



Twentynine Palms
Water District

Local Hazard Mitigation Plan
Twentynine Palms Water District
Twentynine Palms, California

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Revised:

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Attachments

- Appendix A - Internal/External Meeting Agenda's, Minutes and Sign-In Sheets
- Appendix B - Board of Directors Meeting Minutes, LHMP Public Comment Period
- Appendix C - Screen Shot of District Website LHMP page
- Appendix D - Water Conservation Ordinance
- Appendix E - Special District Incorporation Documentation

SECTION 1: INTRODUCTION

1.1 Purpose of the Plan

Emergencies and disasters can leave people injured or displaced; result in fatalities; cause significant damage to our communities, businesses, public infrastructure and our environment; and cost tremendous amounts in terms of response and recovery dollars and economic loss. Hazard mitigation reduces the risk of personal damages, loss of life, and property damages caused by emergencies and disasters.

Repairs and reconstruction after disasters are often completed to simply restore infrastructure to pre-disaster conditions. Such efforts expedite a return to normalcy; however, merely replicating pre-disaster conditions results in a cycle of damage, reconstruction, and repeated damage. Hazard mitigation attempts to break this cycle by reducing hazard vulnerability.

While we cannot prevent disasters from happening, their effects can be reduced or minimized through preparedness and mitigation. For those hazards that cannot be fully mitigated, the community must be prepared to provide efficient and effective response and recovery to emergencies. This can be accomplished through a well-organized public education and awareness effort.

The purpose of this Local Hazard Mitigation Plan (LHMP) is to identify potential hazards to Twentynine Palms Water District, (TPWD) and formulate mitigation measures for future protection of the District's critical infrastructure and the community's safety with respect to the District's facilities and services. Approval of this LHMP by State of California Office of Emergency Services (OES) will also allow the District to become eligible to receive federal funding assistance under the Local Hazard Mitigation Grant Program or the Pre-Disaster Mitigation program.

1.2 Authority

The Twentynine Palms Water District is a consolidated independent Special District, formed in, and operating pursuant to, the provisions of the Twentynine Palms Water District Law. The legal authority for Twentynine Palms Water District is set forth in Division 12 of the Water Code, in the State of California, section 30000 et. seq. The District is governed by a five (5) member Board of Directors, elected at-large from within the District's service area. The General Manager administers the day-to-day operations of the District in accordance with policies and procedures established by the Board of Directors. The Board of Directors employs a General Manager. The General Manager employs a Finance Manager, District Secretary, Operations Manager, Office Manager and Operations Superintendent. There are 14 full-time non-management employees at the District. These 14 employees are union employees and are hired by the General Manager.

As required by the Department of Homeland Security's Federal Emergency Management Administration (FEMA), LHMPs must be updated, adopted, and approved every five (5) years. This is the District's first LHMP.

1.3 Community Profile

The Twentynine Palms Water District serves Twentynine Palms, California, with water. The water services cover the City of Twentynine Palms as-well-as outlying areas in the County of San Bernardino. The District pumps water from the underground aquifer and distributes the water to the customer. The only available water supply is local ground water. The District serves a population of approximately 18,000 residents within an 87-square mile area and maintain approximately 8,000 meter services, 200 miles of pipeline, and 17-million gallons of water storage capacity. When physical operations began in 1955, the District served a population of 4,675 residents within an area of 26.7 square miles. The 1,422 meter services were fed by approximately 94 miles of leaky, undersized, and substandard pipeline. The community's water storage capacity amounted to less than 200,000 gallons.

1.3.1 Physical Setting

Twentynine Palms is a unique Hi-Desert community on the southern boundary of the Mojave Desert in San Bernardino County, just north of the Little San Bernardino and Pinto Mountains. Located 54 miles northeast of Palm Springs at an elevation of 2,000 feet, the area is known for its pure water, crystal clear air and deep blue skies. It is nestled between the largest Marine Corps base in the world, the Marine Corps Air Ground Combat Center to the north, and the Joshua Tree National Park to the south. The Oasis of Mara, a large group of springs aligned along the Pinto Mountain fault and bordering Joshua Tree National Park, is a significant archaeological site and was an original source of water to this area for over 4,000 years.

1.3.2 Community of Twentynine Palms

Twentynine Palms, California, is a unique Hi-Desert community on the southern boundary of the Mojave Desert in San Bernardino County, California just north of the Little San Bernardino and Pinto Mountains. Located 54-miles northeast of Palm Springs at an elevation of 2,000 feet, the area is known for its pure water, crystal clear air, and deep blue skies. The District is nestled between the Marine Corps Air Ground Combat Center, the largest Marine Corps base in the world, to the north, and the Joshua Tree National Park to the south. The National Park attracts more than 1.75 million visitors per year from all over the world. The Oasis of Mara, a large group of springs aligned along the Pinto Mountain fault and bordering Joshua Tree National Park, is a significant archaeological site. This was an original source of water to this area for more than 4,000 years.

County of San Bernardino

The County of San Bernardino has a population of more than 2,000,000 people as of the 2010 census, which is up from the reported 1,709,434 in the 2000 census. With an area of 20,105 square miles, San Bernardino County is the largest county in the United States by area. It is larger than nine States, including New Jersey, Massachusetts, and Maryland.

Located in the southeast section of California, thinly populated deserts and mountains cover most of this vast county. The bulk of the County's population resides in two Census County Divisions, where approximately 1,400,000 people live as of the 2010 Census. San Bernardino County is bordered by the Colorado River on the east, Riverside County on the south, Los Angeles, Orange and Kern Counties on the west and Inyo County on the north.

1.3.3 Demographics

The District serves approximately 18,000 residents through 8,000 service connections.

The area of Twentynine Palms is considered a disadvantaged community, by the State of California. Per the 2010 United States Census, Twentynine Palms had a median household income (MHI) of \$42,572 with 17.0% of the population living below the federal poverty line. The MHI is approximately 70% of the State MHI of \$61,094.

1.3.4 Existing Land Use

The existing land use is housing, commercial and light industry. The City of Twentynine Palms, is responsible for land use, TPWD does not have authority to regulate land use in the area. Incorporated areas are regulated by the City of Twentynine Palms and the County of San Bernardino.

1.3.5 Development Trends

Development of the Twentynine Palms area was reduced significantly during the housing industry crash of 2008. Twentynine Palms is seeing only individual custom or speculation homes being built in the area. There are no housing tracks being developed in the District's spear of influence. Home prices in the area are increasing at a much lower rate, than other communities in the high desert and a much lower increase than the State of California.

SECTION 2: PLAN ADOPTION

2.1 Adoption by Local Governing Body

The completed Local Hazard Mitigation Plan (LHMP) will be presented to the District's Governing Body for adoption. The plan will then be forwarded to CalOES and then to FEMA for approval. If any sections of the plan are changed during the process, the document will be sent back to the District's Board of Directors for final adoption.

Upon adoption, the District's Board of Directors meeting minutes will be included within the LHMP.

2.2 Promulgation Authority

This Local Hazard Mitigation Plan was reviewed and approved by the elected members of the Twentynine Palms Water District Board of Directors:

Mr. Kerron E Moore

Board President

Description of Involvement: President, Twentynine Palms Water District Board of Directors

Ms. Carol Giannini

Vice-President

Description of Involvement: Vice-President, Twentynine Palms Water District Board of Directors

Mr. Roger Shinaver

Director

Description of Involvement: Director, Twentynine Palms Water District Board of Directors

Ms. Suzi Horn

Director

Description of Involvement: Director, Twentynine Palms Water District Board of Directors.

Mr. Robert Coghil Jr.

Director

Description of Involvement: Director, Twentynine Palms Water District Board of Directors

Mr. Ray Kolisz

General Manager

Description of Involvement: General Manager, Twentynine Palms Water District

Mr. Ray Kolisz

Board Secretary

Description of Involvement: Board Secretary, Twentynine Palms Water District

2.3 Primary Point of Contact

The Point of Contact for information regarding this plan is:

BEFORE FEMA APPROVAL IS:

Gary Sturdivan
Sierra West Consultants, Inc.
gsturdivan@me.com
909-658-5974

AFTER FEMA APPROVAL IS:

Mr. Ray Kolisz
General Manager
Twentynine Palms Water District
72401 Hatch Rd.
Twentynine Palms, CA 92277
760-367-7546 (Office)

SECTION 3: PLANNING PROCESS

This section documents the planning process used to review and compile information that leads to an effective LHMP. A comprehensive description of the planning process informs citizens and other readers how the plan was developed, and provides a permanent record of how decisions were reached. These decisions can be understood, reconsidered, replicated, or modified in future updates. An integral part of the planning process is documentation of how the public was engaged throughout the process.

This LHMP was completed with the coordination and involvement of the Twentynine Palms Water District staff and representatives from the local community. These team members have a vested interest in the performance and resiliency of the TPWD. Team members from the local community include: business owners from Twentynine Palms. This team developed and implemented the planning process.

San Bernardino County Office of Emergency Services reviewed the plan and the contents of this plan for items that should be included from the County HMP. County Fire OES supplied all hazard maps that are included in this document.

This section includes a list of the Planning Team Members, a summary of the meetings held, coordination efforts with the surrounding communities/groups, and public outreach efforts.

3.1 Preparing for the Plan

The Planning Team reviewed FEMA's "Hazard Mitigation Plan Crosswalk", and San Bernardino County OES supplied information on past events that affected the service area.

The San Bernardino County OES completed a FEMA Hazard Profile of the area. Each of the maps were submitted to the District for use in this LHMP. The Hazard Profile maps were used in the planning meetings to show past flood areas, earthquakes, flash floods and other disasters that have affected the area. Other written documentation of past events was also reviewed. The team discussed the different events that have happened in the community; such as flash flooding, earthquakes, windstorms, power outages and freezing events. Members of the planning team have been longtime residents of the community and have lived through many of these emergency events.

The planning process consisted of:

- Documenting past events
- Incorporating data
- Engaging the Planning Team
- Posting the meeting agendas, meeting minutes and draft LHMP onto the District's website and asking for public input and comments on the planning process
- Sharing information at the monthly District Board of Directors Meetings
- Conducting Public Outreach

During the planning process the Planning Team utilized the following plans to gain information on the hazards that face the area and the mitigation goals of the County of San Bernardino. The following plans were utilized.

- East Valley Water District LMHP
- Twentynine Palms LHMP
- San Bernardino County HMP
- USGS Golden Guardian Shake Out 2008
- Twentynine Palms Water District's, Water Master Plan
- California HMP 2013

Table 1 & 2: Plans Reviewed by Team

<u>Study Plan</u>	<u>Key Information</u>
Bighorn Desert View LMHP	Layout of an LHMP for water agencies
Hi-Desert Water District, Draft LHMP	Hazard Identification, Mitigation measures
San Bernardino County HMP	Mitigation measures and goals, Hazards,
USGS Golden Guardian 2008	Earthquakes, affects, planning
Twentynine Palms Water District Water Master Plan	Land use for area, future projects
2013 California HMP	Goals for the State of California
San Bernardino County Flood Control	Gain information on future flood control projects
FEMA Flood Insurance Study for S.B. County	Flood history

Financial Resources for future Mitigation projects

	Local		Revenues		Amount
The District's Budgets and Financial Planning Documents		Water Sales, new construction			Varies from year to year
FEMA Grants		None			None
State Revolving Funds Draft application		None			None
Prop 84 Funding		None			None
FEMA Mitigation Grants		District has not applied for FEMA funding in the past			As funding and approval are obtained
Future Budget Funds Considerations		Water Sales			Varies as funding is available each year

3.2 Planning Team

The Planning Team compiled information and reviewed this LHMP under the authorization of the District. The Planning Team members include:

Mrs. Cindy Fowlkes

Twentynine Palms Water District, District Secretary

Description of Involvement: Internal Planning Team Member and Editor

Mrs. Fowlkes began working for the Twentynine Palms Water District in 2012 when she was hired as the District Secretary. Mrs. Fowlkes has a background in human resources and worked for a homeowner's association prior to employment at the District. Her duties at the District include compilation of the Board packets, meeting minutes, Board travel arrangements, government agency compliance, human resource duties, website administrator, assistant to the General Manager and assists District staff as necessary.

