather, or an unusual amount of rainfall. Flooding from these intense weather events usually occurs in areas experiencing an increase in runoff from impervious surfaces associated with development and urbanization as well as inadequate storm drainage systems.

Tidal flooding – Tidal flooding develops when high tides exceed either the top of bank elevation of tidal sloughs and channels, or the crest of bay levees. An especially high tide event that occurs during alignment of the gravitational pull between the sun and the moon, causing tidal water levels to rise to higher-than normal levels. King tides are normal, predictable events that occur semi-annually during winter months. Typically storms in which high tides coincide with peak stormwater flow are the most damaging in Marin County.

The area is also at risk to flooding resulting from levee failures and dam failures. Dam failure flooding is discussed separately in the Dam Failure Section of this document; levee failure flooding is discussed separately in the Levee Failure Section of this document. Regardless of the type of flood, the cause is often the result of severe weather and excessive rainfall, either in the flood area or upstream reach.

A weather pattern called the “Atmospheric River” contributes to the flooding potential of the area. An Atmospheric River brings warm air and rain to the West. A relatively common weather pattern brings southwest winds to the Pacific Northwest or California, along with warm, moist air. The moisture sometimes produces many days of heavy rain, which can cause soil saturation, extensive flooding and other impacts such as landslides. The warm air also can melt the snowpack in the mountains, which further aggravates the flooding potential. In the colder parts of the year, the warm air can be cooled enough to produce heavy, upslope snow as it rises into the higher elevations of the Sierra Nevada or Cascades. Forecasters and others on the West Coast often used to refer to this warm, moist air as the “Pineapple Express” because it comes from around Hawaii where pineapples are grown. A diagram of an atmospheric river event is shown in Figure 29.

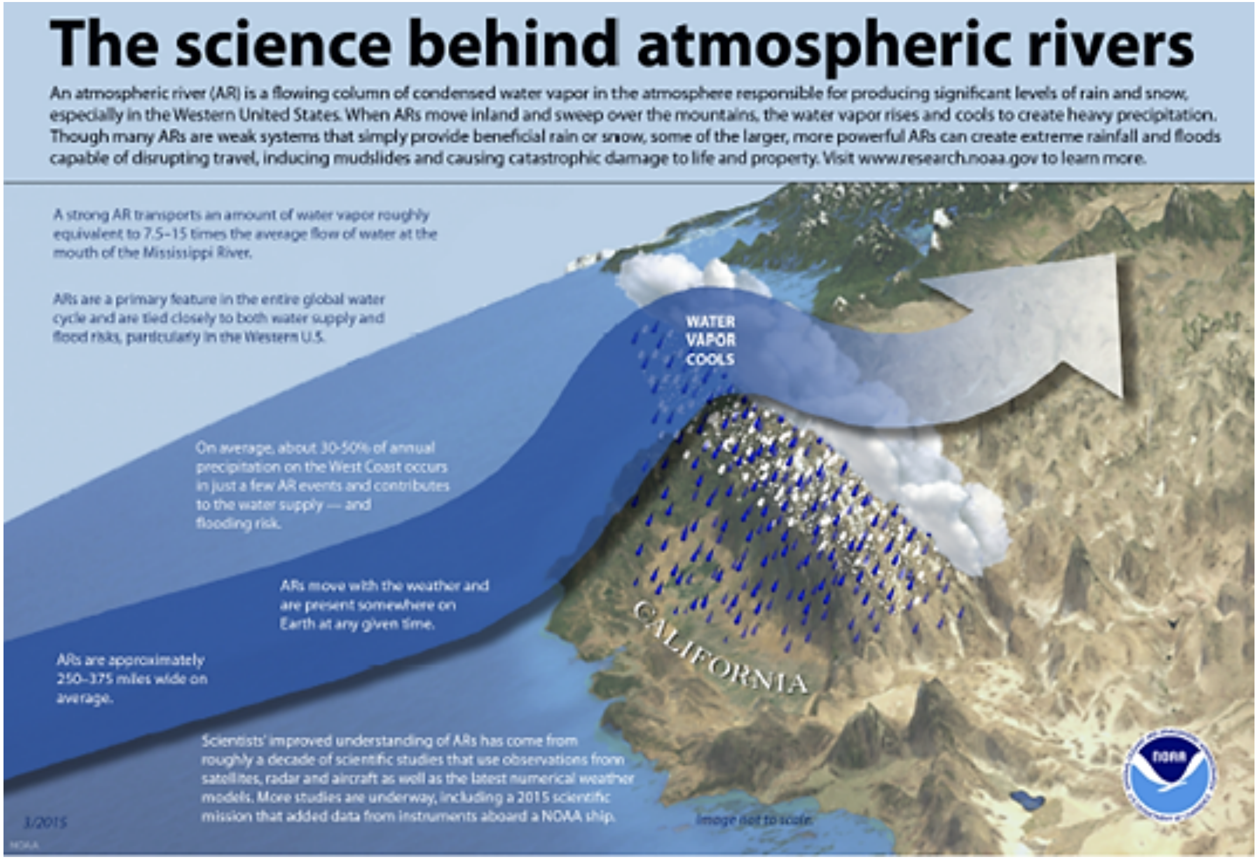


Figure 29: Diagram of an Atmospheric River Event
Source: NOAA

The Marin County OA is susceptible to various types of flood events. In coastal areas, flooding may occur when strong winds or tides result in a surge of seawater into areas that are above the normal high tide line. Other types of flooding in Marin include isolated ponding and stormwater overflow. Isolated ponding is when pools form on the ground and can occur in any area that doesn't drain effectively – for example, in a natural depression in the landscape. Stormwater overflow is when storm drains back up. Stormwater drainage systems quickly convey rainwater through underground pipes to creeks and the Bay. When the storm drains are obstructed or broken or when the water bodies to which they lead to are already full, water backs up onto the streets. Although stormwater overflow and isolated ponding also occur throughout the County, the effects are typically not widespread or significantly damaging.

Flooding in the BCPUD generally results from a combination of high tides and storm runoff in low-lying areas. Downtown Bolinas and Olema-Bolinas Road (the only egress road out of town) also have flooded in the past during the period of high tides and storm runoff. Wharf Road and Brighton Avenue in downtown Bolinas follow former riverbeds that cut through the topography, so both streets are at the bottom of small valleys and Olema-Bolinas Road is in a mapped floodplain. These past floods have impacted the water and sewer systems.

The Bolinas Community Public Utility District does not have any critical facilities within a flood zone. However, the Bolinas Community Public Utility District maintains small private dams or reservoirs that, should they fail, could result in flooding and damage to their facilities. These dams or reservoir facilities are not certified by the California Department of Water Resources, Division of Safety of Dams and are not known to pose potential downstream impacts to life or private property.

The impact of King Tides (which typically occur in November, December and January of each year) at the same time as high rainfall events - the combination of the two occurring at the same time specifically affects low-lying areas of Marin such as Bolinas near the coast and the Bay.

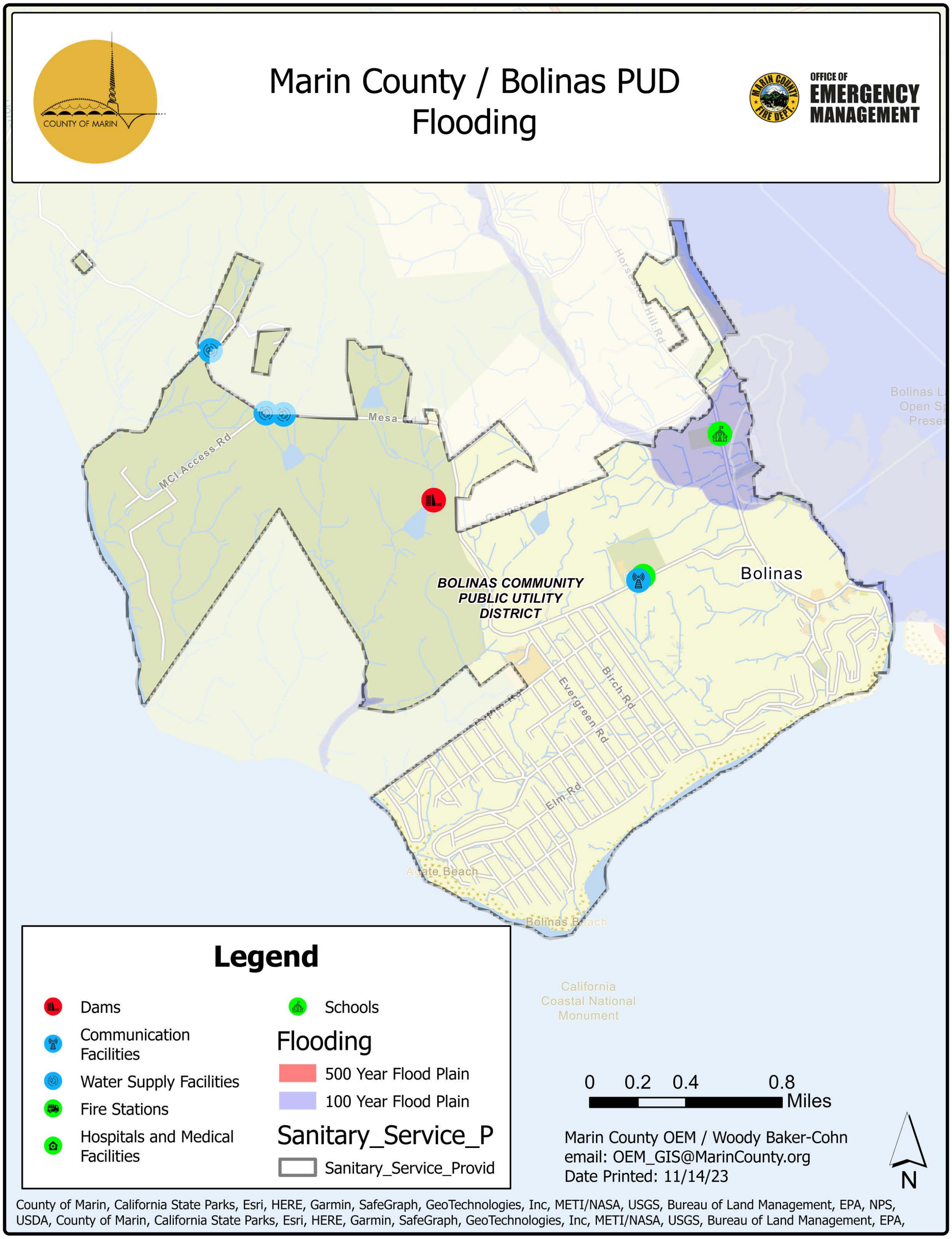


Figure 30: BCPUD Flooding Critical Facilities and Infrastructure
Source: Marin County OEM

Floodwaters can be deep enough to drown people and move fast enough to sweep people and vehicles away, lift buildings off foundations, and carry debris that smashes into buildings and other property. Flood waters can cause significant erosion which can lead to slope instability, severely damaging transportation and utility infrastructure by undermining foundations or washing away pavement. If water levels rise high enough to get inside buildings, flooding can cause extensive damage to personal property and the structure itself. Flood events that develop very quickly are especially dangerous because there may be little advance warning. Flooding may occur when strong winds or tides result in a surge of seawater into areas that are above the normal high tide line. Tide elevations within the Bolinas Lagoon and Bolinas Bay have the potential to significantly impact the County's storm drain system in Bolinas.

In Bolinas, Olema-Bolinas Road – the only egress road out of town -- has been closed due to flooding on numerous occasions, nearly always during a combination of heavy rains and King Tides, isolating the community for hours and rendering evacuation nearly impossible.

2.2.6 LAND SUBSIDENCE/SINKHOLES

Land subsidence is a gradual settling or sudden sinking of the Earth's surface owing to subsurface movement of earth materials. The principal causes are aquifer-system compaction, drainage of organic soils through groundwater pumping, underground mining, hydro-compaction, natural compaction, sinkholes, and thawing permafrost. More than 80 percent of the identified subsidence in the United States is a consequence of underground water exploitation. The increasing development of land and water resources threatens to exacerbate existing land-subsidence problems and initiate new ones.

Sinkholes can form in three primary ways. Dissolution sinkholes form when dissolution of the limestone or dolomite is most intensive where the water first contacts the rock surface. Aggressive dissolution also occurs where flow is focused in preexisting openings in the rock, such as along joints, fractures, and bedding planes, and in the zone of water-table fluctuation where groundwater is in contact with the atmosphere. See Figure 31 for a picture and description of how dissolution sinkholes form.

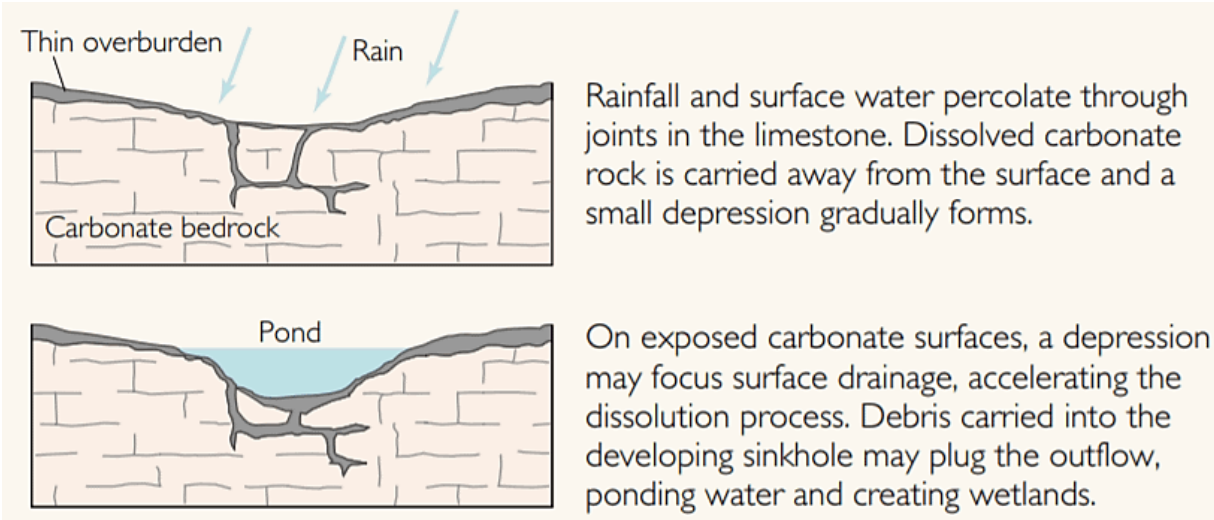


Figure 31: Dissolution Sinkhole Formation
Source: USGS

Cover-subsidence sinkholes tend to develop gradually where the covering sediments are permeable and contain sand. In areas where cover material is thicker, or sediments contain more clay, cover-subsidence sinkholes are relatively uncommon, are smaller, and may go undetected for long periods. See Figure 32 for a picture and description of how cover-subsidence sinkholes form.

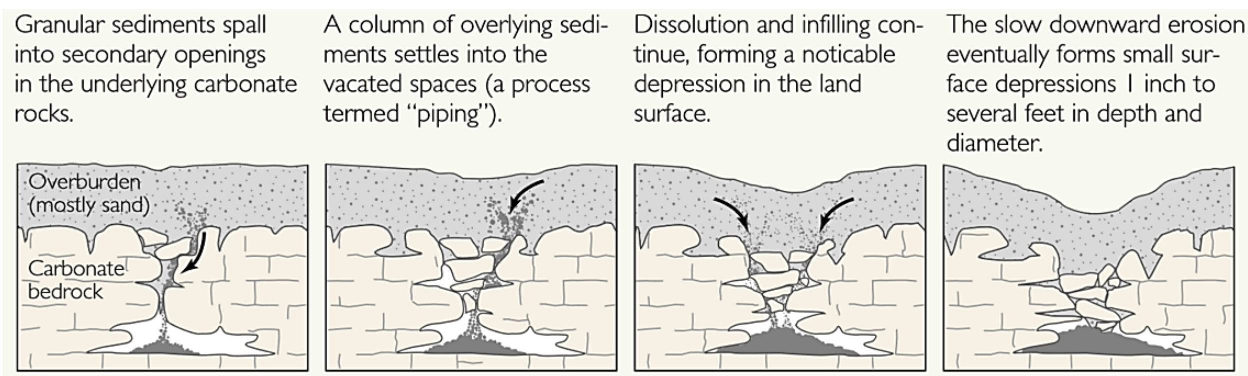


Figure 32: Cover-Subsidence Sinkhole Formation
Source: USGS

Cover-collapse sinkholes may develop abruptly over a period of hours and cause catastrophic damages. They occur where the covering sediments contain a significant amount of clay. Over time, surface drainage, erosion, and deposition of sediment transform the steep-walled sinkhole into a shallower bowl-shaped depression. See Figure 33 for a picture and description of how cover-collapse sinkholes form.

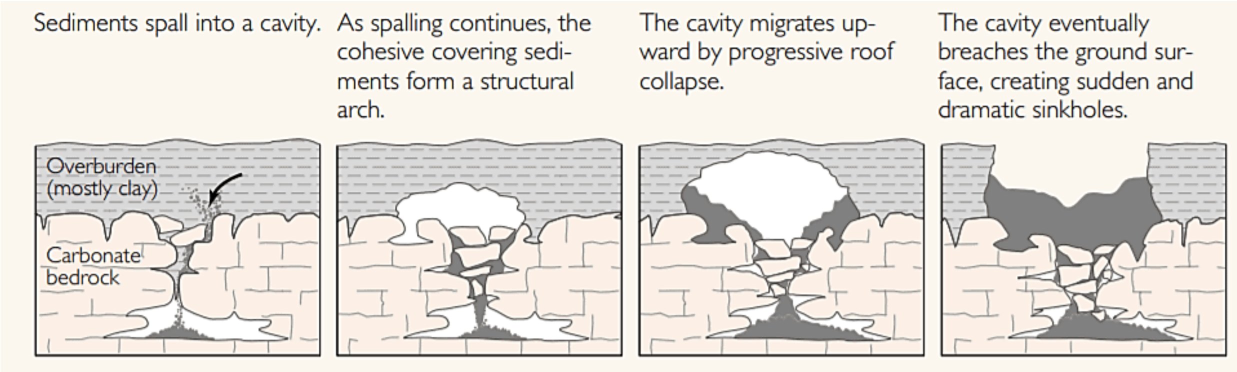


Figure 33: Cover-Collapse Sinkhole Formation
Source: USGS

New sinkholes have been correlated to land-use practices, especially from groundwater pumping and from construction and development practices that cause land subsidence. Sinkholes can also form when natural water-drainage patterns are changed and new water-diversion systems are developed. Some sinkholes form when the land surface is changed, such as when industrial and runoff-storage ponds are created. The substantial weight of the new material can trigger an underground collapse of supporting material, thus causing a sinkhole.

The overburden sediments that cover buried cavities in the aquifer systems are delicately balanced by groundwater fluid pressure. The water below ground helps to keep the surface soil in place. Groundwater pumping for urban water supply and for irrigation can produce new sinkholes in sinkhole-prone areas. If pumping results in a lowering of groundwater levels, then underground structural failure, and thus, sinkholes, can occur.

Land subsidence and sinkholes would most likely occur in the lowland areas of the Bolinas Community Public Utility District where superficial deposits and fill are more prevalent. Land subsidence could have numerous impacts for the BCPUD, including the settling of district facilities and infrastructure as well as the shifting of roadways that run through the District. In recent years, numerous sinkholes have appeared under Wharf Road (a County-maintained road) in downtown Bolinas where the road is adjacent to the Bolinas Lagoon. These sinkholes appear to be related to wave scour undermining a County seawall that supports the road. These sinkholes and the shifting of Wharf Road threaten the BCPUD's water and sewer infrastructure in this area.

2.2.7 Levee Failure

Levee failure is the overtopping, breach or collapse of the levee. Levees can fail in the event of an earthquake, internal erosion, poor engineering/construction or landslides, but levees most commonly fail as a result of significant rainfall or very high tides. During a period of heavy rainfall, the water on the water-body side of the levee can build up and either flow over the top ("overtopping") or put pressure on the structure causing quickening seepage and subsequent erosion of the earth. The overflow of water washes away the top portion of the levee, creating deep grooves. Eventually the levee weakens, resulting in a breach or collapse of the levee wall and the release of uncontrollable amounts of water. Figure 34 shows a levee and the multiple ways it can fail.

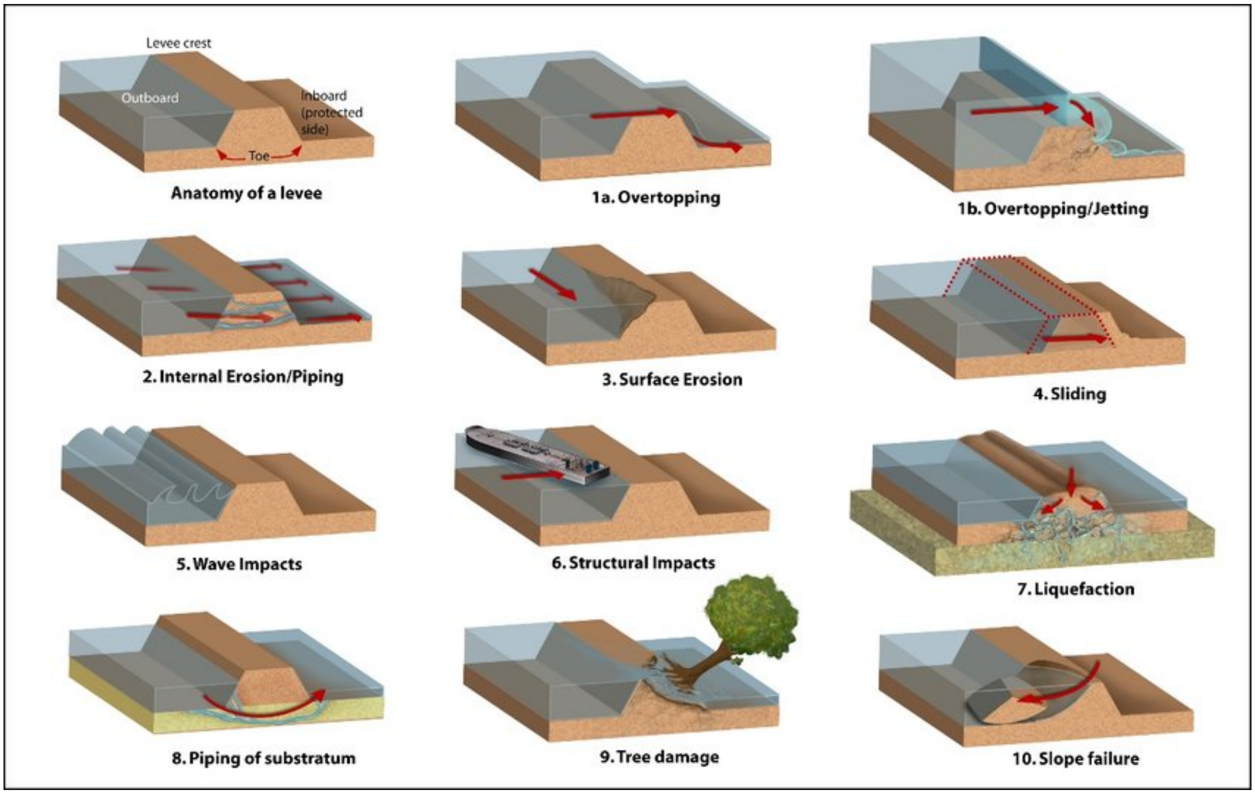


Figure 34: Levee Failure Mechanisms
Source: University of California

The BCPUD has levees in the form of four primary treatment ponds at its sewer treatment facility at 101 Mesa Road. The facility is an integrated pond system which uses no chemicals in the treatment process, relying instead on a biological process of methane fermentation, with aeration and recirculation for odor control. Following primary and secondary treatment, the effluent is spray-irrigated to land surrounding the treatment facility. Pursuant to the terms of the Waste Discharge Order 88-100 applicable to this facility, the BCPUD is not permitted to discharge from the ponds between November 15 and April 15 in any given year and must maintain two feet of freeboard in the ponds at all times. However, during years when the BCPUD receives 50-inches or more of rain, the BCPUD's levees are vulnerable to overtopping, which could cause flooding into the District, with property and critical infrastructure down gradient of the treatment facility (including downtown Bolinas) being most susceptible.

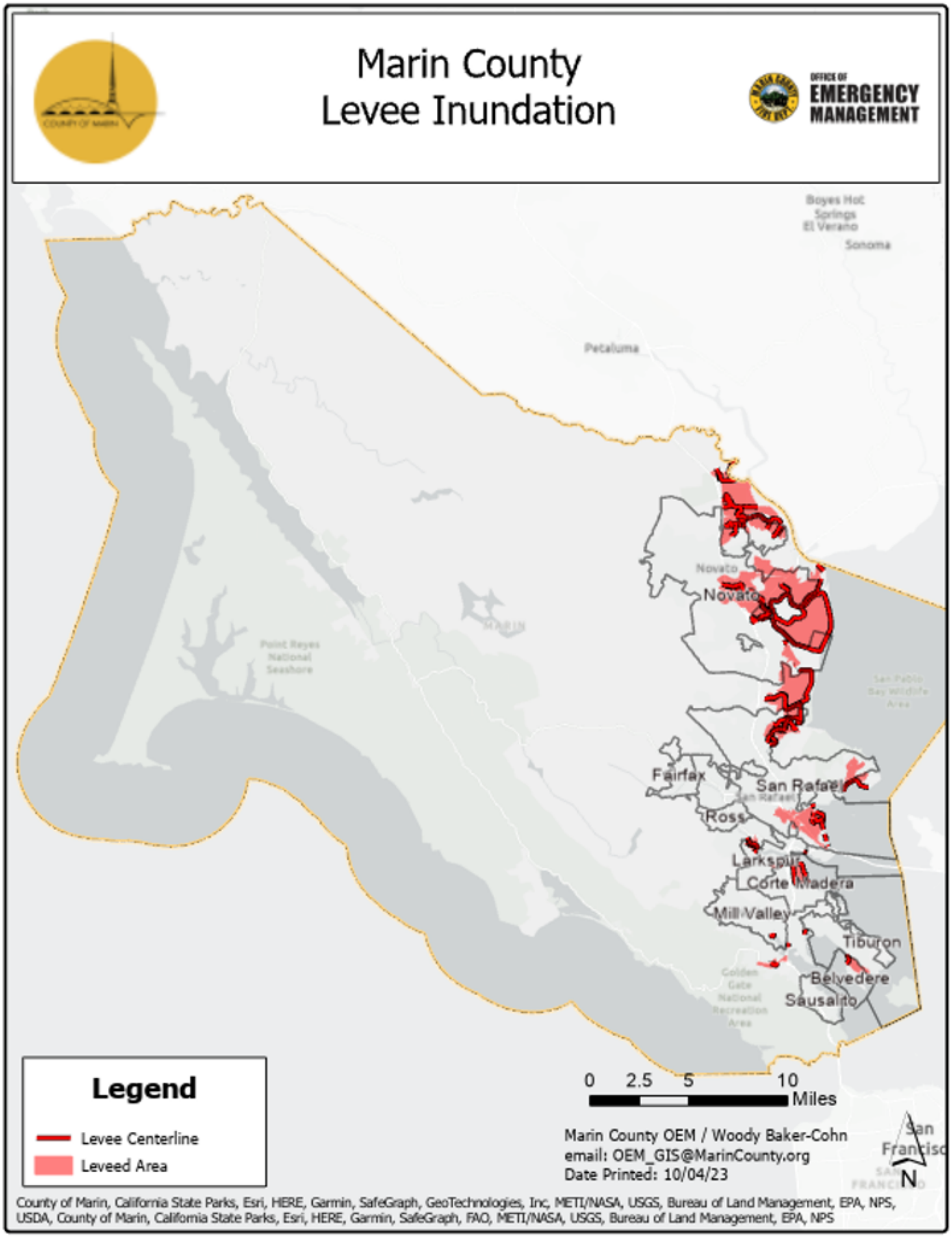


Figure 35: Marin County Levee Inundation Map
Source: Marin County OEM

2.2.8 Sea Level Rise

Climate change is the distinct change in measures of weather patterns over a long period of time, ranging from decades to millions of years. More specifically, it may be a change in average weather conditions such as temperature, rainfall, snow, ocean and atmospheric circulation, or in the distribution of weather around the average. While the Earth's climate has cycled over its 4.5-billion-year age, these natural cycles have taken place gradually over millennia, and the Holocene, the most recent epoch in which human civilization developed, has been characterized by a highly stable climate until recently.

The Marin County OA MJHMP is concerned with human-induced climate change that has been rapidly warming the Earth at rates unprecedented in the last 1,000 years. Since industrialization began, the burning of fossil fuels (coal, oil, and natural gas) at escalating quantities has released vast amounts of carbon dioxide and other greenhouse gases responsible for trapping heat in the atmosphere, increasing the average temperature of the Earth. Secondary impacts include changes in precipitation patterns, the global water cycle, melting glaciers and ice caps, and rising sea levels. According to the Intergovernmental Panel on Climate Change (IPCC), climate change will "increase the likelihood of severe, pervasive and irreversible impacts for people and ecosystems" if unchecked.

Through changes to oceanic and atmospheric circulation cycles and increasing heat, climate change affects weather systems around the world. Climate change increases the likelihood and exacerbates the severity of extreme weather – more frequent or intense storms, floods, droughts, and heat waves. Consequences for human society include loss of life and injury, damaged infrastructure, long-term health effects, loss of agricultural crops, disrupted transport and freight, and more. Climate change is not a discrete event but a long-term hazard, the effects of which communities are already experiencing.

Climate change adaptation is a key priority of the State of California. The 2013 State of California Multi- Hazard Mitigation Plan stated that climate change is already affecting California. The State has also seen increased average temperatures, more extreme hot days, fewer cold nights, a lengthening of the growing season, shifts in the water cycle with less winter precipitation falling as snow, and earlier runoff of both snowmelt and rainwater in the year. In addition to changes in average temperatures, sea level, and precipitation patterns, the intensity of extreme weather events is also changing.