Mr. Gary Sturdivan

LHMP Consultant

Description of Involvement: Planning Team Lead

Mr. Sturdivan, as a consultant to the District, is the team leader for the LHMP. Mr. Sturdivan develops the agendas for each LHMP meeting, leads the discussions, compiles the meeting minutes and other information for public comment, and prepares draft text for the LHMP. Mr. Sturdivan provides informational updates to the District's Board of Directors and incorporates the Board's comments into the planning process and LHMP. Mr. Sturdivan has a vast knowledge of Mitigation Planning, Grant Funding, and Emergency Management. Mr. Sturdivan worked in the water industry for 25 years, with 8 years as the Director of Safety/Regulatory Affairs/Emergency Management and Grants for East Valley Water District prior to becoming a consultant in 2011.

Mr. Mike Minatrea

Operations Superintendent

Description of Involvement: Internal Planning Team Member:

Mr. Minatrea has been employed by the Twentynine Palms Water District for 25 years, He started on the construction crew and was promoted to Operations Superintendent in 2014.

Mr. Minatrea holds a California Treatment Operator Grade III and a California Distribution Operator Grade V and a California Cross-Connection Specialist Certification. Mr. Minatrea also holds a San Bernardino County Backflow Prevention Device Tester Certification and a California Class A driver's license.

Mrs. Rochelle Bowe
Office Manager

Description of Involvement: Internal Planning Team Member

Mrs. Bowe began working for the Twentynine Palms Water District in 1988. During her employment, she's worked in customer service, accounting and currently serves as the Office Manager. Mrs. Bowe oversees a staff of 2 customer service representatives and a bookkeeper. Her duties include accounts payable, payroll, employee benefits and worker's compensation.

Mr. Matthew Shragge
Operation and Maintenance Lead Worker

Description of Involvement: Internal Planning Team Member

Mr. Shragge has been employed with Twentynine Palms Water District for 10 years and currently serves as Operation and Maintenance Lead Worker. Mr. Shragge has a background in construction with emphasis in underground utilities and grading. Some of Mr. Shragge's responsibilities include Chairman of the District's Safety Committee, Cross Connection Control Program, and Water Conservation/Complaint issues. His duties at the District include daily scheduling for Operation and Maintenance staff, customer service, leak audit services, and "water waste" complaints. He currently holds a State of California Water Distribution Certificate, Grade III and a California Water Treatment Certificate Grade II and an American Water Works Association as a Cross Connection Control Specialist.

Mr. Timothy Cole

Description of Involvement: External Planning Team Member

Mr. Cole worked with Hi Desert Medical Center for 5 years then joined the Twentynine Palms Fire Department. During the 22 years with Twentynine Palms Fire Department Mr. Cole became an Engineer. Timothy now works with San Bernardino County Fire Department as an Engineer at station # 44 in Twentynine Palms. Engineer Cole holds a class B license and enjoys serving his Community helping others.

Mr. Jeffery Johnson

Description of Involvement: External Planning Team Member

Mr. Johnson has been a plumbing contractor since 1984. In 1977, he began servicing pumps and wells and managed his own private water company until 2010. Mr. Johnson is a resident and homeowner in Twentynine Palms, Mr. Johnson has an interest in water quality and the future availability of water in the region.

3.3 Coordination with Other Agencies and Organizations

TPWD staff invited residents of the community to participate in the LHMP planning process. The Internal and External Planning Teams include two water system customers, four persons from Twentynine Palms Water District. The County of San Bernardino OES was invited to be on the Planning Team, but they were unable to attend. However, the County OES provided the hazard maps attached to this document and gave guidance in the planning of this document. In addition, San Bernardino County OES, LHMP Officer Miles Wagner has reviewed and commented on the draft LHMP and his comments have been incorporated into the final LHMP.

The Planning Team participated in monthly meetings to coordinate efforts, provide input, and receive support for the LHMP. The support included receiving technical expertise, resource materials and tools. The TPWD facilitated the LHMP process and provided sufficient information to follow FEMA requirements for the program. The tools, resource materials, and other project related information are maintained on a project portal on the District's website www.29palmswater.org which, allowed access to the information by all participants and the public.

The 2016/2017 Board meeting agendas, meeting minutes, and sections of the LHMP were posted on the TPWD Website as the LHMP was written. Requests were made on the Website for public comments and informing the public that comments could be made by e-mailing Mr. Sturdivan at gsturdivan@me.com or by calling Mr. Sturdivan at 909-658-5974. No public comments were received by Mr. Sturdivan or by the District staff.

3.4 Public Involvement/Outreach

A critical component of the LHMP process is to assess the likely hazards that may impact the District's facilities or operations. It is important to have a competent understanding of these hazards without over-analyzing remote or highly unlikely hazards.

This LHMP has been developed through an extensive review of available information on hazards the TPWD has faced in the past and most likely will face in the future. The Planning Team reviewed and discussed items that have happened in the State of California as well as disasters that have happened in the TPWD service area and in other desert areas of the California and Arizona. The Team reviewed documents such as engineering drawings, photographs, and available geotechnical and geologic data both from the Internet and outside sources (for example, FEMA Hazard Mapping, San Bernardino County hazard maps and documents from the District on past events).

The Planning Team completed the assessment of the various hazards in a group setting. The Team members have many years of personal experience working in the local area and many working in a water utility. Team members know the history of past hazardous or emergency events, such as the 1992 Landers Earthquake - a 7.3 magnitude earthquake that severely impacted the region. This

earthquake's epicenter was only 10 miles northwest of Twentynine Palms in Landers, CA. Team members have also experienced other events affecting the community.

See **Attachment A** for the details of the public involvement process such as the meetings dates, purpose, agendas, sign-in sheets, minutes and public comments.

3.5 Assess the Hazard

A critical component of the LHMP process is to assess the likely hazards that may impact the District's facilities and or operations. It is important to have a thorough understanding of these hazards without over-analyzing remote or highly unlikely hazards.

This LHMP has been developed through an extensive review of available information on hazards the District has faced in the past and most likely will face in the future. The Planning Team reviewed and discussed items that have happened in the State of California as well as disasters that have happened in other desert areas of the United States. The Planning Team reviewed documents such as engineering drawings, photographs, and available geotechnical and geologic data both from the Internet and outside sources (for example, FEMA Hazard Mapping, San Bernardino County hazard maps, and documents from the District on past events).

The Planning Team completed the assessment of the various hazards in a group setting. The Team members have many years of personal experience working in the local area and many working with a water utility. Team members know the history of past hazardous or emergency events, such as the 1992 Landers Earthquake - a 7.3 magnitude earthquake that severely impacted the region. This earthquake's epicenter was only 10 miles northwest of Twentynine Palms in Landers and Flamingo Heights, California. This earthquake didn't impact the TPWD but, is still remembered by many residents.

3.6 Set Mitigation Goals

After the hazards were identified, the potential damages that could result were estimated. Mitigation goals are set based on the likelihood and the potential damages from a hazard.

The process of identifying mitigation goals began with a review and validation of damages caused by specific hazards at similar agencies in the surrounding area. Damages to other agencies outside the area were also considered. In addition, the Planning Team developed estimated damages using engineering budget estimates for anticipated response and replacement costs. The Planning Team completed an assessment of the likelihood and damages for each identified hazard and discussed whether each of the mitigation goals was valid. This discussion led to the opportunity to identify new goals and objectives for mitigation in the LHMP. From this, the Planning Team determined the best mitigation goals to reduce or avoid long-term vulnerabilities.

The Planning Team set the goals for the 2017 LHMP. The team members understand the issues facing the TPWD with respect to the District's Mission Statement: "The mission of the Twentynine Palms Water District is to provide a safe and adequate supply of water at the lowest feasible cost

to the people of the district and to preserve and protect the water resources within the established boundaries of the district."

At a planning meeting, the group "brainstormed" to determine appropriate mitigation goals to reduce or eliminate long-term vulnerabilities and to identify the related hazards. First, the team reviewed the past hazards that have faced the area and other water agencies in the area, and discussed changes in the community that may have mitigated these events. Then the team decided whether those hazards were still viable today. Some hazards were removed and other hazards were added to the list.

3.7 Review and Propose Mitigation Measures

Meetings were held with the Planning Team to review the identified hazards and solicit input on appropriate mitigation measures for each hazard to be identified in the LHMP. The Team identified mitigation measures for each critical piece of infrastructure. Each meeting focused on specific hazards of the District's facilities, operations, risk assessment, and mitigation strategy.

3.8 Draft Local Hazard Mitigation Plan

The District's consultant led the Planning Team and prepared the draft LHMP with the input from the Planning Team, Board of Directors, and the public. The Planning Team members reviewed and commented on the draft LHMP and subsequent changes were made before the LHMP was finalized and adopted by the Board of Directors. All meeting agenda's, meeting minutes, draft documents were posted on the District Web-site. Notices were sent to all water consumers in the service area, stating that all LHMP documents were posted on the Web-site and asked for comments. Each Board meeting was opened with a public comment period. All comments or concerns were addressed by Gary Sturdivan. Mr. Sturdivan's email address was also, posted on the District's Web-site.

The LHMP was reviewed in comparison to the FEMA-designed Crosswalk. The Crosswalk links the Federal Requirements and identifies the sections in the LHMP where the information can be found. This provides a rating as to the level of compliance with the federal regulations.

3.9 Adoption of the Plan

The draft LHMP was posted on the District's Web site for 30 days, asking for comments from the public. The public could comment by e-mail, telephone, or in person at a District Board of Directors meeting. There were no public comments.

The LHMP was submitted to the District's Board of Directors for adoption after incorporating any final comments. The 2017 LHMP was adopted at the District's regularly scheduled Board of Directors meeting on XX-XX-XXXX. The LHMP was then sent to the State of California Office of Emergency Services, before being sent to FEMA for final approval.

SECTION 4: RISK ASSESSMENT

The goal of mitigation is to reduce the future impacts of a hazard, including property damage, disruption to local and regional economies, and the amount of public and private funds spent for recovery. Mitigation decisions are based on risk assessments where the probability of an event is evaluated with respect to the anticipated damages caused by such an event.

The purpose of this section is to understand the hazards and their risks in the District's service area. There are generally four steps in this process: 1) hazard identification; 2) vulnerability analysis 3) risk analysis and 4) perform a vulnerability assessment, including an estimation of potential losses. Technically, these are four different items, but the terms are sometimes used interchangeably.

4.1 Hazard Identification

The Planning Team discussed potential hazards and evaluated their probability of occurrence. The following subsections describe this process and the results.

4.1.1 Hazard Screening Criteria

The intent of screening the hazards is to help prioritize which hazards create the greatest concern to the District. A list of the natural hazards to consider was obtained from Federal Emergency Management District's (FEMA) State and Local Mitigation Planning How-to Guide: Understanding Your Risks (FEMA 386-1). The Planning Team used the Stafford Act and the California Emergency Service Act and guidance from the American Water Works Association, Standards, G-440 and J-100 RAMCAP. Each risk was ranked with a 1 - 4. (1) being the "Highly Likely" event, (2) being "Likely" (3) being the "Somewhat Likely" event and (4) being "Least Likely" event. The Planning Team reviewed each hazard on the list, using their experience and historical data pertaining to each hazard, and developed the following list with the ranking:

Hazards:

- Earthquake = 1
- Power Failure = 2
- Flash Flooding = 2
- Freezing Events = 4
- Climate Change/Drought = 1
- Terrorist Event = 1
- Wildfires/Fire = 4

The following natural hazards were considered not to affect or be a risk to the District and were given a ranking well below a 4:

- Volcanoes
- Tsunami
- Windstorms

- Road Closures - ingress/egress to the area. Coordination with the City and County. Roads are not in the TPWD sphere of influence.