Rising sea levels are considered a secondary effect of climate change due to warming ocean temperatures and melting glacial ice sheets into the ocean. The California coast has already seen a rise in sea level of four to eight inches over the 20th century due to climate change. Sea level rise impacts can be exacerbated during coastal storms, which often bring increased tidal elevations called "storm surge." The large waves associated with such storm surges can cause flooding in low-lying areas, erosion of coastal wetlands, saltwater contamination of drinking water, disruption of septic system operations, impacts on roads and bridges, and increased stress on levees. In addition, rising sea levels results in coastal erosion as shoreline sediment is re-deposited back into the ocean. Evidence shows that winter storms have increased in frequency and intensity since 1948 in the North Pacific, increasing regional wave heights and water levels during storm events.

According to the 2017 “Rising Seas in California, An Update on Sea-Level Rise Science” report Marin County may experience impacts from Sea Level Rise over defined periods of time, to include long-term changes (second half of this century and beyond), and short- to mid-term projections (within the next two or three decades).

All residents in the Marin County OA, including in the unincorporated area, are susceptible to climate change, with effects being more prevalent in those with pre-existing health conditions and the elderly. Communities most vulnerable to the impacts of sea level rise in unincorporated Marin County include Muir Beach, Stinson Beach, Bolinas, Inverness, Pt. Reyes Station, Marshall, and Dillon Beach.

The Marin Ocean Coast Sea Level Rise Vulnerability Assessment and Marin Shoreline Sea Level Rise Vulnerability Assessment estimate that by 2100 around 7,000 acres, 9,000 parcels, 10,000 buildings and 120 miles of roads throughout the Marin County OA will be exposed to sea level rise and 100-year storm events.

In their current conditions, the most vulnerable coastal Marin County OA infrastructure, in order of onset and flood depth, includes

Near term (ten years):

- Beaches, underground on-site wastewater treatment systems (OWTS), buildings, and streets in Stinson Beach west of Shoreline Highway
- Shoreline Highway between Stinson Beach and Bolinas, at Green Bridge over Lagunitas Creek in Pt. Reyes Station, the Walker Creek crossing in Marshall, and bridges on Middle Road and Valley Ford Lincoln School Road
- Beaches and beach front and downtown buildings and streets (where critical BCPUD water and sewer infrastructure is located) in Bolinas
- Septic systems, beaches, marshes, and buildings along the eastern and western shores of Tomales Bay
- The water distribution pipe underneath Shoreline Highway and Sir Francis Drake
- Boulevard serving many Inverness residents
- Intertidal rocky lands in Muir Beach and Duxbury Reef in Bolinas
- Fire service facilities and tsunami evacuation routes in Stinson Beach
- Blufftop buildings in Muir Beach, Bolinas, and Dillon Beach may be vulnerable to accelerated erosion

Medium Term (thirty years):

- Olema-Bolinas Road, which is the only road into Bolinas, and the Bolinas-Stinson Union School District’s Bolinas campus, along with numerous public, non-profit and private (commercial and residential) properties
- Additional buildings and streets in downtown Bolinas, including the historic district and the College of Marin’s Bolinas Field Station
- Bolinas Community Public Utility District’s sewer lift station on Wharf Road
- Shoreline Highway in Pt. Reyes Station and East Shore, and Sir Francis Drake Blvd. in Inverness

Long Term (seventy years):

- Shoreline Highway along the East Shore
- Buildings in Inverness west of Sir Francis Drake Blvd
- Downtown Bolinas up to the intersection of Wharf Road and Brighton Avenue, including the markets, shops, library, community center, gas station, museum, and other valued places

Along the bay shoreline, in the near-term timeframe, tidal flooding at 10 inches of sea level rise could reach 5,000 acres, 1,300 parcels, and 700 buildings, potentially impacting tens of thousands of residents, employees, and visitors. With an additional 100-year storm surge, the previously impacted acres, parcels, and buildings could face tidal and storm surge flooding. An additional 3,000 acres, 2,500 parcels, and 3,800 buildings could anticipate storm surge flooding across the Marin County OA.

Beaches, estuaries, marshes, wetlands, and intertidal areas on the Marin County OA coast, including in the unincorporated area, are vulnerable to sea level rise and storms. Nearly all beaches except Dillon Beach and the federal portion of Stinson Beach, could be lost entirely in the long-term. Roughly 9,000 acres in the estuaries of Tomales Bay, Bolinas Lagoon, and Esteros Americano and San Antonio, 1,800 acres of wetlands and marshlands could be impacted to varying degrees across all of the scenarios in all of the communities. Sea level rise may push coastal habitats inland where possible, flooding tidal areas more frequently and new inland areas with saltwater. The North Central California Coast and Ocean Vulnerability Assessment identified the five most vulnerable species to sea level rise as the Western snowy plover, black oystercatcher, black rail, California mussel, and red abalone.

Much of the BCPUD is at a lower elevation than many of the coastal areas in Marin County. As such, the lowland areas in BCPUD are particularly vulnerable to sea level rise and could experience between one and six feet of inundation.

Critical facilities throughout the District can become damaged extensively with their foundations compromised over time. Of particular concern are those facilities that have not been elevated to projected sea level rise heights over the next century. Sea level rise in the District has the potential to exacerbate inland flooding when a significant rain or tidal event occurs, pushing water from local creeks over their banks and into areas were critical facilities lie. Sea level rise can also cause increased subsidence in the District, which may damage underground water and wastewater pipelines and disrupt services.

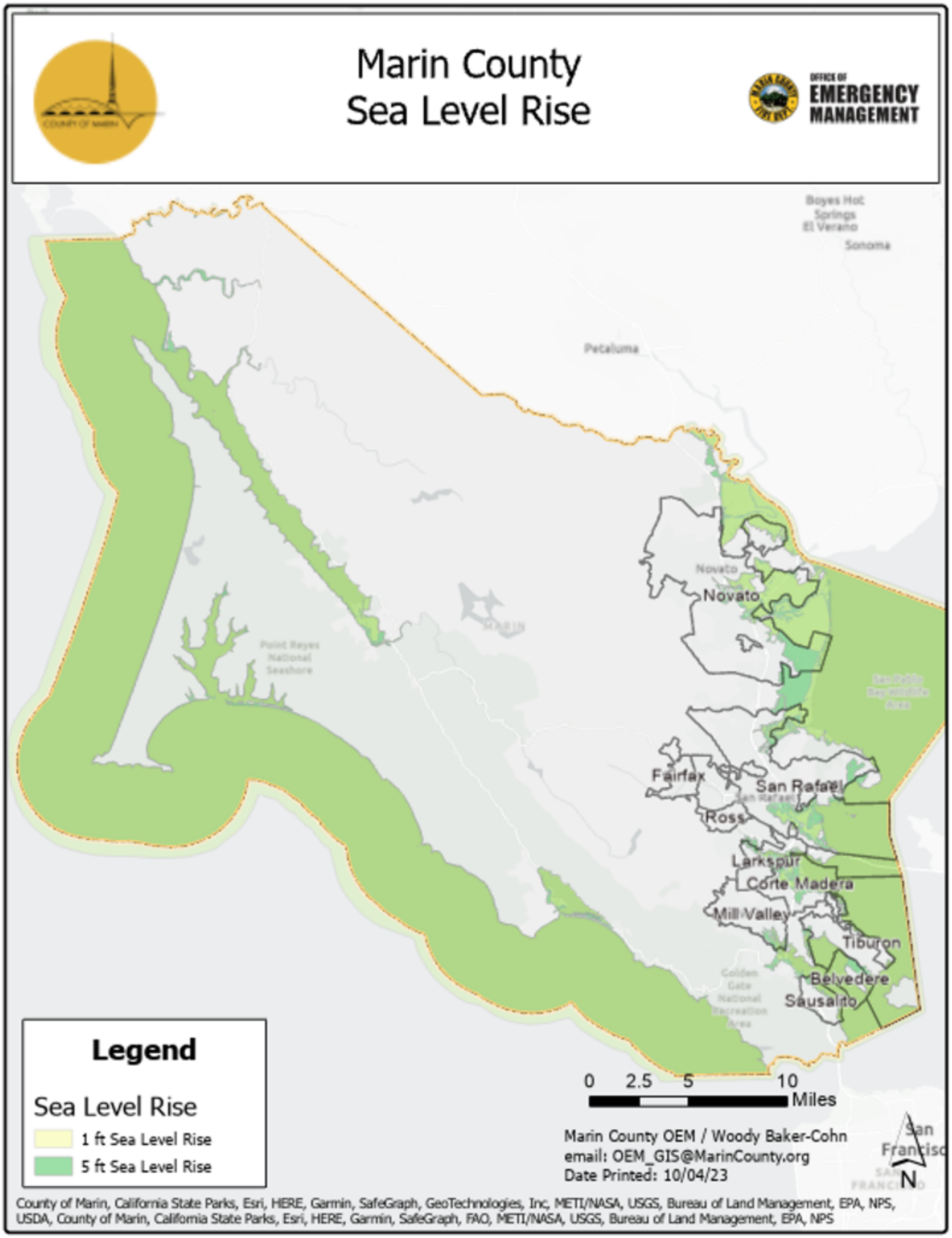


Figure 36: Marin County Sea Level Rise Impact
Source: Marin County OEM

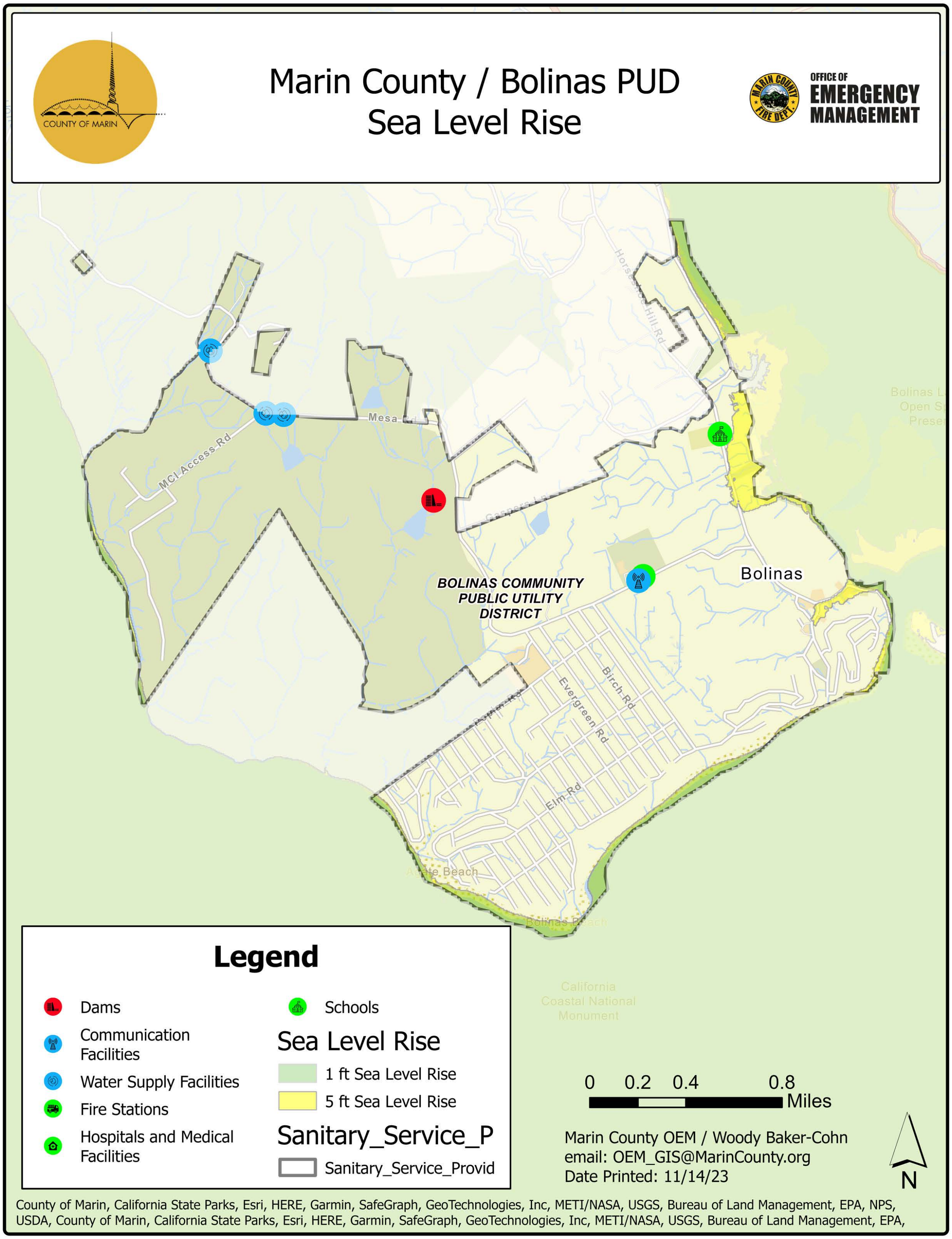


Figure 37: BCPUD Sea Level Rise Impact on Critical Facilities
Source: Marin County OEM

2.2.9 Severe Weather – Extreme Heat

Extreme heat is defined as temperatures that hover 10 degrees or more above the average high temperature for the region and last for several weeks. A heat wave is an extended period of extreme heat, often with high humidity. When relative humidity is factored in, the temperature can feel much hotter as reflected in the Heat Index (see Figure 38):

NOAA's National Weather Service

Heat Index

Temperature (ºF)

Relative Humidity (%)	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110
40	80	81	83	85	88	91	94	97	101	105	109	114	119	124	130	136
45	80	82	84	87	89	93	96	100	104	109	114	119	124	130	137	
50	81	83	85	88	91	95	99	103	108	113	118	124	131	137		
55	81	84	86	89	93	97	101	106	112	117	124	130	137			
60	82	84	88	91	95	100	105	110	116	123	129	137				
65	82	85	89	93	98	103	108	114	121	126	130					
70	83	86	90	95	100	105	112	119	126	134						
75	84	88	92	97	103	109	116	124	132							
80	84	89	94	100	106	113	121	129								
85	85	90	96	102	110	117	126	135								
90	86	91	98	105	113	122	131									
95	86	93	100	108	117	127										
100	87	95	103	112	121	132										

Likelihood of Heat Disorders with Prolonged Exposure or Streuous Activity

Caution | Extreme Caution | Danger | Extreme Danger

Figure 38: Heat Index
Source: NOAA

Heat kills by taxing the human body beyond its abilities. In a normal year, about 1,300 Americans succumb to the demands of summer heat. Heat is the leading weather-related cause of mortalities in the US. In 2006, California reported a high of 204 heat related deaths, with 98 reported in 2017 and 93 deaths reported in 2018.

Extreme heat can affect a range of key infrastructure from energy systems, water and wastewater treatment systems, the operation of government buildings, and public transit. While higher summer temperatures increase electricity demand for cooling, at the same time, it also can lower the ability of transmission lines to carry power, possibly leading to electricity reliability issues during heat waves. Increased temperatures also impact the efficiency of solar power infrastructure by increasing the surface temperature of solar panels, which reduces the voltage that panels can generate and thereby lowers efficiency. Although warmer winters will reduce the need for heating, modeling suggests that total U.S. energy use will increase in a warmer future. Extreme heat can also increase the risk of other types of disasters and exacerbate the urban heat island effect. Heat can exacerbate drought, and hot dry conditions can in turn create wildfire conditions. In cities, buildings, roads and infrastructure can be heated to 50 to 90 degrees hotter than the air while natural surfaces remain closer to air temperatures. The heat island effect is most intense during the day, but the slow release of heat from the infrastructure overnight (or an atmospheric heat island) can keep cities much hotter than surrounding areas. People who are required to work outside during extreme heat are especially vulnerable to the effects of extreme heat. In California , between 2000-2017, 15,996 workers experienced heat related illness (Risk factors for occupational heat-related illness among California workers, 2000-2017 - PubMed (nih.gov).