4.1.2 Hazard Assessment Matrix

The TPWD used a qualitative ranking system for the hazard screening process consisting of generating a high/medium/low style rating for the probability and impact of each screened hazard.

- For **Probability**, the ratings are: Highly Likely, Likely or Somewhat Likely
- For **Impact**, the ratings are: Catastrophic, Critical, or Limited

The screening assessment matrix is used for the District’s hazards. The hazards have been placed in the appropriate/corresponding box/cell of the corresponding “Hazard Matrix” based on the Planning Team’s collective experience. A subset of this group of hazards is used for the prioritization of the hazards in the following section.

Table 3: Screening Assessment Matrix

	<i>Impact</i>			
		Catastrophic	Critical	Limited
<i>Probability</i>	Highly Likely 1	Terrorist Event Earthquake Long Term Drought	Climate Change	
	Likely 2	Flash Flooding	Power Failure	Flooding
	Somewhat Likely 3			
	Least Likely 4			Freezing Wildfire

NOTE: There were no threes identified and items identified as a four are not a treat to the District.

4.1.3 Hazard Prioritization

Using the hazard screening criteria and assessment matrix, the Planning Team identified the following hazards to be the most likely to affect the District:

1. **Earthquake:** There are many faults running through the District’s service area. The 1992 Landers earthquake caused significant damage to the distribution system of Bighorn Desert View Water Agency’s, and Hi Desert Water District, wells, and reservoirs. FEMA funding replaced portions of the pipelines after the 1992 Landers Earthquake at those locations. However, Twentynine Palms Water District, didn't see the same system failure rate, as other agencies in the area. The local faults could potentially damage 100% of the District’s critical facilities. A major earthquake has not happened in the service area, however, it will occur, someday, as there are many earthquake fault lines running around, through, and near the service area.

2. **Terrorist Event:** The largest Marine Base in the world is located within 4 miles of the TPWD Northern boundary. A major terrorist event at the Marine Base could have a negative effect on the water supply or damage to the infrastructure of the District, leaving the District with no power and no water in the system due to ruptured pipelines, contamination, or other damages. Since the terrorist attack in San Bernardino, most governmental agencies have had to rethink their precautions of buildings and infrastructure, public, and staff. There are two off base housing structures in the District's service area that the District supplies water too.

3. **Climate Change/Long-term Drought:** Climate change is altering California's water supply throughout the state. Northern California is experiencing warmer winters, less snow pack, and longer periods between wet seasons. This affects water supply throughout the Central Valley and urban Southern California. TPWD does not utilize imported water from Northern California to recharge the underground aquifer and imported water is not available to the District. The State has been in a prolonged drought, however the winter of 2016/2017 delivered more snow pack and rain, which has moved most of the State from the Drought of the last seven-years. The District, however, relies on groundwater and the impacts from climate change are long-term. Higher temperatures may increase water use and groundwater extraction, which will lower the groundwater table. Increased storm events will increase flash flood risks and will decrease groundwater recharge because the water will runoff instead of infiltrating to re-charge the underground aquifer and groundwater. Over time, the District could experience increased pumping costs and water supply wells may become too shallow and must be replaced with deeper wells. Climate change could also, mean that the ground water become higher in the aquifer, which would mean the TPWD has an overabundance of water.

4. **Flash Flooding:** Flash flooding is very common in the San Bernardino County Deserts, and happens almost yearly. The last flooding events in Twentynine Palms was in 2015 and prior to that in 2011. These events uncovered pipelines installed within dirt roads throughout the distribution system.

5. **Power Failure:** Power failure of a few minutes to a few hours are common and not considered a substantial hazard. A prolonged power failure, however, will affect delivery of water from the wells to the distribution system. The District pumps groundwater directly into the distribution system and the water is stored in a series of reservoirs at various elevations to maintain relatively even pressures throughout the system. The District has only minor water treatment systems at most of the wells, however, TPWD operates a 3.0 million gallon-a-day Fluoride Removal Treatment Plant. The fluoride removal plant produces the majority of the drinking water in the service area. Most of the groundwater in the area meets or exceeds the Federal and State of California regulations for potable drinking water. Without power, stored water in the reservoirs would be exhausted within three to five days in the winter months, and two days in the summer months. As such, a prolonged power outage could shut down all water supplies. There have been no significant power failures in the recent past, but power failure is a high concern for the District, given its remote location and being many miles from a power generating plant. TPWD owns and maintains several diesel fired generators to counter act the loss of power.

6. **Wildfires/Fire:** Wildfires are not a significant concern in the desert, while local facility fires are a significant concern. The District's office facilities, computer systems, SCADA system, and operating pump stations are susceptible to fire damage. The consequences include loss of life,

buildings, equipment, and property damage. There have been no wildfires or brush fire in this area, the landscape is pretty barren, therefore not much to burn. There have been no documented wildfires in the service area.

7. **Freezing Events:** The temperature range in the Morongo Basin is quite extreme. Temperatures range from a low of 40 degrees in the winter to 115 degrees in the summer months. The five highest profile hazards for the District are: 1) Earthquake 2) Climate/Drought 3) Terrorist Event 4) Flash Flooding/Flooding 5) Power Failure. While other hazards are profiled in the following sections for completeness, the District's priority and focus for the mitigation projects will be for the five high profile hazards.

4.2 Hazard Profile

4.2.1 Earthquake Hazard

Probability: **Highly Likely**

Impact: **Catastrophic**

General Definition: An earthquake is a sudden, rapid shaking of the Earth caused by the breaking and shifting of rock beneath the Earth's surface. For hundreds of millions of years, the forces of plate tectonics have shaped the Earth as the huge plates that form the Earth's surface move slowly over, under, and past each other. Sometimes the movement is gradual. Increased movement occurs when the plates become locked together, unable to release the accumulating energy. When the accumulated energy grows strong enough, the plates break free causing the ground to shake. Most earthquakes occur at the boundaries where the plates meet. However, some earthquakes occur in the middle of plates.

Ground shaking from earthquakes can collapse buildings and bridges; disrupt gas, electric, water utilities, and phone service; and trigger landslides, avalanches, fires, and destructive ocean waves, including tsunamis. Buildings with foundations resting on unconsolidated landfill and other unstable soil, as well as homes not tied to their foundations are at risk because they can be shaken off their mountings even during a mild earthquake. When an earthquake occurs in a populated area, it may cause deaths, injuries and extensive property damage.

Earthquakes strike suddenly, without warning. Earthquakes can occur at any time of the year and at any time of the day or night. On a yearly basis, 70 to 75 damaging earthquakes occur throughout the world. Estimates of losses from a future earthquake in the United States approach \$200 billion.

There are 45 states and territories in the United States at moderate to very high risk from earthquakes, and they are in every region of the country. California experiences the most frequent damaging earthquakes; however, Alaska experiences the greatest number of large earthquakes - most located in uninhabited areas. The nearby Southern Section of the San Andreas Fault is ranked in the top 5 most likely faults to cause major damage in the U.S. by USGS (www.USGS.org). See fault map on page 24.

Description: There are several earthquake faults located within the District's service area. While there have been many earthquakes in and around the District's service area, the 1992 Landers/Big Bear earthquakes damaged above ground reservoirs, miles of pipelines in the distribution system, and groundwater wells. In other locations, there was no significant damage in the TPWD service area.

A source for the earthquake profile was a report that describes a new earthquake rupture forecast for California developed by the 2007 Working Group on California Earthquake Probabilities (WGCEP 2007). The Earthquake Working Group was organized in September 2005, by the U.S. Geological Survey (USGS), the California Geological Survey (CGS), and the Southern California Earthquake Center (SCEC) to better understand the locations of faults in California. The group produced a revised, time independent forecast for California for the National Seismic Hazard Map.

Mitigation:

Projects to help mitigate damage from earthquakes range from installing seismic shut-off valves on all water reservoirs in the District to flexible pipe joints that can be installed at reservoirs, wells and booster pumps. Flexible pipe joints can also be installed in sections of water pipelines to allow the pipelines more flexibility during earth movement. Block walls can be installed around facilities to help insure the security of critical facilities and control water that may escape from reservoirs. The District has flex couplings on all of the reservoirs, but does not have seismic shut-off valves on any reservoir.