Extreme heat has the potential to impact all areas of the BCPUD and would be felt more at lower elevations in the central and eastern areas of the District. Heat waves can cause power outages, which can impact the operability of the District's critical facilities and impede the delivery of services. Heat waves can also impact district employees who are exposed to high temperatures while working outside in the heat.

2.2.10 SEVERE WEATHER – HIGH WIND & TORNADO

High Wind

High wind is defined as a one-minute average of surface winds 40 miles per hour or greater lasting for one hour or longer, or winds gusting to 58 miles per hour or greater regardless of duration that are either expected or observed over land. These winds may occur as part of a seasonal climate pattern or in relation to other severe weather events such as thunderstorms. The Beaufort scale is an empirical measure that relates wind speed to observed conditions on land and is a common measure of wind intensity (see Figure 36).

Windstorms in the Marin County OA are typically straight-line winds. Straight-line winds are generally any thunderstorm wind that is not associated with rotation (i.e., is not a tornado). It is these winds, which can exceed 100 mph, which represent the most common type of severe weather and are responsible for most wind damage related to thunderstorms.

Straight-line winds may exacerbate existing weather conditions by increasing the effect on temperature and decreasing visibility due to the movement of particulate matters through the air, as in dust and snow storms. The winds may also exacerbate fire conditions by drying out the ground cover, propelling fuel around the region, and increasing the ferocity of exiting fires. These winds may cause personal injury, damage crops, push automobiles off roads, damage roofs and structures, overturn mobile homes, tear roofs off of houses, topple trees, snap power lines, shatter windows, sandblast paint from cars, and cause secondary damage due to flying debris. Other associated hazards include utility outages, arcing power lines, debris blocking streets, dust storms, and an occasional structure fire. Due to the wildfire threat posed by trees falling or leaning on power lines as a result of high winds and other conditions, Pacific Gas and Electric began initiating PSPS events after the 2017 Northern California Wildfires and the 2018 Camp Fire (see wildfire profile) in order to prevent the start of wildfires. These PSPS events can have numerous impacts on residents who rely on electricity for cooling their homes, powering water pumps, keeping critical medical equipment operable and other needs.

Beaufort number	Description	Wind speed		Land conditions
		kts	km/h	
0	Calm	< 1	< 1	Calm. Smoke rises vertically.
1	Light air	1 – 2	1 – 5	Wind motion visible in smoke.
2	Light breeze	3 – 6	6 – 11	Wind felt on exposed skin. Leaves rustle.
3	Gentle breeze	7 – 10	12 – 19	Leaves and smaller twigs in constant motion.
4	Moderate breeze	11 – 15	20 – 28	Dust and loose paper raised. Small branches begin to move.
5	Fresh breeze	16 – 20	29 – 38	Branches of a moderate size move. Small trees begin to sway.
6	Strong breeze	21 – 26	39 – 49	Large branches in motion. Whistling heard in overhead wires. Umbrella use becomes difficult. Empty plastic garbage cans tip over.
7	High wind, Moderate gale, Near gale	27 – 33	50 – 61	Whole trees in motion. Effort needed to walk against the wind. Swaying of skyscrapers may be felt, especially by people on upper floors.
8	Gale, Fresh gale	34 – 40	62 – 74	Some twigs broken from trees. Cars veer on road. Progress on foot is seriously impeded.
9	Strong gale	41 – 47	75 – 88	Some branches break off trees, and some small trees blow over. Construction/temporary signs and barricades blow over. Damage to circus tents and canopies.
10	Storm, Whole gale	48 – 55	89 – 102	Trees are broken off or uprooted, saplings bent and deformed. Poorly attached asphalt shingles and shingles in poor condition peel off roofs.
11	Violent storm	56 – 63	103 – 117	Widespread vegetation damage. Many roofing surfaces are damaged; asphalt tiles that have curled up and/or fractured due to age may break away completely.
12	Hurricane	≥ 64	≥ 118	Very widespread damage to vegetation. Some windows may break; mobile homes and poorly constructed sheds and barns are damaged. Debris may be hurled about.

Figure 39: Beaufort Wind Scale
Source: NOAA

In the Marin County OA, storms with strong winds knock down trees and power lines nearly every year and continue to slowly erode vulnerable coastal areas and critical inland ponds (i.e. reservoirs/dams, berms/levees around stormwater detention ponds, wastewater treatment/storage ponds). Although the entire OA is affected by wind, coastal areas tend to be impacted more frequently by the strongest winds (9+ on the Beaufort scale) than inland areas. The Marin County OA's coastal areas have small resident populations but large visiting populations, such as Muir Beach, Stinson Beach, and Bolinas that can be impacted by strong winds. Beachgoers and boaters would be particularly impacted by wind hazards. Tourism is a key part of the economy in Marin County, particularly in coastal communities, and thus there are potentially significant economic impacts of wind events. Some communities, such as Oceana Marin and Olema, rely on water and wastewater infrastructure that has potential to be impacted by coastal erosion, wind driving up wave elevations, and erosion from waves forming due to wind over treatment and storage ponds. Inland critical ponds are also impacted by wind-driven wave erosion such as dams on drinking water reservoirs, and levees/berms containing stormwater retention and detention ponds. Across the county powerlines are potentially impacted by wind, potentially affecting commercial, industrial, and residential areas, and most years downed trees lead to temporary road closures.

1/2023 – In Bolinas, extreme high winds estimated at close to 100 mph knocked down numerous trees across Mesa Road, closing the road several times, causing power outages and, in one case, injury. These winds also toppled a tree across Terrace Avenue, closing that road at the same time one of the Mesa Road closures occurred, temporarily blocking both egress roads out of town.

Tornado

Tornadoes are rotating columns of air marked by a funnel-shaped downward extension of a cumulonimbus cloud whirling at destructive speeds of up to 300 mph, usually accompanying a thunderstorm. Tornadoes are the most powerful storms that exist, and damage paths can be in excess of one mile wide and 50 miles long. The Enhanced Fujita Scale (see Figure 40) is commonly used to rate the intensity of tornadoes in the United States based on the damages that they cause.

Enhanced Fujita Scale	
EF-0	65-85 mph winds
EF-1	86-110 mph winds
EF-2	111-135 mph winds
EF-3	136-165 mph winds
EF-4	166-200 mph winds
EF-5	>200 mph winds

Figure 40: Enhanced Fujita Scale
Source: NOAA

Tornadic waterspouts are tornadoes that form over water or move from land to water. They have the same characteristics as a land tornado. They are associated with severe thunderstorms, and are often accompanied by high winds and seas, large hail, and frequent dangerous lightning.

Figure 41: Waterspout Formation
Source: MarineInsights

All of the BCPUD is susceptible to storms and damage from wind and tornadoes, though the higher elevation areas throughout the District have increased susceptibility due to a greater number of trees. Drought and/or heavy rainfall can increase the susceptibility of trees toppling over in a high wind event. Fallen trees could damage critical facilities and infrastructure. Power lines could be impacted by fallen trees and wind, causing power outages. Roadways could also become blocked by fallen trees, impacting public safety and affecting the delivery of services and access to critical facilities.

2.2.11 Tsunami

Tsunamis consist of waves generated by large disturbances of the sea floor, which are caused by volcanic eruptions, landslides or earthquakes. Shallow earthquakes along dip slip faults are more likely to be sources of tsunami than those along strike slip faults. The West Coast/Alaska Tsunami Warning Center (WC/ATWC) is responsible for tsunami warnings. Tsunamis are often incorrectly referred to as tidal waves. They are actually a series of waves that can travel at speeds averaging 450 (and up to 600) miles per hour with unusual wave heights. Tsunamis can reach the beach before warnings are issued.

A tsunami experienced by the BCPUD would most likely occur from an earthquake, the location of which would determine the amount of time that the tsunami waves would reach the District. A tsunami poses threat primarily to the coastal areas of the District.

The BCPUD has never experienced a significant tsunami however, given its proximity to the San Francisco Bay, it is within a Tsunami zone and could potentially experience the impacts of one, primarily in downtown Bolinas and along Olema-Bolinas Road.

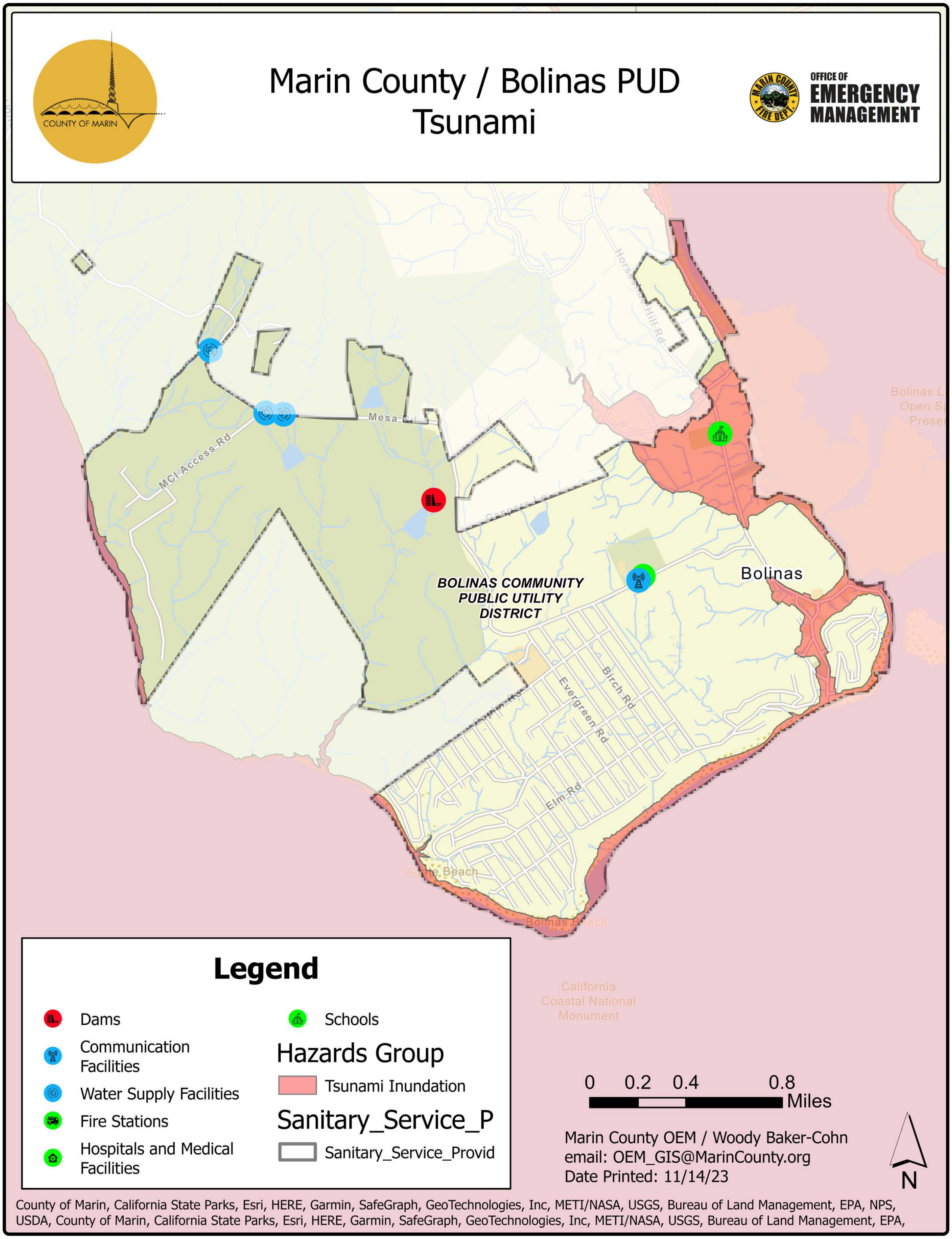


Figure 42: BCPUD Tsunami Critical Facilities and Infrastructure
Source: Marin County OEM

2.2.12 Wildfire

A wildfire is a fire that occurs in an area of combustible vegetation. The three conditions necessary for a wildfire to burn are fuel, heat, and oxygen. Fuel is any flammable material that can burn, including vegetation, structures, and cars. The more fuel that exists and the drier that fuel is, the more intense the fire can be. Wildfires can be started naturally through lightning or combustion or can be set by humans. There are many sources of human-caused wildfires including arson, power lines, a burning campfire, an idling vehicle, trains, and escaped controlled burns. On average, four out of five wildfires are started by humans. Uncontrolled wildfires fueled by wind and weather can burn acres of land and everything in their path in mere minutes and can reach speeds up to 15 miles per hour. On average, more than 100,000 wildfires burn 4 to 5 million acres of land in the United States every year. Although wildfires can occur in any state, they are most common in the Western states including California where heat, drought, and thunderstorms create perfect wildfire conditions.

Wildfires are of primary concern when they occur in the Wildland Urban Interface (WUI), which is defined as areas where homes are built near or among lands prone to wildfire. Even relatively small acreage fires may result in disastrous damages. Most structures in the WUI are not destroyed from direct flame impingement, but from embers carried by wind. The damages can be widely varying, but are primarily reported as damage to infrastructure, built environment, and injuries to people.

The pattern of increased damages is directly related to increased urban spread into historical forested areas that have wildfire as part of the natural ecosystem. Many WUI fire areas have long histories of wildland fires that burned only vegetation in the past. However, with new developments, a wildland fire following a historical pattern may now burn these newly developed areas. WUI fires can occur where there is a distinct boundary between the built and natural areas or where development or infrastructure has encroached or is intermixed in the natural area. WUI fires may include fires that occur in remote areas that have critical infrastructure easements through them, including electrical transmission towers, railroads, water reservoirs, communications relay sites or other infrastructure assets.

Consequently, wildland fires that burn in natural settings with little or no development are part of a natural ecological cycle and may actually be beneficial to the landscape. Century old policies of fire exclusion and aggressive suppression have given way to better understanding of the importance fire plays in the natural cycle of certain forest types.

Warning times are usually adequate to ensure public safety, provided that evacuation recommendations and orders are heeded in a timely manner. While in most cases wildfires are contained within a week or two of outbreak, in certain cases, they have been known to burn for months, or until they are completely extinguished by fall rains.

Wildfire poses the greatest risk to human life and property in the Marin County OA's densely populated WUI, which holds an estimated 69,000 living units. Marin County is home to 23 communities listed on CAL FIRE's Communities at Risk list, with approximately 80% of the total land area in the county designated as having moderate to very high fire hazard severity ratings. The county has a long fire history with many large fires over the past decades, several of which have occurred in the WUI. To compound the issue, national fire suppression policies and practices have contributed to the continuous growth (and overgrowth) of vegetation resulting in dangerous fuel loads. The Community Wildfire Protection Plan (CWPP) provides a scientifically based assessment of wildfire threat in the WUI of the Marin County OA.