Figure 1A: ShakeOut, Shake Map

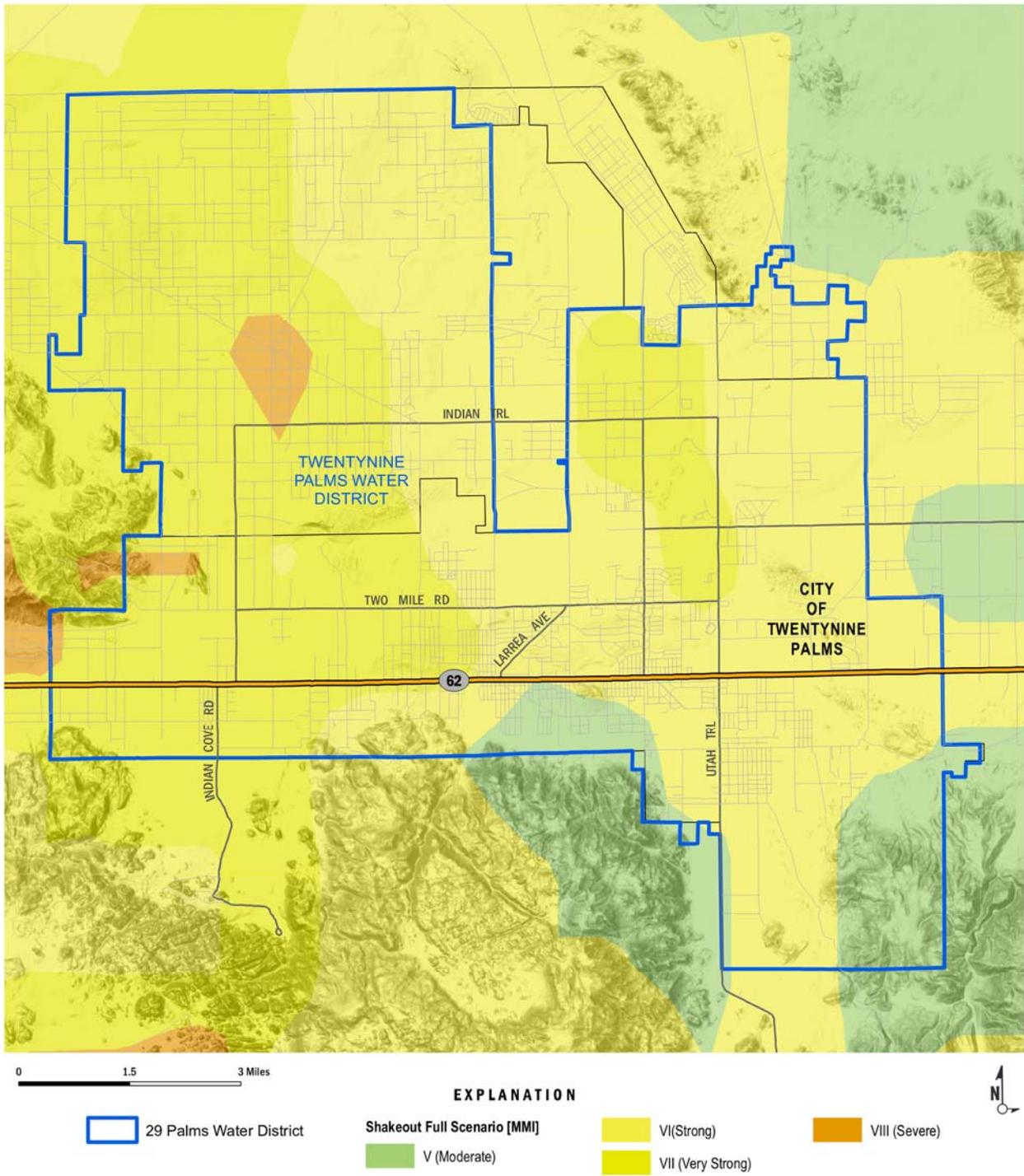


Figure 1B: Earthquake Fault Map/ with District Boundaries

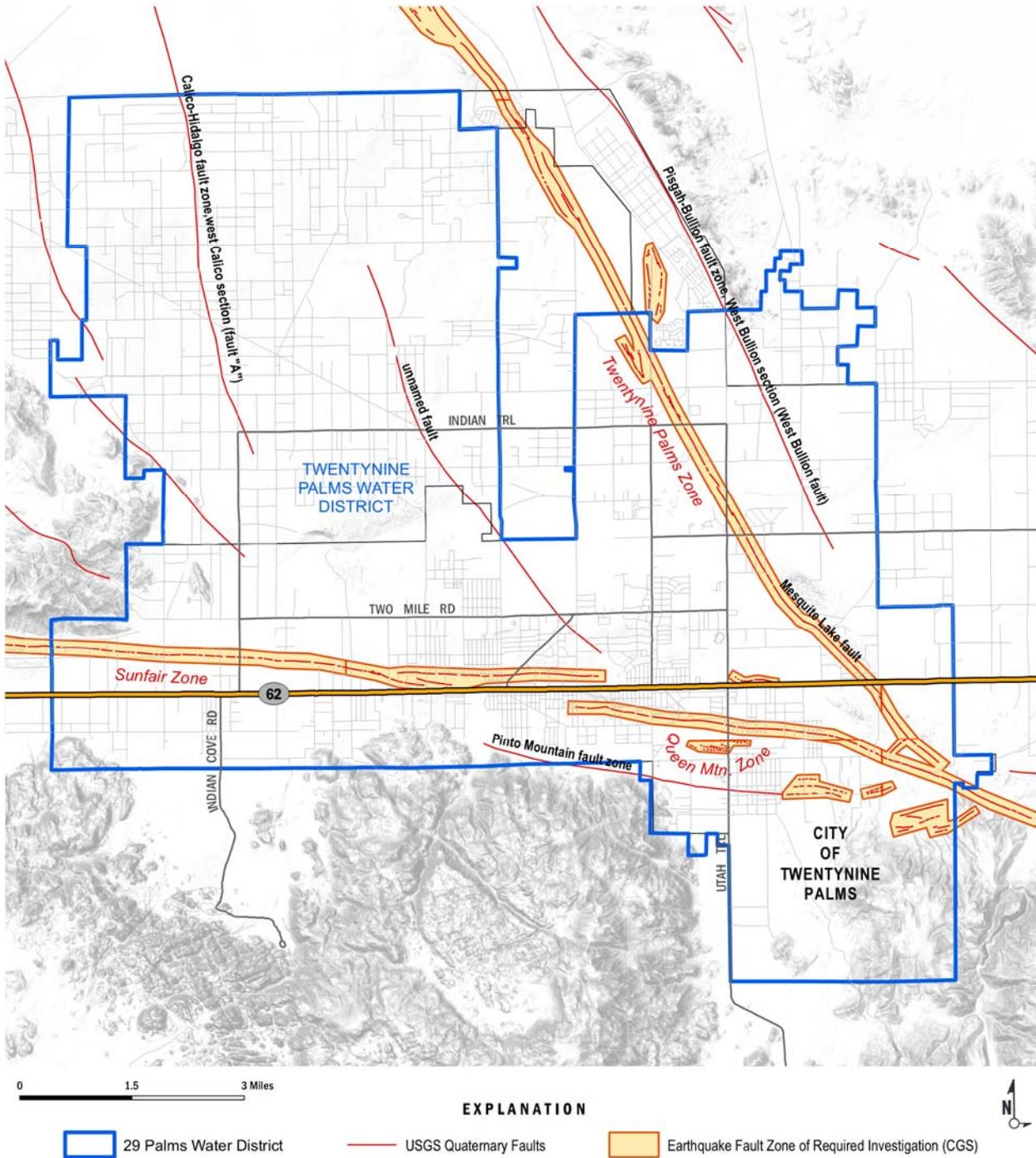
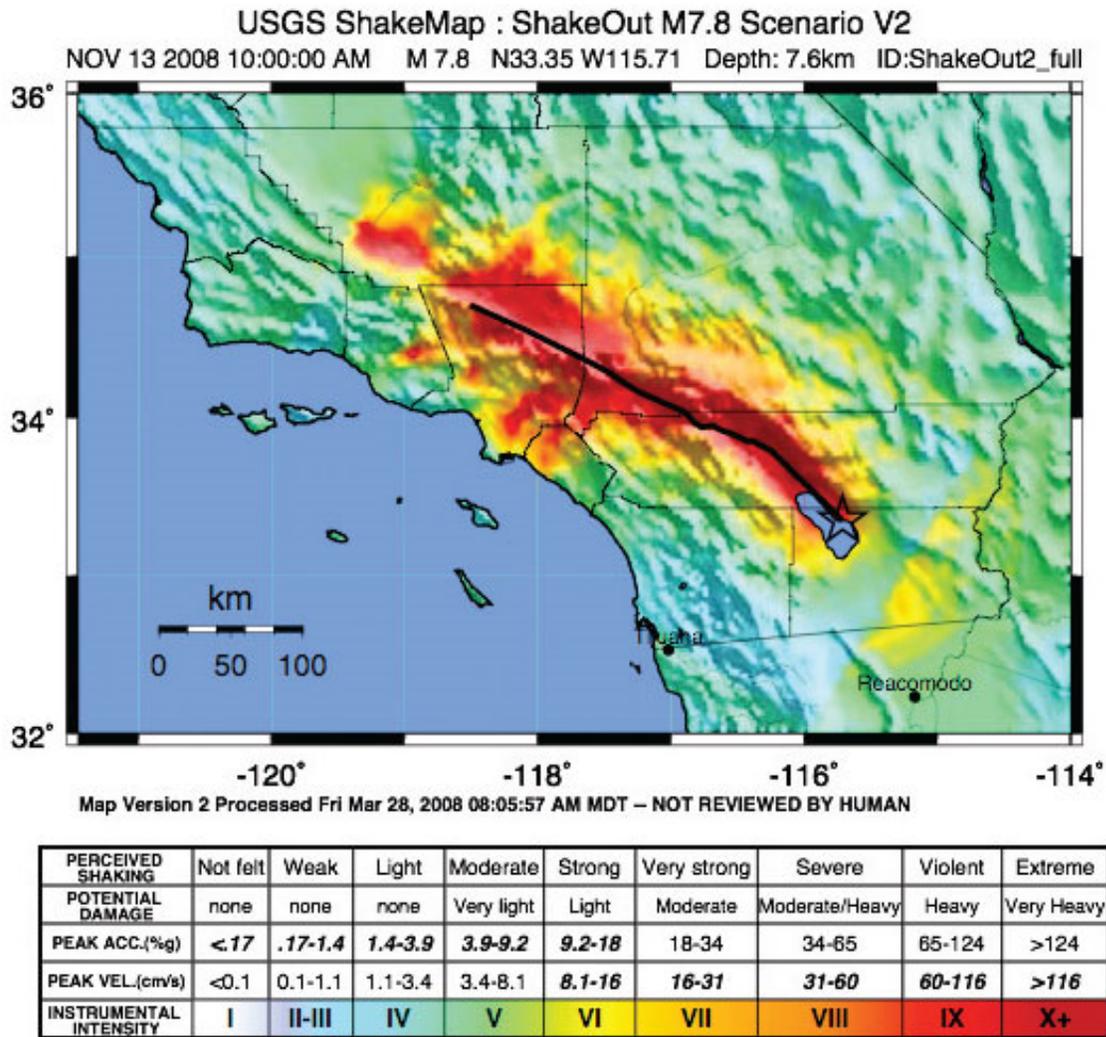


Table 4: Historic Southern California Earthquakes:

<i>Earthquake Name</i>	<i>Date of Earthquake</i>	<i>Magnitude of Quake</i>	<i>Damage Description</i>
<i>Wrightwood Earthquake</i>	<i>Dec. 8, 1812</i>	<i>7.5</i>	<i>40 deaths.</i>
<i>Cajon Pass</i>	<i>July 22, 1899</i>	<i>5.7</i>	<i>Landslides, heavy damage to buildings in San Bernardino. No deaths.</i>
<i>San Jacinto</i>	<i>Dec. 25 1899</i>	<i>6.5</i>	<i>San Jacinto & Hemet had severe damage. Six deaths. Chimneys thrown down and walls cracked in Riverside.</i>
<i>Elsinore</i>	<i>May 15, 1910</i>	<i>6</i>	<i>Chimney's toppled.</i>
<i>San Jacinto</i>	<i>April 21, 1918</i>	<i>6.8</i>	<i>Most damage in San Jacinto and Hemet. Several injuries, one death. Landslides, cracks in ground, roads, and canals.</i>
<i>North San Jacinto</i>	<i>July 22, 1923</i>	<i>6.3</i>	<i>Chimney's toppled, broken windows, 2 critical injuries, no deaths. San Bernardino hospital and Hall of Records badly damaged.</i>
<i>San Jacinto Terwilliger</i>	<i>March 25, 1937</i>	<i>6.0</i>	<i>Few chimneys damaged, some plaster cracked, a few windows broken. Minimal damage mostly due to sparsely populated area.</i>
<i>Fish Creek Mountains</i>	<i>Oct 21, 1942</i>	<i>6.6</i>	<i>Little damage due to remote location, felt over a large area. Rockslides</i>
<i>Desert Hot Springs</i>	<i>Dec 4, 1948</i>	<i>6.0</i>	<i>Widespread damage. In Los Angeles, a 5,800 gallon water tank split, water pipes broken in Pasadena, at UCLA, and San Diego. Walls cracked in Escondido and Corona.</i>
<i>1954 San Jacinto</i>	<i>March 19, 1954</i>	<i>6.4</i>	<i>Minor widespread damage. Parts of San Bernardino experienced a temporary blackout.</i>
<i>Borrego Mountain</i>	<i>April 8, 1968</i>	<i>6.5</i>	<i>Largest most damaging earthquake in 16 years. Damage across most of Southern California. Landslides, huge boulders thrown.</i>
<i>Lytle Creek</i>	<i>Sept. 12, 1970</i>	<i>5.2</i>	<i>Landslides, rock falls, 4 injuries. San Bernardino radio station knocked off the air.</i>
<i>White Wash</i>	<i>Feb 25, 1980</i>	<i>5.5</i>	<i>Landslides. Windows and dishes broken. Fire broke out in Rancho Mirage due to a gas line rupture in an empty home.</i>
<i>1988 Upland and Corona</i>	<i>June 26, 1988 and Feb 28, 1990</i>	<i>4.7 and 5.4 respectively</i>	<i>Landslides, damage to San Antonio Dam, 38 minor injuries. Public-\$4.87M; business-\$4.7M; private-\$2,4M; total-\$12M; 501 homes and 115 businesses damaged or destroyed.</i>
<i>North Palm Springs</i>	<i>July 8, 1986</i>	<i>5.6</i>	<i>29 injuries. Destruction or damage of 51 homes. Landslides. Damage over \$4M.</i>
<i>Joshua Tree</i>	<i>April 22, 1992</i>	<i>6.1</i>	<i>Minor injuries. Near Landers</i>

<p><i>2 separate earthquakes: Landers and Big Bear</i></p>	<p><i>June 28,1992</i></p>	<p><i>Landers 7.3 Big Bear - 6.4</i></p>	<p><i>Landslides in San Bernardino Mountains. Near Landers. Substantial damage in Big Bear and Landers. Landers earthquake was the largest earthquake in Southern California in 40 years. Earthquake ruptured 5 separate faults. Total rupture length was 53 miles. One death, 402 injuries. Private-\$47.5M; business-\$17M; public-\$26.6M; total-\$91M; 77 homes destroyed, 4,369 homes damaged, 139 businesses damaged.</i></p>
<p><i>Hector Mine</i></p>	<p><i>Oct. 16, 1999</i></p>	<p><i>7.1</i></p>	<p><i>Very remote location. Ruptured in both directions from the epicenter. Near the District's service area.</i></p>

Figure 2: USGS Shake Map and Table for Shake Out M7.8 Scenario V2



As shown above, the table within the figure presents the earthquake profile findings for the District’s service area. The ground motion findings indicate the peak ground acceleration within the District’s service area could exceed 65 percent. Typically, any acceleration over 30 percent is considered Strong to Severe. Also, the USGS reports there is a 97% probability that Southern California will have a 7.6 scale earthquake within the next 30 years.

Earthquake Damage to Water Reservoir's



Earthquake Damage to Water Reservoir





Earthquake, Ground Fracture and Pipeline Failure Above and Below



Earthquake, Ground Fracture and Pipeline Failure



Earthquake Damage to Water Well

4.2.2 Climate Change/Drought

Climate Change

Probability: **Highly Likely**

Impact: **Catastrophic**

General Definition: Climate change could increase water demands while lowering the groundwater table. This would result in increased pumping costs and may require installing deeper water supply wells. Extreme weather events will increase runoff and flash flooding while reducing the groundwater recharge.

Description: Climate Change is a change in the statistical distribution of weather patterns when that change lasts for an extended period (i.e., decades to millions of years). Climate change may refer to a change in average weather conditions, or in the time variation of weather around longer-term average conditions (i.e., more or fewer extreme weather events). Climate change is caused by factors such as biotic processes, variations in solar radiation received by Earth, plate tectonics,

and volcanic eruptions. Certain human activities have also been identified as significant causes of recent climate change, often referred to as *global warming*.

Mitigation: Monitor groundwater levels and evaluate long-term trends. Study the long-term viability of the groundwater aquifer. Evaluate and possibly implement obtaining water from the State water projects. See Water Master Plan for other options to supply more water to the area.

4.2.3 Terrorist Event

Probability: **Highly Likely**

Impact: **Catastrophic**

Description: When a person or group of people strike mayhem within a population by threatening the trust of a population. To kill or injure people to make a point to the terrorist cause and to cause fear with the population to further their cause. In the case of a public water system, to make the water non-drinkable by polluting the water or render the water in the system or the system infrastructure useless to serve water to the public.

4.2.4 Power Failure

Probability: **Likely**

Impact: **Critical**

General Definition: Long-term power failures affect the delivery of water from the wells that feed the water system. The District pumps ground water from the underground aquifer into the distribution system as potable water and has minimal treatment systems in place. Without power from the local utility, potable water in some reservoirs would be exhausted within 3 to 5 days in the winter months and 2 days in the summer months.

Description: Power failure is the loss of Electrical power coming from Southern California Edison, who is the only supplier of electrical power to the District.

Mitigation: Purchase additional generators for back-up power to be able to power up wells and booster stations in the event of a long-term power failure.

4.2.5 Flash Flooding/Flooding Hazard

Probability: **Likely**

Impact: **Catastrophic**

General Definition: An unusually heavy rain in a concentrated area, over a short or long period that collects on the ground in low areas of the land. Flash Flooding occurs when there are large amounts of rainfall in areas where the water runs off to lower elevations. Typically, Flash Flooding happens in the desert, where there is little vegetation to hold or stop the water.

Description: Flash flooding can occur in the summer as well as the winter. Monsoon Season is typically in June and July of each year. During Monsoons, heavy rainstorms that form in the Gulf of Mexico move into Arizona, New Mexico, Texas, and the Deserts of California. These storms bring powerful winds and heavy rains within a short period and can produce two to five inches of rain within a half-hour period. There is no flood control infrastructure in this area of San Bernardino County. Many roads in the District's service area are unpaved, dirt roads.

Mitigation: Install flood control walls to direct Flash Flood waters away from facilities and lower pipelines where needed.

FEMA Flash Flooding and or Flood Inundation Mapping:

The FEMA 500-year flood map is included below. 500-year flooding is only in a small portion of the service area along the river bottom area where most of the District's water supply wells are located. Most of the well-motors are installed on elevated concrete pads that raise the well- motor to a height above the 500-year high water elevation. The District's Fluoride Removal Plant is in the middle of the 100-year flood plain, as Identified by FEMA. This facility was raised above the flood plain, by raising the elevation of the land the building is built on, thus, mitigating the damage from a 100-year flood.

Flooding only happens when water can collect in valleys or lower laying areas. The District is located in a large desert valley, where water runs off from higher mountainous areas on its way to the dry lake area and dry river bed on the desert floor. These waters are very dangerous, since the waters can come from many miles away at very fast speeds. These waters rage through the jurisdiction from the west to the east collecting in the wash area noted on the map. These washes run from the south to the north through the District's service area.

Figure 3: 100/500-year Flood Map

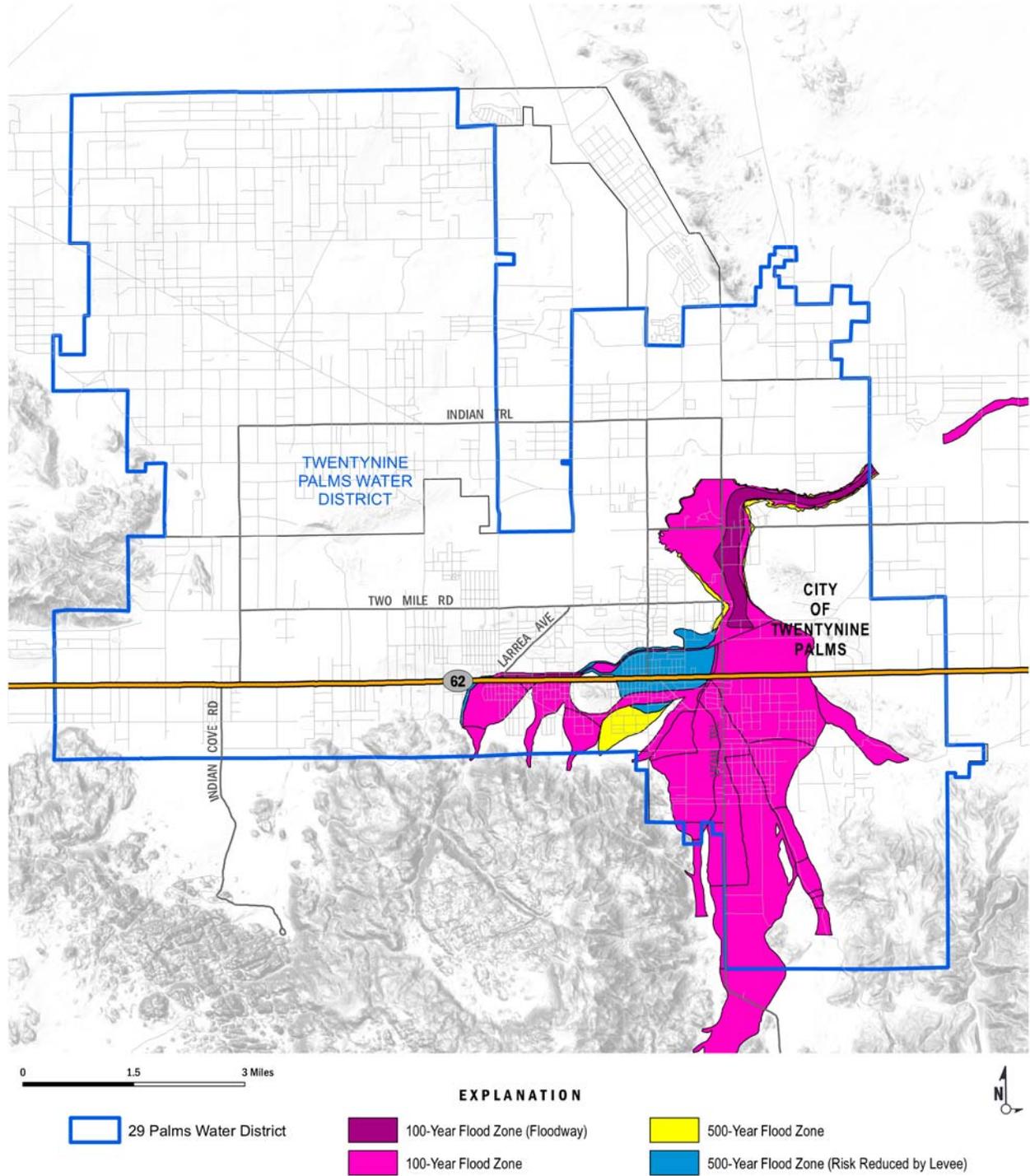


Table 5: Flash Flooding/Flooding History

Date of event	Type of Damage	Amount of Damage	Statewide or Local
Dec-55	74 deaths	\$200 M	State wide
Apr-58	13 deaths, several injuries	\$20 M, plus \$4 M agricultural	State wide
Fall 1965	Abnormally heavy and continuous rainfall.	Public- \$5.8 M; private \$16.0 M; Total \$21.8 M	Riverside, San Bernardino, Ventura, San Diego Counties
Winter 1966	Abnormally heavy and continuous rainfall.	Public- \$14.6 M; private \$14 M; Total \$28.7 M	Various
Winter 1969	Storms, flooding, 47 dead, 161 injured. An alluvial flood and debris flow on Deer Creek in San Bernardino County killed 11 people.	Public- \$185 M, Private - \$115 M; Total -\$300 M	Various
Sep-76	High winds, heavy rains, and flooding	Public-\$65.7 M; private-\$54.3 M; TOTAL-\$120 M	Imperial, Riverside, San Bernardino, San Diego Counties
Winter 1978	14 dead, at least 21 injured	Public-\$73 M; private-\$44 M; Total -\$117 M; 2,538 homes destroyed	Various
Jul-79	No Deaths	Public-\$3.0 M; private-\$22.9 M; Total -\$25.9 M	Riverside
Feb-80	Rain, wind, mud slides, and flooding		Various
Winter 82-83	Heavy rains, high winds, flooding, levee breaks	Public-\$151 M; private-\$159 M; agricultural-\$214 M; TOTAL-\$524 M	Various