Fire protection in California is the responsibility of either the federal, state, or local government. On federally owned land, or federal responsibility areas (FRA), fire protection is provided by the federal government, and or in partnership with local agreements. In state responsibility areas (SRA), CAL FIRE typically provides fire protection. However, in some counties CAL FIRE contracts with county fire departments to provide protection of the SRA – this is the case in Marin County, where CAL FIRE contracts with MCFD. Local responsibility areas (LRA) include incorporated cities and cultivated agriculture lands, and fire protection is typically provided by city fire departments, fire protection districts, counties, and by CAL FIRE under contract to local government.

CAL FIRE contracts with MCFD to provide wildland fire protection and associated fire prevention activities for lands designated by the State Board of Forestry as SRA. Marin County is one of six counties in the state who contract with CAL FIRE to protect SRA. The MCFD is responsible for the protection of approximately 200,000 acres of SRA within the county and is the primary agency that handles wildland fires. MCFD also provides similar protection services to approximately 100,000 acres of FRA in the Golden Gate National Recreation Area (GGNRA), the Muir Woods National Monument, and the Point Reyes National Seashore.

Figure 40 indicates the federal responsibility areas, state responsibility areas and local responsibility areas in the Marin County OA.

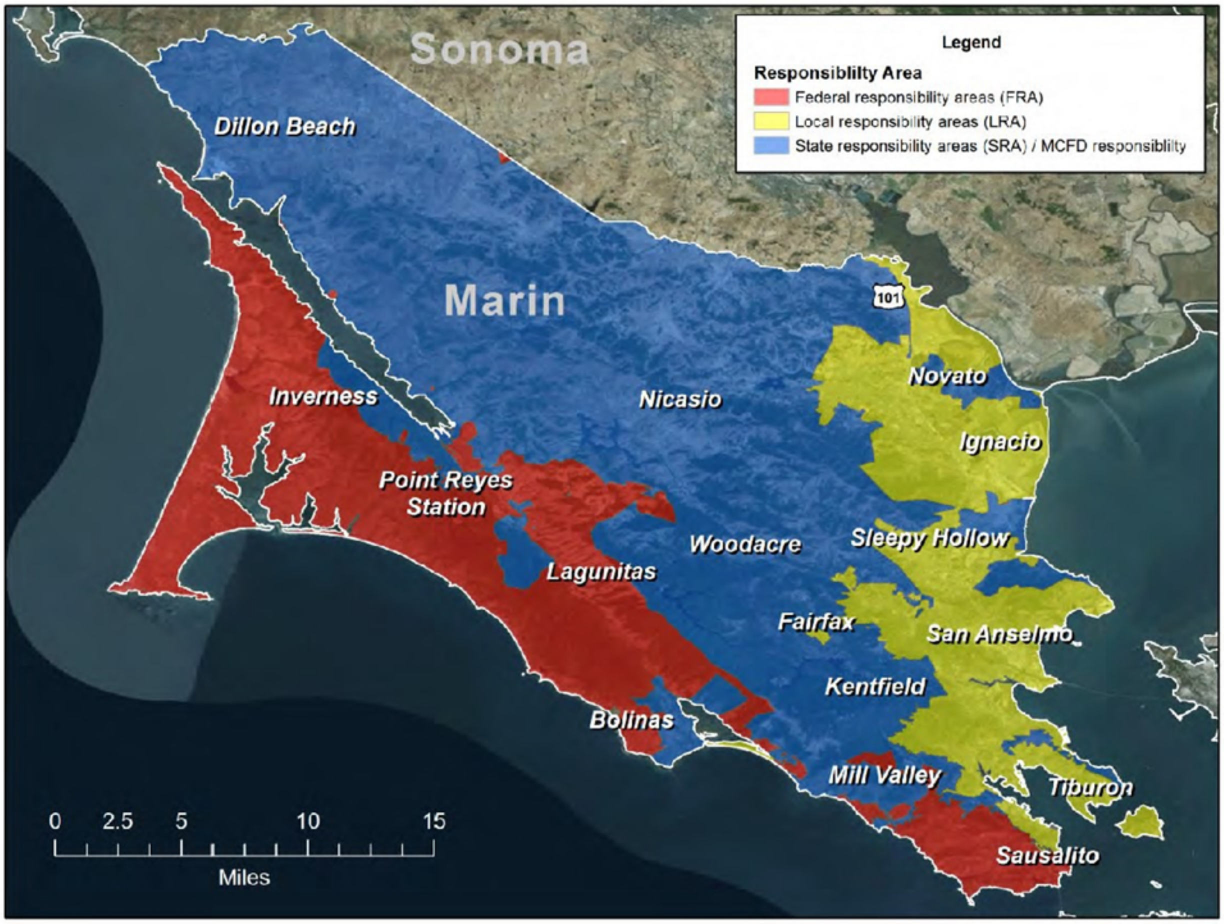


Figure 43: Federal, State and Local Responsibility Areas in the Marin County OA
Source: Marin Community Wildfire Protection Plan

The mix of weather, diverse vegetation and fuel characteristics, complex topography, and land use and development patterns in the Marin County OA are important contributors to the fire environment. The MCFD Woodacre ECC currently manages the data from four Remote Automated Weather Stations (RAWS) for predicting fire danger utilizing the National Fire Danger Rating System (NFDRS) during the fire season. The RAWS are located in Woodacre, Middle Peak, Barnabe, Big Rock and a new station will be coming online in Novato.

Marin County is bounded by the cool waters of the Pacific Ocean to the west, the San Francisco and Richardson Bays to the southeast, the San Pablo Bay to the east, and Sonoma County agricultural lands to the north. The combination of these large bodies of water, location in the mid-latitudes, and the persistent high pressure over the eastern Pacific Ocean results in several micro-climates. Weather in the OA consists of warm, dry summers and cool, wet winters. The climate in early fall and late spring is generally similar to the summer, and late fall is similar to winter. Spring is generally cool, but not as wet as winter. While these general weather conditions are fairly representative of the typical Marin County weather, complex topography, annual variability of weather patterns, and less frequent and transient weather patterns are important to fire conditions.

In the late spring through early fall, the combination of frequent and strong high-pressure systems (known as the Pacific High) over California combined with the cool waters of the ocean/bays results in persistent fog and low clouds along the coast (including over southern Marin County near the San Francisco Bay). The fog often penetrates into the inland valleys of northern and central Marin County, especially during overnight hours. At the coastline, mist from fog can keep the land surfaces modestly moist while inland land surfaces above the fog or inversion are often very dry.

The Pacific High that persists from late spring through early fall over the eastern Pacific, combined with a thermal low pressure over the Central Valley of California, results in an almost continuous sea breeze. These winds usher in cool and moist air and can be strong (15 to 25 mph), especially over the ridge tops and through northwest to southeast lying valleys, including San Geronimo/Ross, Hicks, and Lucas Valleys. These westerly winds are usually highest in the afternoon, decrease in the evening, and are light overnight before increasing again in the late morning/early afternoon.

Occasionally in the summer and more often in the fall, the Pacific High moves inland and centers over Oregon and Idaho, while low pressure moves from the Central Valley of California to southern California and Arizona. The resulting north-to-south pressure gradient can be strong enough to retard the typical sea breeze and can even result in winds blowing from the land to the ocean (offshore winds). As the offshore winds move air from the Great Basin to the coastal areas of California, the air descends and compresses, which greatly warms and dries the air. Under these “Diablo” wind conditions, temperatures in the Marin County OA can reach 100°F in the inland areas and even 80°F at the coast, and relative humidity can be very low. In addition, wind speeds can be high (20 to 40 mph) and gusty and are often much faster over the mountains and ridge tops such as Mt. Tamalpais, Loma Alta, and Mt. Burdell compared to low-lying areas. Wind speeds can be high over the ridges and mountains at all times of day under this “offshore” wind pattern and are often much slower or even calm at night in low-lying areas because nighttime cooling decouples the aloft winds from the surface winds. It is during these Diablo wind events that there is a high potential for large, wind-driven fires should there be an ignition. Historically, the largest and most destructive fires have occurred during these offshore (also known as Foehn) wind events including the Angel Island and the Vision fires.

A few times per year in the summer and early fall, monsoonal flow from Mexico brings in moist and unstable air over central and northern California, which can result in thunderstorms with or without precipitation. With the otherwise dry summer conditions, the lightning can ignite fires. These monsoonal flow patterns are usually only one to two-day events.

Beginning in late November and lasting through the end of March, the Pacific High moves south and weakens, allowing storms that originate in the Gulf of Alaska to move over California.

These storms bring precipitation and, at times, strong winds out of the south. Each storm usually results in one fourth inch to several inches of rain over a day or so. Near Mt. Tamalpais, rainfall amounts are enhanced by orographic lifting, resulting in higher rain amounts in the Kentfield and Fairfax areas compared to the rest of the county. Typically, after the first rain in November, the cool weather and occasional storm keeps the ground wet through late Spring. However, in some years, significant rain does not occur until later in the year (e.g., early-to-late December) and there can be several weeks without any storms and rain. During storms, temperatures are usually mild.

When there are no storms over California, a land-breeze typically forms (i.e., winds blowing from the Central Valley to the Pacific Ocean). These winds can reach 30 mph, and travel through the southeast to northwest lying valleys, over low-lying ridges such as the Marin Headlands, and through the Golden Gate. These winds are usually highest in the mid-morning hours and decrease in the afternoon as the Central Valley warms during the day. The winds are associated with cold and modestly moist air.

In late February/early March through late April, the Pacific High strengthens and moves north, and storms impacting the county become less frequent. During this time of year there is often a low-pressure area over the desert in southwest California. The combination of the Pacific High to the north and low-pressure to the southwest results in strong winds blowing from the northwest to the southeast. Like the sea breeze, these winds bring in cool, moist air and are usually highest in the afternoon hours. Because of winter and spring rains, the land is wet and there is little danger of wildland fire despite the strong winds and only occasional precipitation. There is often little coastal fog this time of year.

Vegetation, which is also known as fuel, plays a major role in fire behavior and potential fire hazards. A fuel's composition, including moisture level, chemical make-up, and density, determines its degree of flammability. Of these, fuel moisture level is the most important consideration. Generally, live trees contain a great deal of moisture while dead logs contain very little. The moisture content and distribution of fuels define how quickly a fire can spread and how intense or hot it may become. High moisture content will slow the burning process since heat from the fire must first eliminate moisture.

In addition to moisture, a fuel's chemical makeup determines how readily it will burn. Some plants, shrubs, and trees such as chamise and eucalyptus (both present in the Marin County OA) contain oils or resins that promote combustion, causing them to burn more easily, quickly, and intensely.

Finally, the density of a fuel influences its flammability; when fuels are close together but not too dense, they will ignite each other, causing the fuel to spread readily. However, if fuels are so close that air cannot circulate easily, the fuel will not burn freely.

The Marin County OA has extensive topographic diversity that supports a variety of vegetation types.

Environmental factors, such as temperature, precipitation, soil type, aspect, slope, and land use history, all help determine the existing vegetation at any given location. In the central and eastern parts of the county, north facing slopes are usually densely wooded from lower elevations to ridge peaks with a mixture of mostly hardwood tree species such as coast live oak, California bay, Pacific madrone, and other oak species. Marshlands are also present throughout the county; once ignited marsh fires can be difficult to contain and extinguish.

Grasslands with a mixture of native and nonnative annual and perennial plant species occur most often in the northern and western parts of the county due to a combination of soil type, lower rainfall, and a long history of ranching. The southern and western facing slopes tend to have a higher percentage of grasslands, which in turn have the potential to experience higher rates of fire spread. Grassland fires are dangerous even without extreme fire weather scenarios due to the rapid rate of fire spread; in some cases, fires spread so quickly that large areas can burn before response resources are able to arrive.

In the west portion of the county closer to the coast, where precipitation is higher and marine influence is greater, most areas are densely forested with conifer species (i.e., Bishop pine, Douglas-fir, and coast redwood) and associated hardwood species. Chaparral vegetation also occurs in parts of the county, especially on steeper south and west facing slopes. This mix of densely forested areas mixed with chaparral results in higher fuel loads and potentially higher fire intensity. Expansion of the residential community into areas of heavier vegetation has resulted in homes existing in close proximity to dense natural foliage; these homes are often completely surrounded by highly combustible or tall vegetation, increasing the potential that wildland fires could impact them.

As part of the development of the CWPP, an updated vegetation map layer was created using the most recent vegetation information available from a variety of state and local data sources.

Vegetation distribution in the Marin County OA is characterized by approximately 20 different types of vegetation which have been classified into 15 fire behavior fuel models.

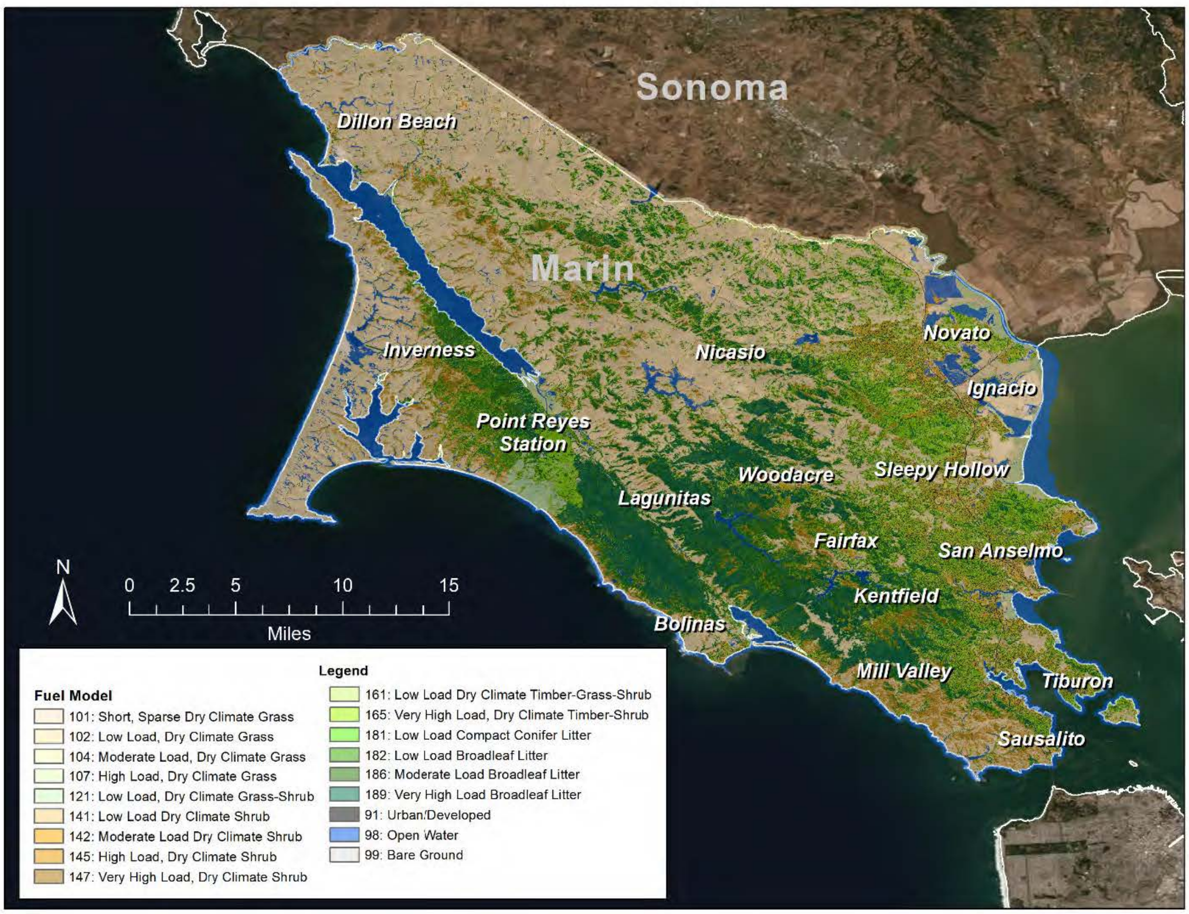


Figure 44: Fuel Model Map for the Marin County OA
Source: Unknown

Insect infestations and plant diseases, such as California oak mortality syndrome (sudden oak death), are increasing and threaten to change the structure and overall health of native plant communities in Marin County. Sudden oak death has no known cure and is the biggest concern; this syndrome is caused by the fungus-like Phytophthora ramorum, which has led to widespread mortality of several tree species in California since the mid-1990s; the tanoak (Lithocarpus densiflorus) in particular appears to have little or no resistance to the disease. Sudden oak death has resulted in stands of essentially dead trees with very low fuel moistures.