Date of event	Type of Damage	Amount of Damage	Statewide or Local
Aug-83	High winds, storms, and flooding; 3 deaths	Public \$10 M, private \$15 M, agricultural \$10 M; TOTAL-\$35 M	Inyo, Riverside, San Bernardino Counties
Feb-92	Flash Flooding, rainstorms, mud slides; 5 deaths	Public-\$95 M; private-\$18.5 M; business-\$8.5 M, agricultural-\$1.5 M; TOTAL-\$123 M	Los Angeles, Ventura, Kern, Orange, San Bernardino Counties
Dec-92	Snow, rain, and high winds, 20 deaths, 10 injuries	Total - \$600 M	Various
Jan-95	11 deaths	Public-\$299.6 M; individual-\$128.4 M; businesses \$58.4 M; highways-\$158 M; ag-\$97 M; TOTAL-\$741.4 M; damage to homes: major-1,883; minor-4, 179; destroyed-370.	Various
Feb-95	17 deaths	Public property-\$190.6 M; individual-\$122.4 M; business-\$46.9 M; highways-\$79 M; ag-\$651.6 M; TOTAL-approximately \$1.1 billion; damage to homes: major-1,322; minor-2,299; destroyed-267	57 counties (all except Del Norte)
Feb-98	17 deaths	\$550 M	Various
Dec. - 03	15 deaths	\$30 M	San Bernardino, Waterman Canyon, Lytle Creek
Jan. 04	None	\$20,000 public property	San Bernardino County High Desert
October 2010	None	\$2.5 M	Flash flooding San Bernardino County High Desert
Dec. 2010 and Jan. 2011	None	\$18 M San Bernardino/Highland, High Desert, San Bernardino Mountains, Forest Falls	Various location in San Bernardino County

Date of event	Type of Damage	Amount of Damage	Statewide or Local
May 2012 March 2014	None	\$50,000	S.B. County High Desert Various



Flash Flooding in Twentynine Palms Water District's Service Area



Flash Flooding in Twentynine Palms Water District's Service Area



Flash Flooding in Twentynine Palms Water District's Service Area



Flash Flooding Mojave Desert 2014

4.2.6 Freezing Event

Probability: **Unlikely**

Impact: **Limited**

General Definition: The temperature range in the Morongo Basin is quite extreme. Temperatures range from a low of 40 degrees in the winter to a high of 115 degrees in the summer months. The District had a major freezing event during the winter of 2010 and 2013 that froze water in the pipes coming out of a wellhead. Freezing can cause damage to the pump motor and rupture the pipe.

Description: High desert locations are known to have a wide range between summer and winter temperatures. It is not uncommon to have summer temperatures in the low 100's and winter temperatures below 30 degrees. Winter storms coming down from Alaska cause rain and cold temperatures, but in the high desert these storms cause snow and freezing temperatures. The high desert is at an elevation of 1,988 feet above sea level. Cold winter storms can drive the temperatures below 20 degrees, freezing water pipes coming out of wells, in homes and businesses. The freezing temperatures cause pipes to burst or restricting water flow to residents and businesses. The District can become inundated with "no water" calls from customers- because of the frozen pipes. The District warns customers each year to protect their pipes from freezing. The District receives hundreds of calls during a freezing event, which takes manpower away from other issues and directs resources to customer calls.

Mitigation: Insulate above ground piping. Install pipeline heating systems to keep the water in the wellhead and output pipelines from freezing.

4.2.7 Long Term Drought

Probability: Highly Likely

Impact: Catastrophic

General Definition: This is a growing concern in California, as the State has been in a drought for the last 7 years. Northern California has experienced some relief in the winter of 2016, although the El Nino affect that was expected to relieve the drought statewide did not materialize in Southern California. The lack of rain and most importantly the lack of snowfall in the Sierra Nevada mountain range have severally impacted the residents of California.

The desert communities in San Bernardino County are not as affected by drought, because these communities, including the District, receive most of their water supply from groundwater. These communities are dependent on underground water aquifers. TPWD does not purchase water through the State Water project and has no connection, available to the District. The District's underground aquifers are in overdraft and a large portion of the District's wells have elevated levels of naturally occurring fluoride, hexavalent chromium, and arsenic. It is challenging for the District to find alternative water supplies from underground aquifers that meet California's water quality standards without constructing additional water treatment facilities.

Description: California has a long history of droughts. Droughts occur when there are long periods of no rainfall in the State. The cycle of droughts and wet periods are in terms of El Nino and La Nina. A drought is a period of below-average precipitation in a given region, resulting in prolonged shortages in its water supply, weather atmospheric, surface water or ground water.

Mitigation: Construct more water storage capacity. Drill more wells. Develop ways to capture rainwater from the higher mountains during flash flooding events and divert these waters to percolation ponds to recharge the underground aquifers. Seek alternative water supplies by setting up agreements and constructing pipelines to purchase State of California aqueduct water, and water from other agencies.

4.2.8 Fire and Wildfire

Probability: Least Likely

Impact: Limited

Description: Local facility fires are a significant concern. The District's office facilities, computer systems, SCADA system, and operating pump stations are susceptible to fire damage. The consequences include loss of life, buildings, equipment, and property damage.

California is very susceptible to wildfires, especially during the fall and summer months. Southern California has the Santa Ana Winds that develop mostly in the late summer and fall. These winds are known for their high speeds and drying affect, which turn the natural grasses brown and dry the southwest natural vegetation. These winds are also capable of blowing down power lines that are

known to start fires in the mountains and hills. The fires are driven by the high winds and the fires become large events that destroy large areas within cities and towns and cause millions of dollars in damage to property and loss of life.

Wildfires are not expected to affect the water infrastructure system because most of the infrastructure is underground and constructed of non-flammable materials. In addition, the local vegetation is such that wildfires are not expected to occur within the District boundaries.

There are, however, some issues from wildfires that can affect the District. During large wildfires, firefighting personnel may draw large amounts of water and strain the water supply system. The fires have a potential to burn through electrical power lines and the District can lose power in critical areas. Without power the District cannot pump groundwater from the aquifer or pump additional water to needed areas.

Mitigation: More water storage, backup generators, improve communications between the District, the public, firefighting personnel, the City, and County Offices of Emergency Services.



Figure 4: Fire Map

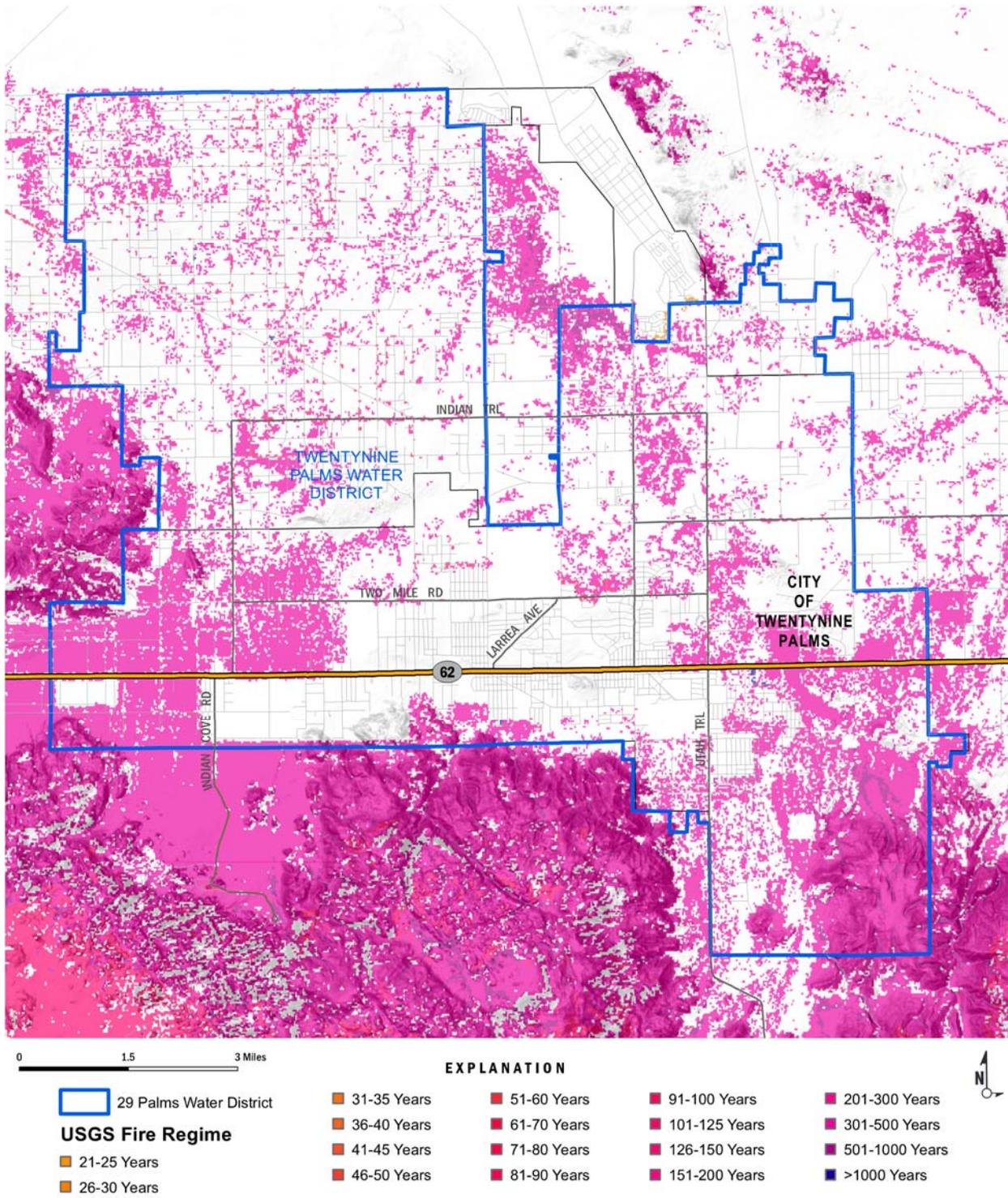
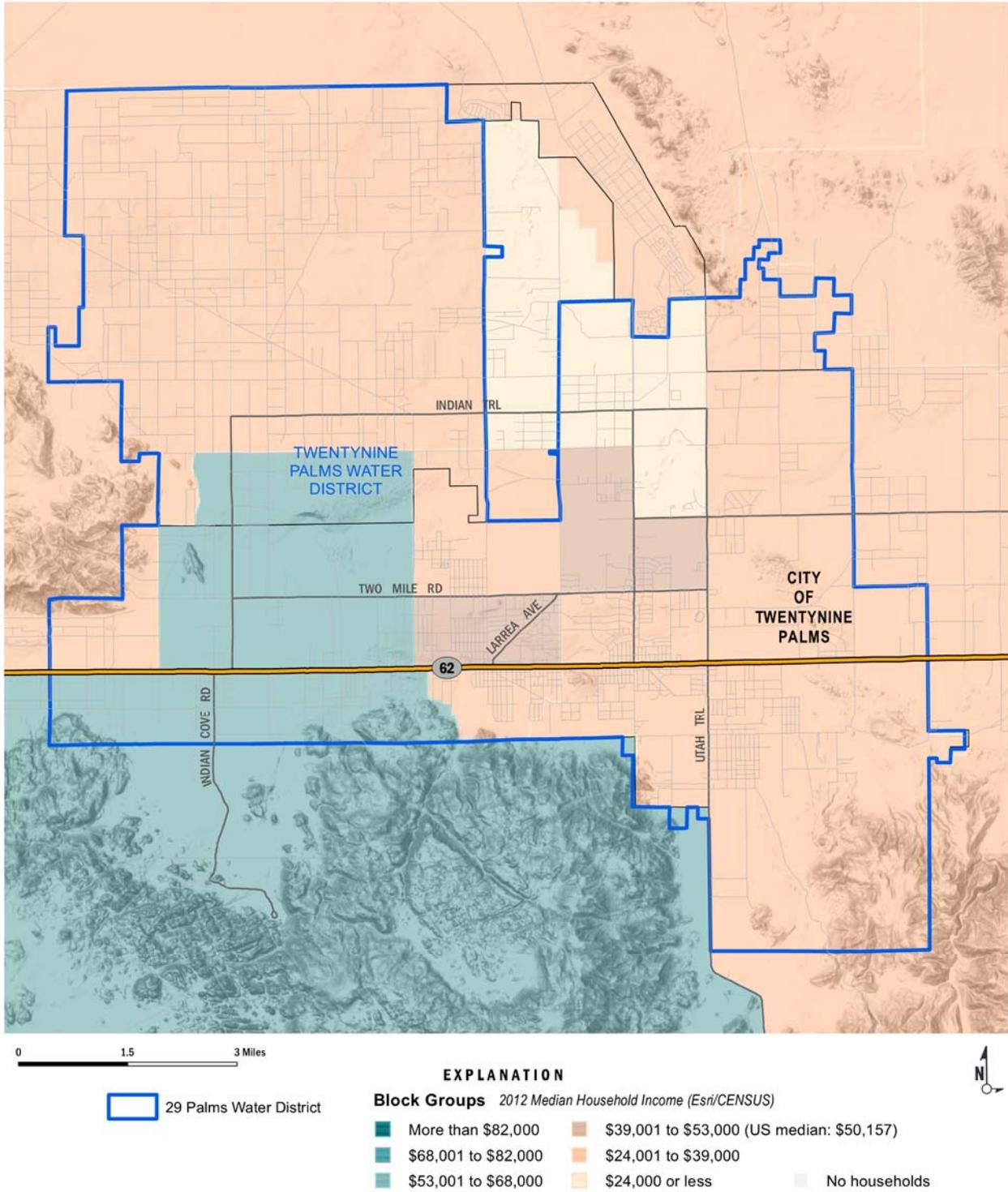


Figure 5: Population, Median Income



4.3 Inventory Assets

This section provides an overview of the assets in the District and the hazards to which these facilities are susceptible.

4.3.1 Facilities Overview

As of March 2015, the District operates and maintains the following facilities:

- 8 pressure zones
- 10 existing reservoirs with a total storage capacity of 17 million gallons
- 6 existing wells with a total pumping maximum capacity of 6.5MGD
- 1 water treatment plant
- Approximately 200 miles of distribution and transmission facilities (pipe sizes of 4 inches to 16 inches in diameter).

Figure 4 is a map of the District's facilities. This figure illustrates how the facilities are arranged to provide potable drinking water to the residents of the service area. Water demands in the service area vary throughout the year with maximum daily summer demands estimated at 3.89 million gallons per day in June. The District relies entirely on groundwater for their raw water supply.

4.3.2 Critical Facility List

This section provides a listing of the District's facilities as developed by the Planning Team. This list is in order of most critical to least critical, by category.

Table 6: Critical Facilities List:

Most Critical Facilities:

Fluoride Removal Water Treatment Plant

Main offices and Repair Facilities

Booster Facilities:

Cactus Booster

Lupine Booster

Two-Mile Booster

Wells:

Well TP-1

Well 14

Well 17

Well 16

Well 12

Well 15

Reservoirs:

Campbell Reservoir

Hanson Reservoir and Booster Pumps

Donnell

2260 Reservoir

Plant 11 A/B Reservoir

Plant 11 A/B Booster pumps

Stockwell Reservoir

2400 Reservoir and Booster

Worthing Reservoir

Desert Heights Reservoir and Pneumatic System

4.4 Vulnerability Assessment

The team reviewed pictures of each of the District's facilities. The pictures were presented with a map of the area to convey the location within the system as well as the site-specific characteristics of the facility. The team members each have a long history in the area and a knowledge of the potential disasters and emergencies that can occur in and around the community. The internal team members have the knowledge to assess the system and give valuable input into the assessment and vulnerabilities to the system.

4.4.1 Methodology

The team reviewed the District's facilities and applied their local and operational knowledge to evaluate how vulnerable each facility is to a potential hazard. The team ranked the facilities by their importance to the District's production and delivery of drinking water, and then using this ranking the team developed an estimate of potential economic impact that could be caused by the high priority hazards. A percentage based on ranking was applied to the District's projected- 2016-2017 annual water revenue (4.6 million) to obtain the annual economic impact for each facility

4.4.2 Earthquake Vulnerability Analysis

Population: Approximately 100% of District's population is vulnerable.

Critical Facilities: Approximately 100% of District's critical facilities are vulnerable.

All facilities are vulnerable in the event of a major earthquake within the District's boundaries. There are many nearby faults that could affect the District's facilities: Emerson, Camp Rock, Big Bear, Garlock, Blue Cut, Pinto Mountain and the San Andreas Faults are nearby. If any of these faults experience a rupture of 6.5 magnitudes or more, it would have a negative effect on District's facilities.

Estimated Losses: The economic loss resulting from this hazard is approximately \$8 million. The loss from damage to structures and pipelines, from this hazard is approximately \$25 million.

Losses are estimated assuming:

1. Lost revenue from water sales for 12 months based on the 2016/2017 projected Twentynine Palms Water District revenue
2. Time to restore the system to full function, 24 months
3. All the District's critical facilities are at risk, including 80% of the District's pipelines.
4. Without the critical facilities, no revenue can be generated for the District.

4.4.3 Flash Flooding Vulnerability Analysis

Population: Approximately 40% of the District's population is vulnerable.

Critical Facilities: Approximately 40% of the District's critical facilities are vulnerable.

Flash Flooding only happens when heavy and concentrated rains occur in steep basin areas where runoff is channeled through limited areas. District is in the foothills or the valley floor, where water runs off from higher mountainous areas on its way to the dry lake areas on the desert floor. These waters are very dangerous because they can originate many miles away and travel at fast speeds. Flash flood waters rage through the service area from the south or the north and collect in the wash area or low land area's mostly on the south side of the valley.

4.4.4 Long Term Drought Vulnerability Analysis

Population: Approximately 100% of the District's population is vulnerable.

Critical Facilities: Approximately 100% of District's critical facilities are vulnerable.

The specific critical facilities vulnerable in the District is:

The wells are critical to drought because they supply groundwater for the District. During a long-term drought, the groundwater levels become lower. During the current drought, the decrease water level has not been significant, although pumping costs increase due to greater lift required. It is also possible that wells and pumps may be too shallow if the groundwater level drops significantly. In these instances, the pump shaft and bowls may need to be lowered deeper in the well. In extreme cases, a new and deeper well may be required.

Of the critical facilities listed, 12 are wells. Currently, these wells are operating without significant hardship during the ongoing drought. Reservoirs are not considered critical in a drought, however Pipelines can collapse, if the system is left with no water.

The District adopted Resolution 14-12 and 15-7, passed on August 27, 2014 and May 27, 2015 respectively, which, established the policy and conservation measures needed during drought conditions. Also, California Governor, Jerry Brown has declared a Water State of Emergency for the entire State, mandating water conservation by all residents.

Estimated Losses: The economic loss resulting from this hazard is approximately \$60,000 a month.

The loss or damage to structures from this hazard is approximately \$2 million, due to collapsed pipelines, booster pumps, and contamination to the system.

4.4.5 Climate Change Vulnerability Analysis

Population: 100% of the District's population is vulnerable to climate change.

Critical Facilities: The groundwater aquifer is the most vulnerable component of the District's critical facilities (or resources). Without the aquifer, there is no water supply.

Climate change is an immediately sensitive issue in coastal communities, with increasing ocean waters, sea surges, tidal issues and surging waves. Northern California and in turn, the Central Valley are being affected by recent changes in weather patterns. In the inland desert regions of California, climate change is a longer-term concern. As the weather becomes hotter and dryer in a changing climate, water would need to be captured during the rainy periods to recharge the underground aquifers, outdoor watering would be restricted, and other conservation measures would be needed.

As climate change results in more extreme weather patterns, the District would need to become more resilient in the management of groundwater resources. Planning for lower groundwater tables may include monitoring and studying the aquifer in greater detail, as well as installing deeper water supply wells. Enhanced groundwater recharge opportunities may also be explored and implemented.

4.4.6 Wildfires Vulnerability Analysis

Population: Approximately 20% of the District's population is vulnerable.

Critical Facilities: Approximately 10% of the District's critical facilities are vulnerable.

Wildfires in the desert communities are common. On July 9, 2006, lightning ignited natural vegetation in several locations that became known as the Sawtooth, Water, and Ridge fires. These three fires merged into one fire known as the Sawtooth fire, which burned two-miles into Yucca Valley, destroying over 300 structures. Yucca Valley is approximately 20 miles from Twentynine Palms Water District's service area. Fires are not cause concern in Twentynine Palms, as there is less vegetation in this area of the Desert. There are ancillary issues at hand, such as power failure due to downing power lines. The other ancillary affect is the loss of water in the distribution system, as the fire fighters draw large amounts of water from the system.

4.4.7 Dam Inundation Vulnerability Analysis

Population: None: There are no Dam's in or around this service area.

Critical Facilities: There are no earthen or concrete dams or any other type of dam in the District's Service area.

4.4.8 Power Failure Vulnerability Analysis

Population: 100% of the District's population are vulnerable.

Critical Facilities: Approximately 100% of the critical facilities are vulnerable.

Power failures are common in the high desert communities, due in a large part of the aging and undersized electrical service to the communities and the fact that the high desert communities still have above ground electrical systems. Above ground electrical systems are vulnerable to high winds, snow, earthquakes, and wildfires. High winds snap electrical poles, cable and wires. Wildfires burn the supporting poles and cause power outages. Also, power lines short circuit during fires, windstorms, earthquakes and snow storms, which lead to long-term outages.

4.4.9 Freezing Event Vulnerability Analysis

Population: 10% of the District's critical facilities are vulnerable.

Freezing events rarely occur in this area., but have happened in the past. During these events water in well-heads, pipelines that are above ground, water backflow valves, and fire hydrants can freeze.

4.4.10 Terrorist Event Vulnerability Analysis

Population: 100% of the District's critical facilities are vulnerable.

The Twentynine Palms Water District has a large population of U.S Marine's living in the community, due to the fact the world's largest U.S Marine Base is within 5 miles of the community. There are two large apartment complexes in the service area that are owned by the Marine Base and house military and their families. Terrorist events could happen at any time. Normally terrorist events are looking at making the biggest impact to the public and the U.S Military. Terrorist events could range from water contamination events to dirty bombs. Water contamination events are the main concern of the team.

4.4.11 Potential Loss Estimate

Replacement costs listed in this section were arrived by utilizing the District's insurance documentation. The Joint Powers Insurance Authority (JPIA) has listed the replacement cost value for each facility. The team has communicated with the JPIA on the values listed below and was assured that the estimated costs are accurate. Table 13, summarizes the economic impacts on the critical facilities within the District.