Studies examining the impacts of sudden oak death on fire behavior indicate that while predicted surface fire behavior in sudden oak death stands seems to conform to a common fuel model already in use for hardwood stands, the very low moisture content of dead tanoak leaves may lead to crown ignitions more often during fires of “normal” intensity.

Two other plant diseases prevalent in the Marin County OA are pitch canker (which affects conifers such as Bishop pine and other pine species), and madrone twig dieback (which affects Pacific madrones). Pitch canker is caused by the fungus Fusarium circinatum (F. subglutinans, F. sp. pini), which enters the tree through wounds caused by insects. While some trees do recover, most infected trees are eventually killed by the fungus. Management of this disease largely focuses on containment to reduce the fungus spreading to other trees. Pitch canker is a particular issue in the NPS lands of Pt. Reyes National Seashore, where many acres of young Bishop Pines that were seeded on the Inverness Ridge by the Mount Vision Fire of 1995 have been infected.

These dead and dying trees have created large swaths of land with dense and dry fuel loads. Madrone twig dieback is caused by the native fungus Botryosphaeria dothidea and appears to be getting worse throughout the county due to drought effects on Pacific madrones. Three additional threats to trees common to the Marin County OA include:

- Bark and ambrosia beetles (Monarthrum dentiger and monarthrum scutellare), which target oak and tanoak trees. Sudden oak death may be exacerbating the effects of beetle infestations which prey on trees already weakened by this disease.
- Root rot, caused by oak root fungus (Armillaria mellea), is primarily associated with oaks and other hardwoods but also attacks conifers. These fungal infestations cause canopy thinning and branch dieback and can kill mature trees. As with the beetle infestations, sudden oak death may be exacerbating the effects of root rot fungus in the county forests.
- Velvet-top fungus (Phaeolus schweinitzii) is a root rot fungus affecting Douglas-fir and other conifers, with the infection typically occurring through a wound.

Topography characterizes the land surface features of an area in terms of elevation, aspect, and slope. Aspect is the compass direction that a slope faces, which can have a strong influence on surface temperature, and more importantly on fuel moistures. Both elevation and aspect play an important role in the type of vegetation present, the length of the growing season, and the amount of sunlight absorbed by vegetation. Generally, southern aspects receive more solar radiation than northern aspects; the result is that soil and vegetation on southern aspects is warmer and dryer than soil and vegetation on northern aspects. Slope is a measure of land steepness and can significantly influence fire behavior as fire tends to spread more rapidly on steeper slopes. For example, as slope increases from 20 – 40%, flame heights can double and rates of fire spread can increase fourfold; from 40 – 60%, flame heights can become three times higher and rates of spread can increase eightfold.

The Marin County OA is topographically diverse, with rolling hills, valleys and ridges that trend from northwest to southeast. Elevation throughout the county varies considerably, with Mt.

Tamalpais' peak resting at 2,574 feet above sea level and many communities at or near sea level. Correspondingly, there is considerable diversity in slope percentages. The San Geronimo Valley slopes run from level (in the valley itself) to near 70%. Mt. Barnabe has slopes that run from 20 to70%, and Throckmorton ridge has slopes that range in steepness from 40 – 100%. These slope changes can make fighting fires extremely difficult.

In the WUI where natural fuels and structure fuels are intermixed, fire behavior is complex and difficult to predict. Research based on modeling, observations, and case studies in the WUI indicates that structure ignitability during wildland fires depends largely on the characteristics and building materials of the home and its immediate surroundings.

The dispersion of burning embers from wildfires is the most likely cause of home ignitions. When embers land near or on a structure, they can ignite near-by vegetation or accumulated debris on the roof or in the gutter. Embers can also enter the structure through openings such as an open window or vent and could ignite the interior of the structure or debris in the attic.

Wildfire can further ignite structures through direct flame contact and/or radiant heat. For this reason, it is important that structures and property in the WUI are less prone to ignition by ember dispersion, direct flame contact, and radiant heat.

Public Safety Power Shutoff (PSPS) Events

As a result of the 2017 Northern California Wildfires, the 2018 Camp Fire in Butte County and other wildfires caused by power line infrastructure, Pacific Gas & Electric (PG&E) began initiating Public Safety Power Shutoff (PSPS) events in their service areas (including Marin County) to help prevent the start of future wildfires. PG&E will initiate a PSPS if conditions indicate potentially dangerous weather conditions in fire-prone areas due to strong winds, low humidity, and dry vegetation. During these events, PG&E will proactively turn off power in high fire risk areas to reduce the threat of wildfires. The most likely electric lines to be considered for a public safety power outage will be those that pass through areas that have been designated by the California Public Utilities Commission (CPUC) High Fire-Threat District at elevated (Tier 2) or extreme risk (Tier 3) for wildfire. Customers outside of these areas could have their power shut off, though, if their community relies upon a line that passes through a high fire-threat area or an area experiencing severe weather. PG&E will consider numerous factors and analyze historical data to help predict the likelihood of a wildfire occurring, and closely monitoring weather watch alerts from the National Weather Service (NWS). These factors generally include, but are not limited to:

- A Red Flag Warning declared by the National Weather Service
- Low humidity levels, generally 20 percent and below
- Forecasted sustained winds generally above 25 mph and wind gusts in excess of approximately 45 mph, depending on location and site-specific conditions such as temperature, terrain and local climate
- Condition of dry material on the ground and live vegetation (moisture content)
- On-the-ground, real-time observations from PG&E's Wildfire Safety Operations Center and field crews

Pacific Gas & Electric Company (PG&E) operates a total of 1,179 miles of overhead electricity transmission and distribution lines in the Marin County OA. Overhead electricity lines and poles can be damaged or downed under severe weather conditions, particularly severe wind conditions, which increases the potential for wildfire ignition. 52 percent of PG&E's overhead distribution lines and 41 percent of its overhead transmission lines are located in CPUC-identified High-Fire Threat Districts subject to elevated or extreme fire risk. PG&E is currently planning and implementing safety measures to prevent wildfires and reduce the impacts of Public Safety Power Shutoff (PSPS) events on communities in the Marin County OA and throughout California.

These measures include installing weather stations; installing high-definition cameras; installing sectionalizing devices on its overhead lines to separate the grid into smaller sections; hardening the system by installing stronger power poles, covering lines, and undergrounding lines in targeted areas; creating temporary microgrids to provide electricity during PSPS events; and enhancing existing vegetation management activities. From 2018 to July 2021, PG&E hardened three miles of overhead lines, installed 68 transmission and distribution sectionalizing devices, completed enhanced vegetation management on approximately 51 of overhead line miles, installed 28 weather stations, and installed 12 high-definition cameras in the Marin County OA.

A wildfire in the BCPUD would most likely occur in the areas of the District where there is more forested terrain. There are no District critical facilities in these areas, although the BCPUD's jurisdictional boundaries are relatively small, so the critical facilities are nearby this forested terrain. District critical facilities, including the Woodrat 1 Reservoir/dam, the Woodrat 2 Reservoir/dam, the Woodrat Water Treatment Plant, and the BCPUD's treated water storage tanks and booster pump station are in a Moderate FHSZ and could be impacted by a brush fire in the vegetated areas of the District. All of the BCPUD could be impacted by a Public Safety Power Shutoff (PSPS) event and/or suffer poor air quality from smoke as a result of wildlfire anywhere in Marin County or the surrounding region. As wildland areas around the District become drier due to climate change and drought, the risk of a wildfire or brush fire occurring and impacting the District will continue to increase as open spaces experience drier conditions.

The Bolinas Community Public Utility District has never experienced a major wildfire or brush fire.

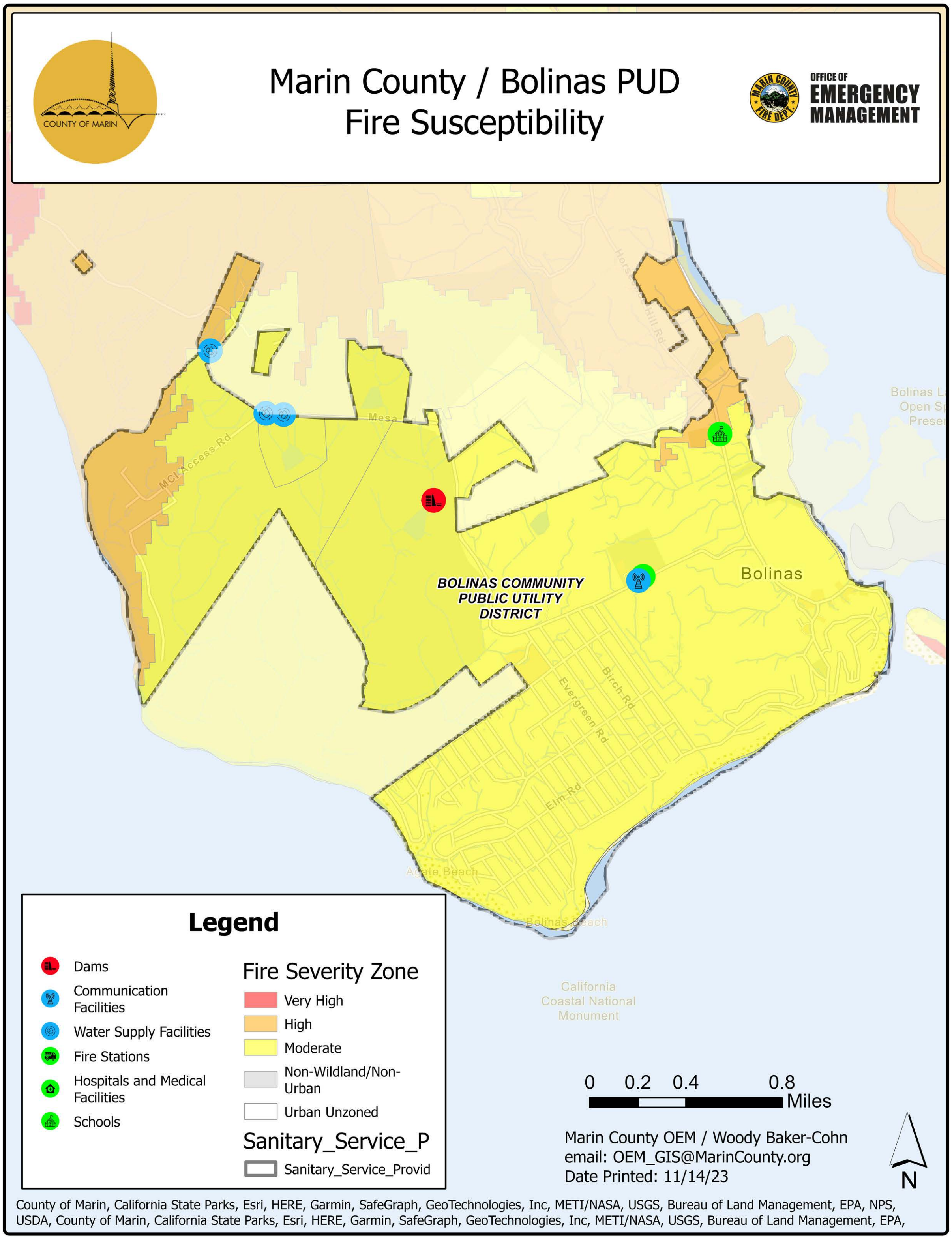


Figure 45: BCPUD Wildfire Critical Facilities and Infrastructure
Source: Marin County OEM

3.0 MITIGATION STRATEGY

3.1 CHANGES IN DEVELOPMENT

There has been some development within the Bolinas Community Public Utility District since the County's last plan update in 2018. However, the development has been in the form of numerous capital improvements to existing district facilities or within the facility footprint of the BCPUD. There has not been any increased risk to the District as a result of new development since the County's last plan update in 2018.

As a small special district in unincorporated Marin County, the BCPUD does not have jurisdiction over land use or planning in the community (that responsibility lies with the Marin County Community Development Agency). Significant development is not anticipated for Bolinas within the next 5 years given development constraints and the limited nature of the local water supply and consequent moratorium on new connections to the water system. The table below identifies projects planned for new district facilities or infrastructure in the next five years.

Future land use and growth management strategies in the Bolinas Community Public Utility District are consistent with priorities detailed in the 2018 Marin County MJHMP and aim to concentrate future development into and toward existing areas away from locations where natural characteristics may limit development (e.g., steep slopes or sensitive habitats), and to areas that have, or can readily be supplied with, adequate public facilities and services. This is done through various policies relating to zoning and minimum development standards and requirements. No further development is planned for the next five years.

Table 9: BCPUD Future Growth Areas						
Project Location	**# of Units**	**# of Parcels**	**Application Status**	**Acres**	**Fire Severity Zone**	**Flood Zone**
New Administrative Building – 270 Elm Road, Bolinas	1	1	3-5 years		Moderate	None
Wharf Well – new treatment facilities (31 Wharf Road, Bolinas)	N/A	1	Completion 12/31/24		Moderate	None
Resource Recovery Well – new treatment facilities (100 Mesa Road, Bolinas)	N/A	2	Completion 12/31/24		Moderate	None
Connect homes on Canyon Road to the BCPUD's sewer system.	N/A	6	2 years		Moderate	None
Total	**1**	**10**				

Table 9: BCPUD Future Growth Areas
Source: Bolinas Community PUD

3.2 Capability Assessment

The Bolinas Community Public Utility District did not participate in the 2018 MJHMP update. However, the strategies to support the overall District priorities are reflected in the sections below. Several actions were added to coincide with the priorities, progress in local mitigation efforts and changes in development.

Capabilities are the programs and polices currently in use to reduce hazard impacts or that could be used to implement hazard mitigation activities. The capability assessment identifies the local planning mechanisms where information from the 2018 MJHMP is incorporated and where updated hazard mitigation information from this 2023 MJHMP will be incorporated once approved. The capability assessment is divided into four sections: regulatory, administrative and technical, fiscal, and outreach and partnerships.

3.2.1 Regulatory Capabilities

The legal and regulatory capabilities include existing ordinances and codes that affect the District's physical or built environment. Examples of legal and/or regulatory capabilities can include: a jurisdiction's building codes, zoning ordinances, subdivision ordnances, special purpose ordinances, growth management ordinances, site plan review, general plans, capital improvement plans, economic development plans, emergency response plans, and real estate disclosure plans. The table below lists regulatory mitigation capabilities, including planning and land management tools, typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place.

Table 10: Legal and Regulatory Capabilities

Plans	Yes/No Latest Update	Does the plan/program address hazards? Does the plan identify projects to include in the mitigation strategy? Can the plan be used to implement mitigation actions?
Comprehensive /Master Plan	Yes	Integrated Coastal Watershed Management Plan (July 2007) addresses water supply and reliability, water and wastewater treatment, and water conservation, among other things in the Tomales Bay and neighboring watersheds; it identifies hazards and watershed planning efforts; may be used to implement mitigation actions. Marin County LAFCO Countywide Water Service Study (March 2016) – independent assessment of public water service in Marin County over next 5 – 10 years, including but not limited to an evaluation of supply and demand Countywide and within service areas; may be used to implement mitigation actions. BCPUD Sewer System Management Plan (2023); identifies planned improvement projects, can be used to implement mitigation actions.
Strategic Plan	No	
Capital Improvements Plan	Yes	Hazards identified in the district's Five-Year CIP are funded based on priority via the district's annual budget

		process. Mitigation projects could be included in the CIP. The Board of Directors reviews and approves the CIP funding on an annual basis. If the Board approves CIP funding, the plan supports implementation of hazard mitigation actions and addresses resiliency/redundancy in general.
Economic Development Plan	No	N/A
Local Emergency Operations Plan	Yes	The district's plan addresses district-specific responses to hazards and various emergencies that may involve district facilities; the EOP does not identify specific projects to mitigate impacts of hazards.
Continuity of Operations Plan	Yes	The district's operations plan is designed to ensure continuity of operations for water and wastewater systems; the operations plan does not identify specific projects to mitigate impacts of hazards.
Flood Mitigation Plan (FMP)	No	N/A
Engineering Studies for Streams	Yes	The district has developed a base flow recession model for the Arroyo Hondo Creek; this model can be used to implement drought-related hazard mitigation actions.
Open Space Management Plan	No	N/A
Regional Transportation Plan (RTP)	No	N/A
Stormwater Management Plan/Program	No	N/A
Community Wildfire Protection Plan	Yes	Marin County Community Wildfire Protection Plan; identifies hazards, can be used to implement wildfire mitigation actions.
Other special plans (e.g., brownfields redevelopment, disaster recovery, coastal zone management, climate change adaptation)	Yes	Marin County Local Coastal Program and Marin County Collaboration: Sea-level Marin Adaptation Response Team (C-SMART); both programs identify hazards and can be used to implement mitigation actions.
Building Code, Permitting, and Inspections	**Y/N**	**Are codes adequately enforced?**
Building Code	N	N/A
Building Code Effectiveness Grading Schedule (BCEGS) Score	N	N/A
Fire department ISO rating:	N	N/A
Site plan review requirements	N	N/A
Land Use Planning and Ordinances	**Y/N**	**Is the ordinance an effective measure for reducing hazard impacts? Is the ordinance adequately administered and enforced?**
District Code	Y	District ordinances and resolutions authorize, among other things, the collection of water and sewer service fees to fund all operations, capital improvements, debt service and mitigation projects. Adequately administered; no

		enforcement relating to hazard impacts.
Floodplain ordinance	N	
Natural hazard specific ordinance (stormwater, steep slope, wildfire)	N	
Flood insurance rate maps	N	
Elevation Certificates	N	
Acquisition of land for open space and public recreation uses	N	
Erosion or sediment control program	N	

Table 10: Bolinas Community Public Utility District Legal and Regulatory Capabilities
Source: Bolinas Community Public Utility District

Bolinas Community Public Utility District Comprehensive Plan or Master Plan

The BCPUD's jurisdictional boundaries are located entirely within unincorporated Marin County, which is required to have a General Plan or Master Plan per California Government Code Section 65300. Please see the Marin County General Plan for Details.

3.2.2 Administrative and Technical Capabilities

The administrative and technical capability identifies the District personnel responsible for activities related to mitigation and loss prevention. Many positions are full time and/or filled by the same person.

Table 11: Administrative and Technical Capabilities

Administrative	Yes/No	Is coordination effective?
Operations Department	Yes	The BCPUD's Operations staff have a variety of duties, principally related to the operation and maintenance of the BCPUD's critical infrastructure to ensure the safe and reliable provision of utility services within the district.
Administrative and Financial Services	Yes	The BCPUD's administrative and financial functions are performed by the General Manager and Administrative Assistant, subject to oversight by the Board of Directors; these positions work together closely to handle all administrative and financial responsibilities of the district.
Hazard Mitigation Planning	Yes	The BCPUD General Manager and Chief Operator (for Water and Wastewater) coordinate with the Operations Staff to evaluate, plan and implement the district's hazard mitigation projects.
Maintenance programs to reduce risk (e.g., tree	Yes	BCPUD operations staff conduct vegetation management (mowing, brush removal, tree pruning/thinning/removal) on

trimming, clearing drainage systems)		district lands and easements to reduce wildfire risk and facilitate access; culvert clearing and road-side ditch maintenance to reduce flooding.
Mutual aid agreements	Yes	The BCPUD is a member of CalWARN and has a mutual aid agreement with the Bolinas Fire Protection District; informal mutual agreements are under discussion with neighboring water districts.
Technical	Yes/No	Has capability been used to assess/mitigate risk in the past?
Warning systems/services (Reverse 911, outdoor warning signals)	Yes	The BCPUD's water and wastewater treatment facilities have alarm systems to notify staff in the event of a mechanical or other emergency failure of critical facilities.
Grant writing	Yes	The BCPUD's General Manager administers grants from federal and state entities (such as FEMA, CalFire and the California Department of Water Resources) to conduct hazard mitigation activities such as fire fuel reduction projects on district lands (to reduce wildfire risk) and to connect existing groundwater wells to the district's water system (to reduce drought risk).
Staff/Personnel Resources	Yes/No FT/ PT	Is staffing adequate to enforce regulations? Is staff trained on hazards and mitigation? Is coordination between agencies and staff effective?
Emergency Manager	Yes	The BCPUD's General Manager and Chief Operator serve this role and coordinate with other districts and/or Marin County as needed during emergencies; they are trained on hazards and mitigation.
Civil Engineer	Yes	The district's consulting water and wastewater engineers assist the district in the enforcement of regulations, have training on hazard mitigation, and facilitate coordination with other agencies as needed.
Engineer(s), project manager(s), technical staff, equipment operators, and maintenance and construction staff.	Yes	The BCPUD does not have an in-house engineering department but rather contracts with outside consulting engineers; see response above re: the district's Operaions Department. The district's General Manager and Chief Operator oversee the planning, permitting, design and construction management of the water and sewer facilities serving district customers.
Fire Protection District Staff	No	Fire protection in the district is the responsibility of the Bolinas Fire Protection District and Marin County Fire.

Table 11: Bolinas Community Public Utility District Administrative and Technical Capabilities
Source: **Bolinas Community Public Utility District**

3.2.3 Fiscal Capabilities

The fiscal capability assessment shows specific financial and budgetary tools available to the jurisdictions such as community development block grants; capital improvements project funding; authority to levy taxes for specific purposes; fees for water, sewer, gas, or electric services; impact fees for homebuyers or developers for new development; ability to incur debt through general obligations bonds; and withholding spending in hazard-prone areas.

Table 12: Fiscal Capabilities

Financial	Yes/No	Has the funding resource been used in past and for what type of activities? Could the resource be used to fund future mitigation actions?
Capital improvements project funding	Yes	The Board of Directors reviews and approves CIP funding on an annual basis, which supports implementation of projects that often mitigate impacts from hazards, development, or address resiliency/redundancy in general.
Fees for water, sewer, gas, or electric services	Yes	The district has the authority to assess water and sewer service fees to fund operations, maintenance, capital improvement projects, debt service, staff salaries and benefits and various other expenses. When mitigation projects are identified in the CIP, service fee revenue can be adopted with the annual CIP budget to fund projects that have a mitigation component.
Impact fees for new development	No	
Storm water utility fee	Yes	The district has the authority to assess a septic/drainage service fee. This resource has been used to improve surface water drainage to improve septic system performance and can be used to fund future mitigation actions (property flooding).
Incur debt through general obligation bonds and/or special tax bonds	Yes	The BCPUD has incurred debt through general obligation and special tax bonds, as well as loans, to finance larger capital improvement projects, and these resources can be used to fund future mitigation actions.
Other federal funding programs	Yes	USDA Rural Development funding programs have been used by the BCPUD in the past for large capital improvement projects and other federal grant program funding and infrastructure awards could be used to fund hazard mitigation projects to address sea level rise, drought, wildfire, earthquake, and severe weather event hazards.
State funding programs	Yes	State grant program funding could be used to fund hazard mitigation projects, such as sea-level rise, wildfire prevention and drought contingency. California's Drinking

		Water State Revolving Fund, Clean Water State Revolving Fund, CalFIRE's Fire Prevention and the California Department of Water Resources' Small Communities Drought Relief Fund have been used by the BCPUD in the past for infrastructure upgrades and fire fuel reduction projects and can be used to fund future mitigation actions.

Table 12: Bolinas Community Public Utility District Fiscal Capabilities
Source: **Bolinas Community Public Utility District**

3.2.4 Community Outreach

The outreach and partnerships capability assessment shows outreach and public education programs available to the Bolinas Community Public Utility District and the Bolinas Community Public Utility District partnerships utilized to promote those programs.

Table 13: Bolinas Community Public Utility District Community Outreach		
Outreach and Partnerships	Yes/No	Could the program/organization help implement future mitigation activities?
Local citizen groups or non-profit organizations focused on environmental protection, emergency preparedness, access and functional needs populations, etc.	Yes	Yes, the community of Bolinas has many local citizen groups and non-profit organizations dedicated to disaster and emergency preparedness, wildfire risk reduction, preservation of emergency access and egress, preservation of critical facilities and roads, as well as environmental protection. These groups and organizations have partnered with the BCPUD in the past (and several are doing so now) on hazard mitigation projects and would be very important partners in the implementation of future mitigation activities.
Ongoing public education or information program (e.g., responsible water use, fire safety, household preparedness, environmental education)	Yes	The district is actively engaged with the community of Bolinas via the Board of Directors' regular monthly meetings, a quarterly newsletter, periodic special mailings, and social media on a variety of topics including, but not limited to, responsible water use, sewer system "dos and don'ts", solid waste disposal rules, and so forth. These platforms can be used to help implement future mitigation activities.
Public-private partnership initiatives addressing disaster-related issues	Yes	The district has participated in a public-private partnership to stabilize a critical access road where critical infrastructure (water and sewer mains) are located (Terrace Avenue) in Bolinas and this partnership has continued as the road is threatened by bluff erosion. The district also is cooperating with the efforts of a local citizens' group to evaluate and address the wildfire and public safety risks posed by a eucalyptus grove on district lands. These and other public-private partnerships can be used to help implement future mitigation activities.

Table 13: Bolinas Community Public Utility District Community Outreach
Source: **Bolinas Community Public Utility District**

3.2.5 Participation in the National Flood Insurance Program

As a Special District the Bolinas Community Public Utility District does not participate in the national flood insurance program.

3.3 MITIGATION GOALS

44 CFR Requirement §201.6(c)(3)(i) [The hazard mitigation strategy shall include a] description of mitigation goals to reduce or avoid long - term vulnerabilities to the identified

The information developed from the risk assessment was used as the primary basis for developing mitigation goals and objectives. Mitigation goals are defined as general guidelines explaining what each jurisdiction wants to achieve in terms of hazard and loss prevention.

Hazard Risk Prioritization

↓

Mitigation Goals & Objectives

↓

Mitigation Project Identification

↓

Mitigation Project Implementation

Goal statements are typically long-range, policy-oriented statements representing jurisdiction-wide visions. Objectives are statements that detail how each jurisdiction's goals will be achieved, and typically define strategies or implementation steps to attain identified goals. Other important inputs to the development of jurisdiction-level goals and objectives include performing reviews of existing local plans, policy documents, and regulations for consistency and complementary goals, as well as soliciting input from the public.

The following represents overarching strategic goals associated with the identification and eventual implementation of appropriate and meaningful hazard mitigation efforts in relation to prioritized hazards and threats confronting Marin County. These goals form the basis for specific supporting process objectives and are shown from the highest priority, at the top of the list, to those of lesser importance.

The establishment of hazard mitigation goals represents both individual and collective strategies that have been mutually agreed upon by the Steering Committee and have changed with the 2023 MJHMP update. Objectives were added to Goals 2 and 5. Eventually, these goals have been adopted by Marin County and its participating jurisdictions as the guiding policy behind local hazard mitigation efforts, in conjunction with other associated principles.

Goals were defined for the purpose of this mitigation plan as broad-based public policy statements that:

- Represent basic desires of the community;
- Encompass all aspects of community, public and private;
- Are nonspecific, in that they refer to the quality (not the quantity) of the outcome;
- Are future-oriented, in that they are achievable in the future; and
- Are time-independent, in that they are not scheduled events.

Goals are stated without regard to implementation. Implementation cost, schedule, and means are not considered. Goals are defined before considering how to accomplish them so that they are not dependent on the means of achievement. Goal statements form the basis for objectives and actions that will be used as means to achieve the goals. Objectives define strategies to attain the goals and are more specific and measurable.

Goal 1: Minimize risk and vulnerability of the community to the impacts of natural hazards and protect lives and reduce damages and losses to property, economy, and environment in Marin County.

- Minimize economic and resource impacts and promote long-term viability and sustainability of resources throughout Marin County.
- Minimize impact to both existing and future development.
- Provide protection for public health.
- Prevent and reduce wildfire risk and related losses.

Goal 2: Provide protection for critical facilities, infrastructure, utilities, and services from hazard impacts.

- Incorporate defensible space and reduce hazard vulnerability.
- Develop redundancies in utilities and services.
- Enhance resilience through enhanced construction.

Goal 3: Improve public awareness, education, and preparedness for hazards that threaten our communities.

- Enhance public outreach and participation in the Alert Marin Emergency Notification System.
- Enhance public outreach, education, and preparedness program to include all hazards of concern.
- Increase public knowledge about the risk and vulnerability to identified hazards and their recommended responses to disaster events, including evacuation and sheltering options.
- Provide planning and coordination for "At-Risk" populations.
- Provide planning and coordination for companion animals, livestock, and other animal populations.
- Increase community awareness and participation in hazard mitigation projects and activities.

Goal 4: Increase communities' capabilities to be prepared for, respond to, and recover from a disaster event.

- Improve interagency (local, state, federal) emergency coordination, planning, training, and communication to ensure effective community preparedness, response and recovery.
- Enhance collaboration and coordination of disaster-related plans, exercises, and training with local, state, and federal agencies, neighboring communities, private partners, and volunteers.
- Enhance the use of shared resources/Develop a strong mutual aid support system.
- Create and maintain a fully functional, interoperable radio and communication system with all regional public safety partners.

Goal 5: Maintain FEMA Eligibility/Position the communities for grant funding.

- Review hazard events and ongoing hazard mitigation projects annually.
- Assess the need to pursue or adjust hazard mitigation projects after significant hazard events.

Goal 6: Reduce exposure to High Hazard Dams that pose an unacceptable risk to the public.

- Improve alert and warning systems to provide residents downstream of a High Hazard Dam to receive timely warning to evacuation when threatened by potential or imminent dam failure.
- Enhance overall community preparedness to respond and evacuate a potential or imminent dam failure.
- Increase public awareness of the risk posed by High Hazard Dams and the potential for relocation of housing outside a possible inundation zone.
- Prioritize High Hazard Dam Mitigation projects and programs.

3.4 STATUS OF PREVIOUS MITIGATION ACTIONS

The Bolinas Community Public Utility District did not participate in the 2018 Marin County MJHMP and therefore, did not have any previous mitigation actions.

3.5 HAZARD MITIGATION ACTIONS

The 2023 Marin County MJHMP was revised to reflect progress in local mitigation efforts. Mitigation projects were selected for each hazard and for the Bolinas Community Public Utility District based off the hazard risk assessment. The projects are supported by the mitigation goals and objectives, and are ranked using the following criteria; approximate cost, timeframe of completion, whether the project requires District Board of Directors regulatory action, and an assumption as to whether or not the project would be subject to CEQA or NEPA requirements. Funding sources are identified for all projects. All projects consider new, future, and existing development. Project worksheets are used by the Planning Team and Steering Committee to describe criteria for each project.

A cost benefit review process will be completed for each project that will be submitted during a given fiscal year. The general priorities of the cost benefit risk analysis will focus on projects that are lifesaving, life safety, property protection and lastly environmental protection. A ratio of at least one dollar of benefit for each dollar invested will be considered the minimum cost benefit ratio for any projects submitted within the Bolinas Community Public Utility District.

Table 14 lists the Current Hazard Mitigation Actions for the Bolinas Community Public Utility District.

Table 14: Bolinas Community Public Utility District Current Hazard Mitigation Actions

No.	Mitigation Actions	Hazards Mitigated/ Goals Met	Jurisdiction/ Responsible Agency	New, Existing, Completed, Removed	Estimated Cost and Potential Funding Source	Timeline/ Priority	Comments/ Progress
BC-1	Encourage participation in Alert Marin and other community alert & warning systems to ensure the public is aware of any potential emergencies or risk.	All Hazards/ 1, 2, 3, 4, 5	Bolinas Community Public Utility District / Marin County	New (2023)	Cost: General Funds	1 -2 Years/ High	
BC-2	Emergency Operations Plan (EOP) Update	All Hazards 1, 2, 3, 4, 5	Bolinas Community Public Utility District	New (2023)	Cost: TBD	1-2 years	**Update to existing EOP; in progress.**
BC-3	Emergency Generator(s)	All Hazards 1, 2, 4, 5	Bolinas Community Public Utility District	New (2023)	Cost TBD: HMGP, BRIC, CDAA, Private Local Grants	1 - 5 years	Ongoing – secure funding for installation of permanent generators at critical district facilities.
BC-4	Inspect Woodrat 1 and Woodrat 2 reservoir impoundments and install any recommended monitoring technology and/or improvements to structure(s) or spillway(s).	Dam Failure/ 1, 2, 4, 5, 6	Bolinas Community Public Utility District	New (2023)	Cost TBD: HMGP, [other grant sources)	1 - 2 years	Reduces the risk of a dam failure that could destroy the district's water treatment plant (located below Woodrat 1) and/or these emergency stored water supplies.
BC-5	Relocate gravity sewer main off of Terrace Avenue at Surfer's Overlook	Debris Flow, Erosion, Landslide, Post-Fire Debris Flow/ 1, 2, 4, 5,	Bolinas Community Public Utility District	New (2023)	Cost TBD: HMGP, BRIC, CDAA, Private Local Grants	2 – 5 years	Eliminates the risk of a sewer main failure/spill due to bluff erosion at this location (BCPUD relocated its high pressure water main off of this location in 2013).
BC-6	Repair County-owned seawall under Terrace Avenue at Surfer's Overlook to stabilize it and prevent land subsidence.	Landslide/Erosion	Bolinas Community Public Utility District; Marin County Department of Public Works	New (2023)	Cost TBD: HMGP, BRIC, CDAA, Private Local Grants	1 - 2 years	Reduces risk of failure of Terrace Avenue, a critical public egress road, and risk of sewer main failure/spill due to bluff erosion at this location.
BC-7	Retrofit or replace the existing concrete dam at the district's upper diversion point on the Arroyo Hondo Creek.	Debris Flow, Erosion, Landslide,	Bolinas Community Public Utility District	New (2023)	Cost TBD: HMGP, BRIC, CDAA, Private Local Grants	2 – 5 years	Eliminates the potential for impoundment of erosion materials/debris behind this structure and the need for

		Post-Fire Debris Flow/ 1, 2, 4, 5,					associated reservoir siltation removal projects.
BC-8	Inspect and install any necessary improvements to/replacement of the existing radial gate at the district's lower diversion point on the Arroyo Hondo Creek.	Drought/ 1, 2, 4, 5,	Bolinas Community Public Utility District	New (2023)	Cost TBD: HMGP, BRIC, CDAA, Private Local Grants	1 -2 years	Eliminate leaks/water loss currently occurring when this diversion point is in use to improve drought resiliency.
BC-9	Engage consultant to evaluate feasibility of desalination, water recycling or additional groundwater sources as supplemental sources of water supply.	Drought/ 1, 2, 4, 5,	Bolinas Community Public Utility District	New (2023)	Cost TBD: HMGP, BRIC, CDAA, Private Local Grants	2 – 5 years	Add resiliency to the district's water supply and prepare for climate change impacts to surface water sources.
BC-10	Seismic retrofit of the district's West Tank (potable water storage tank, 440,000 gallons)	Earthquake/ 1, 2, 4, 5,	Bolinas Community Public Utility District	New (2023)	Cost TBD: HMGP, BRIC, CDAA, Private Local Grants	1 – 2 years	Retrofit of critical water storage tank that is vulnerable to damage in an earthquake (BCPUD completed retrofit of East Tank in 2021) to ensure reliability of district's water supply.
BC-11	Replace existing district office building	Earthquake/ 1, 2, 4, 5,	Bolinas Community Public Utility District	New (2023)	Cost TBD: HMGP, BRIC, CDAA, Private Local Grants	2 – 5 years	Building is 100+ years old and not built to current code; inspection confirms replacement needed; site assessment underway. Eliminate threat to public safety.
BC-12	Replace existing A/C water and/or sewer mains with C900	Earthquake/ 1, 2, 4, 5,	Bolinas Community Public Utility District	New (2023)	Cost TBD: HMGP, BRIC, CDAA, Private Local Grants	3 – 5 years	Reduce possibility of catastrophic failure of critical facilities during earthquake.
BC-13	Conduct feasibility analysis and upgrade sewer treatment facility to perform during extreme rainfall (50 year+) events.	Flooding/ 1, 2, 4, 5,	Bolinas Community Public Utility District	New (2023)	Cost TBD: HMGP, BRIC, CDAA, Private Local Grants	2 – 5 years	Enable the district to operate in compliance with its Waste Discharge Order and eliminate the possibility of discharging untreated wastewater.
BC-14	Convert Wharf Road Lift Station to a submersible pump station and install protective coating and associated improvement to wet well	Sea Level Rise/ 1, 2, 4, 5	Bolinas Community Public Utility District	New (2023)	Cost: $1 million: HMGP, BRIC, CDAA	1 – 2 years	Adapt the facility in light of sea level rise
BC-15	Repair County-owned seawall under Wharf Road to stabilize it and prevent land subsidence.	Land Subsidence (Sinkhole)/	Bolinas Community Public Utility	New (2023)	Cost TBD: HMGP, BRIC, CDAA,	1 -2 years	Eliminate recurrent sinkholes in Wharf Road and protect

		1, 2, 4, 5,	District, Marin County Department of Public Works		Private Local Grants		critical district infrastructure (water and sewer).
BC-16	Wharf Road Slip-line	Land Subsidence (Sinkhole)/ 1, 2, 4, 5	Bolinas Community Public Utility District	New (2023)	Cost TBD: HMGP, BRIC, CDAA, Private Local Grants	3 – 5 years	Slip line sewer to prevent raw sewage spills into the Bolinas Lagoon.
BC-17	Inspect sewage treatment and storage pond levees and install any recommended improvements.	Levee Failure/ 1, 2, 4, 5,	Bolinas Community Public Utility District	New (2023)	Cost TBD: HMGP, BRIC, CDAA, Private Local Grants	2 – 5 years	Reduces risk of levee failure and catastrophic flooding
BC-18	Remove trees (or portions thereof) on district properties that pose a threat to public safety during severe wind events.	Severe Weather – Wind, Tornado/ 1, 2, 4, 5,	Bolinas Community Public Utility District	New (2023)	Cost TBD: HMGP, BRIC, CDAA, Private Local Grants	1 – 2 years	Reduce threat to public safety during extreme wind event storms in Bolinas.
BC-19	Consult with Fire authorities and licensed tree professionals and implement recommended projects to treat/remove trees on district property and replace them with safer vegetation.	Wildfire/ 1, 2, 4, 5,	BCPUD, Fire Districts	New (2023)	Cost TBD: HMGP, BRIC, CDAA, Fire Safe Marin	1 – 2 years	Reduces chance of wildland fire and supports environmental restoration.

Table 14: Bolinas Community Public Utility District Current Hazard Mitigation Actions

3.6 Progress in Local Mitigation Efforts

This plan has been created as a "living" document with input from the population and professionals within the Bolinas Community Public Utility District. The planning team for the Bolinas Community Public Utility District identified and prioritized the mitigation actions as detailed in Table 14, based on the risk assessment and in accordance with the process outline in Section 3, Mitigation Strategy, of the base plan. Background information and information on how each action will be implemented and administered, such as ideas for implementation, responsible office, potential funding, estimated cost, and timeline are also included. General processes and information on plan implementation and maintenance of this LHMP by all participating jurisdictions is included in Section 4.0: Plan Review, Evaluation, and Implementation.

3.7 Plan Integration

For hazard mitigation planning, "integration" means that hazard mitigation information is used in other relevant planning mechanisms, such as master planning, strategic planning, capital facilities planning, emergency management, hazard specific planning, and that relevant information from those sources is also used in hazard mitigation. This section identifies where the 2023 MJHMP will be used for further integration.

The planning team for the Bolinas Community Public Utility District will maintain this plan and will serve as a lead staff for grant project applications on District projects selected for application under the Hazard Mitigation Assistance grant programs.

Where possible the Bolinas Community Public Utility District will use existing plans and/or programs to implement hazard mitigation actions within the District and through the coordinated efforts with the County, the Bolinas Fire Protection District, and other state or local entities, as appropriate.

Mitigation is most successful when it is incorporated into the day-to-day functions and priorities of government and development. As described in this plan's capability assessment, the Bolinas Community Public Utility District already implements policies and programs to reduce losses to life and property from hazards. This plan builds upon the momentum developed through previous and related planning efforts and mitigation programs and recommends implementing actions, where possible, through these other program mechanisms. These existing mechanisms include Integration opportunities for the 2023 Marin County MJHMP:

District Master & Strategic Plans - Integrates hazard mitigation through the consideration of hazards most likely to impact the district.

District Emergency Operations Plans – Integrates hazard mitigation through the consideration of the Town's planned response to hazards most likely to impact the district.

Flood/Storm Water Management/Master Plans - Integrates hazard mitigation through the consideration of strategies to reduce flood risk and storm water management for the protection of life and property.

Community Wildfire Protection Plan - Integrates hazard mitigation through the consideration of strategies to reduce fire hazard and the risk of catastrophic wildfires in the WUI, while promoting the protection and enhancement of the county's economic assets and ecological resources.

The successful implementation of this mitigation strategy will require review of existing plans and programs for coordination and multi-objective opportunities that promote a safe, sustainable community. A few examples of incorporation of the MJHMP into existing planning mechanisms include:

1. As recommended by Assembly Bill 2140, each community should adopt (by reference or incorporation) this MJHMP into the Safety Element of their General Plans. Evidence of adoption (by formal, certified resolution) shall be provided to CalOES and FEMA
2. Integration of flood actions identified in this mitigation strategy with the actions and implementation priorities established in existing Flood Management Programs
3. Using the risk assessment information to update the hazards section in the County, City and Town Emergency Operations Plans

Efforts should continuously be made to monitor the progress of mitigation actions implemented through these other planning mechanisms and, where appropriate, their priority actions should be incorporated into updates of this hazard mitigation plan.

3.8 FUTURE DEVELOPMENT TRENDS

As a small special district in unincorporated Marin County, the BCPUD does not have jurisdiction over land use or planning in the community (that responsibility lies with the Marin County Community Development Agency). Significant development is not anticipated for Bolinas within the next 5 years given development constraints, the limited nature of the local water supply and consequent moratorium on new connections to the water system, as well as an ongoing moratorium on new connections to the sewer system.

4.0 Plan Review, Evaluation, and Implementation

The strategies presented are deemed appropriate and effective by recommendation of the Bolinas Community Public Utility District.

4.1 Plan Adoption

Upon submission to the California Office of Emergency Services (CalOES) for review, and subsequent approval by the Federal Emergency Management Agency (FEMA), the Marin County MJHMP will be presented to local government for formal adoption. As appropriate, the adopted plan and accompanying Bolinas Community Public Utility District Community Profile will then be incorporated into local general plans for integration into organizational policy.

4.2 Plan Monitoring

The process of hazard mitigation does not end with the completion, approval, and adoption of the Marin County MJHMP and the Bolinas Community Public Utility District Community Profile. Within the lifespan of these documents (five years), local government along with community-based organizations will ensure that the mitigation goals and strategies identified are monitored, that plan administration will continue under a collaborative and cooperative umbrella, and that the document itself will be properly maintained.

The Marin County Office of Emergency Management, as lead coordination agency for hazard mitigation planning within the Marin County and will assist and support the ongoing collaborative efforts of the Bolinas Community Public Utility District, through the established hazard mitigation Steering Committee. Specific plan maintenance activities by the Marin County Office of Emergency Management and the Bolinas Community Public Utility District may include:

- Distribution of the MJHMP and Community Profile to all interested parties, including both written and digital formats
- Monitoring of the Bolinas Community Public Utility District mitigation project activities and dissemination of status reports
- Generation of reports relative to plan status, project management, and revision updates to executive leadership
- Preparations for plan eventual revision and updating

4.3 Plan Evaluation

Upon approval and adoption by the Bolinas Community Public Utility District, the prioritized mitigation strategies will be further developed for funding and implementation by the lead agencies. The plan describes the potential sources of hazard mitigation funding, and general procedures to obtain that funding.

The mitigation strategies represented and adopted within this plan are recommendations only, and must be approved and funded in order to be implemented as official mitigation solutions. Ultimately, it is the responsibility of jurisdictional and agency officials within the Marin County to undertake project implementation based upon identified mitigation strategies, funding availability, and local need when it arises. The Marin County Office of Emergency Management will meet with the hazard mitigation Steering Committee, including the Bolinas Community Public Utility District, to evaluate the plan after each update meeting.

4.4 Plan Update

During the five-year update cycle, the Marin County Office of Emergency Management will hold tri-annual update meetings with the hazard mitigation Steering Committee, including the Bolinas Community Public Utility District, and local stakeholders to discuss revisions to the plan. The Marin County Office of Emergency Management and the Bolinas Community Public Utility District will continue to hold public meetings after the first and third update meetings annually and will continue to invite public participation in the update process via updated public surveys.

FIGURES AND TABLES

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