Table 13: Economic Impacts on Critical Facilities for the District

Fluoride Removal, Water Treatment Plant

Facility Replacement Cost: \$ 15 million

Estimated Economic Impact: \$ 55,000 a month in lost revenue

Description of Economic Impact: loss of water sales, loss of SCADA Control System, loss of productivity

Main office and Repair Facilities

Facility Replacement Cost: \$ 5 million

Estimated Economic Impact: \$ 15,000 a month in lost revenue

Description of Economic Impact: loss of productivity, accounting, payroll and administrative functions and loss of repair facility

Cactus Booster Station

Facility Replacement Cost: \$ 200,000

Estimated Economic Impact: \$5,000 a month in lost revenue

Description of Economic Impact: loss of water sales

Lupine Booster Station

Facility Replacement Cost: \$ 200,000

Estimated Economic Impact: \$ 5,000 a month in lost revenue

Description of Economic Impact: loss of water sales

Two-Mile Booster Station

Facility Replacement Cost: \$ 200,000

Estimated Economic Impact: \$ 5,500 a month in lost revenue

Description of Economic Impact: loss of water sales

Well TP-1

Facility Replacement Cost: \$ 750,000

Estimated Economic Impact: \$ 55,000 a month in lost revenue

Description of Economic Impact: loss of water sales

Well 14

Facility Replacement Cost: \$ 750,000

Estimated Economic Impact: \$ 25,000 a month in lost revenue

Description of Economic Impact: loss of water sales

Well 17

Facility Replacement Cost: \$ 750,000

Estimated Economic Impact: \$ 22,000 a month in lost revenue

Description of Economic Impact: loss of water sales

Well 16

Facility Replacement Cost: \$ 750,000

Estimated Economic Impact: \$ 22,000 a month in lost revenue
Description of Economic Impact: loss of water sales

Well 12

Facility Replacement Cost: \$ 750,000
Estimated Economic Impact: \$ 20,000 a month in lost revenue
Description of Economic Impact: loss of water sales

Well 15

Facility Replacement Cost: \$ 750,000
Estimated Economic Impact: \$ 20,000 a month in lost revenue
Description of Economic Impact: loss of water sales

Campbell Reservoir

Facility Replacement Cost: \$ 1.0 Million
Estimated Economic Impact: \$ 20,000 a month in lost revenue
Description of Economic Impact: loss of water sales

Hanson Reservoir

Facility Replacement Cost: \$ 1.2 Million
Estimated Economic Impact: \$ 8,000 a month in lost revenue
Description of Economic Impact: loss of water sales

Donnell Reservoir

Facility Replacement Cost: \$ 1.2 Million
Estimated Economic Impact: \$ 13,000 a month in lost revenue
Description of Economic Impact: loss of water sales

2260 Reservoir

Facility Replacement Cost: \$ 1.2 Million
Estimated Economic Impact: \$15,500 a month in lost revenue
Description of Economic Impact: loss of water sales

Plant 11 A/B Reservoirs

Facility Replacement Cost: \$ 2.4 Million
Estimated Economic Impact: \$30,000 a month in lost Revenue
Description of Economic Impact: loss of water sales

Plant 11 A/B Boosters

Facility Replacement Cost: \$ 1.2 Million
Estimated Economic Impact: \$ 25,000 a month in lost revenue
Description of Economic Impact: loss of water sales

Stockwell Reservoir

Facility Replacement Cost: \$ 1.1 Million

Estimated Economic Impact: \$ 19,000 a month in lost revenue
Description of Economic Impact: loss of water sales

2400 Reservoir and Booster

Facility Replacement Cost: \$ 1.2 Million
Estimated Economic Impact: \$ 18,000 a month in lost revenue
Description of Economic Impact: loss of water sales

Worthing Reservoir

Facility Replacement Cost: \$ 1.0 Million
Estimated Economic Impact: \$ 8,000 a month in lost revenue
Description of Economic Impact: loss of water sales

Desert Heights Reservoir

Facility Replacement Cost: \$ 1.0 Million
Estimated Economic Impact: \$ 8,000 a month in lost revenue
Description of Economic Impact: loss of water sales

SECTION 5: COMMUNITY CAPABILITY ASSESSMENT

5.1 Agencies and People

The District is in the Southwestern section of the Mojave Desert within San Bernardino County. The District serves the City of Twentynine Palms and some areas of the County of San Bernardino. The District serves approximately 8,000 service connections and a population of approximately 18,000 customers.

To help mitigate the potential impacts of disasters, District joined the Emergency Response Network of the Inland Empire (ERNIE). This organization consists of water agencies within San Bernardino and Riverside Counties. The ERNIE group of agencies coordinates mutual aid to help each District recover from local emergency issues. The District is also a member of the California Water/Wastewater District Response Network (CalWARN). This organization focuses on mutual aid throughout the State of California.

The District employs 17 people. With the capabilities of ERNIE and CalWARN, the District has the potential of having hundreds of mutual aid workers at its disposal within hours of an emergency.

5.2 Existing Plans

The following emergency related plans apply as appropriate:

- ERNIE Emergency Operations Plan
- CalWARN Emergency Operations Plan

- The District's Illness Injury Prevention Plan (IIPP)
- The District's Urban Water Master Plan

In addition, the District has mutual aid agreements within San Bernardino and Riverside Counties and within the State of California. As a government entity (Special District, within California Law), the District can access the Emergency Managers Mutual Aid (EMMA) and the Emergency Management Assistance Compact (EMAC) for national mutual aid and the National WARN System through the American Water Works Association.

5.3 Regulations, Codes, Policies, and Ordinances

The Urban Water Management and Planning Act was passed in 2010 and requires water suppliers to estimate water demands and available water supplies. The District's updated Urban Water Management Plan (UWMP) was completed in January 2017. UWMPs are required to evaluate the adequacy of water supplies including projections of 5, 10, and 20 years. These plans are also required to include water shortage contingency planning for dealing with water shortages, including a catastrophic supply interruption.

UWMPs are intended to be integrated with other urban planning requirements and management plans. Some of these plans include city and county General Plans, Water Master Plans, Recycled Water Master Plans, Integrated Resource Plans, Integrated Regional Water Management Plans, Groundwater Management Plans, Emergency Response Plans, and others.

The District has an Emergency Response Plan that details how the District will respond to various emergencies and disasters. The District must be prepared to respond to a variety of threats that require emergency actions, including:

- Operational incidents, such as power failure or bacteriological contamination of water associated with the District's facilities.
- Outside or inside malevolent acts, such as threatened or intentional contamination of water, intentional damage/destruction of facilities, detection of an intruder or intruder alarm, bomb threat, or suspicious mail.
- Natural disasters, such as earthquakes or floods and power failures.
- Water Conservation Regulations

The District is also required to follow Standard Emergency Management System (SEMS) and the National Incident Management System (NIMS) and the Incident Command System (ICS) when responding to emergencies.

5.4 Mitigation Programs

The District has completed some mitigation programs. The California Department of Water Resources required the District to raise well pump motors and other wellhead assemblies above

the 500-year flood plain elevation. This was accomplished by installing the motors and wellheads on elevated concrete foundations.

5.5 Fiscal Resources

Fiscal resources for the District include the following:

- Revenue from water sales
- Monthly Service Charge fee
- Water Availability Assessment (On Property Taxes)
- Meter Installation Fee
- If necessary, local bond measures and property taxes

Through the California Department of Water Resources, local grants and/or loans are available for water conservation, groundwater management, studies and activities to enhance local water supply quality and reliability. Project eligibility depends on the type of organization(s) applying and participating in the project, and the specific type of project. More than one grant or loan may be appropriate for a proposed activity. Completing the LHMP will facilitate and obtain grant funding in the future.

SECTION 6: MITIGATION STRATEGIES

6.1 Overview

The purpose of this analysis is to identify projects (actions) that help the District meet the goals and objectives for each priority hazard. The District has identified hazards in the community, assessed those hazards that pose the most significant risk, and identified projects to help reduce and/or eliminate those risks.

6.2 Mitigation Goals, Objectives, and Projects

As discussed in Section 3.5, the process of identifying goals began with a review and validation of the goals and objectives in the District and the San Bernardino County's 2010 Operational Area LHMP. Using the County's 2010 LHMP, the District's Planning Team completed an assessment/discussion of whether each of the goals was valid.

Overall, the primary objective is to protect lives and prevent damages to infrastructure that disrupts water services. Global measures that apply across all hazards include:

- Continually improve the community's understanding of potential impacts due to hazards and the measures needed to protect lives and critical infrastructure;
- The District's Communications/Conservation Officer, should provide public outreach to inform the public of the hazards identified to the drinking water system in emergencies, -

how to conserve water in the event of a disaster and how to obtain drinking water when water may not be available;

- Continually provide State and Local Agencies with updated information about hazards, vulnerabilities, and mitigation measures at the District;
- Review local codes and standards to verify that they protect human life and the District's facilities;
- Review and verify that the District's owned and operated infrastructure meet minimum standards for safety;
- Review the District facilities and developments in high-risk areas to verify that these areas are appropriately protected for potential hazards;
- Identify and mitigate imminent threats to life safety and facility damage.

The four high profile hazards for the District are earthquake, power failure, terrorist events and flash flooding. While other hazards were profiled in previous sections, the District's priority and focus for the mitigation projects will be for the five high profile hazards.

6.2.1 Earthquake, Impact Rating (1) from Table 3, Page 20

Description: *Goal is to avoid injury, loss of life, and damages to property.* The District agrees that strengthening of buildings and fire codes are critical to the protection of property, life and the reduction of seismic-caused damages. These codes help water utilities design and construct reservoirs, pump stations, groundwater wells, and pipelines to resist the forces of nature.

Objectives:

- Design new facilities and upgrade existing facilities to withstand an 8.0 earthquake. The District is located in a high-risk earthquake area with many geologic fault zones.
- Encourage property protection measures for structures located in the area.
- Adopt cost-effective codes and standards to protect life properties and critical infrastructure.
- Establish partnerships with other levels of government and the business community to improve and implement methods to protect property.

Mitigation Projects:

- Flexible pipe joints at wellheads, pump stations, and reservoirs
- Seismic shut-off valves
- Bolt down reservoirs
- Tie down equipment
- Generator hook-up

6.2.2 Climate Change and Long-Term Drought, Impact rating (1) from Table 3, Page 20

Description: Due to Global Warming, there are more extremes in the weather, which mean the summers can be hotter, the winters colder, periods of rain can become less wet or more wet causing flooding. Address expected greater fluctuations in weather patterns, including prolonged dry periods and the drought hazard, through mitigation over the long-term. The objectives listed below have been taken from the declaration of a Drought, State of Emergency for California, signed by Governor Jerry Brown in May of 2015. The California Drought has not affected the District at this point, since the area is always in a drought.

Objectives:

- Increase water supply - creating innovative ways to generate new supplies
- Improve operational efficiency
- Reduce water demand - water conservation has become a viable long-term supply option because it saves considerable capital and operating cost for the District

Mitigation Projects:

- Increase public awareness of water conservation
- Monitor groundwater elevations and evaluate trends
- Increase water pumping capabilities
- Increase groundwater supplies
- Study system interties with other water systems in the area
- Generator hook-ups

6.2.3 Terrorist Events, Impact Rating (1) From Table 3, Page 20

Description:

A person or group of persons willingly causes damage to people or property to forward their goals through intimidation or coercion of a civilian population, to influence the policy of a government either large or small, and to affect a government entity.

Objective:

- Prevent damage to critical water facilities
- Educate the public on terrorism
- Enhance safety within the region

Mitigation Projects:

- Train the public in “if you see something, say something.”
- Improved SCADA controls

- Install video cameras at critical facilities
- Increase security measures at critical facilities
- Build block walls around critical facilities for additional security
- Generator hook-up

6.2.4 Power Failure, Impact Rating (2) from Table 3, Page 20

Description: A sudden failure of the electric distribution system to a large geographical area that includes water wells and booster pumps thereby limiting water deliveries.

Objective:

- Provide proper operation of critical facilities during power failures
- Provide water delivery for firefighting and other critical needs;

Mitigation Projects:

- Purchase generators and transfer switches that can power critical facilities during a power failure.
- Public education to promote water conservation during power outages.
- Communication/Conservation officer should develop outreach to the public to educate residents on the hazards to the utility and operation of the utility in emergencies
- Generator hook-up

6.2.5 Flash Flooding, Impact Rating (2) from Table 3, Page20

Description: A sudden, localized flood of great volume and short duration, typically caused by unusually heavy rain in a semiarid area. Flash floods can reach its peak volume in a matter of a few minutes and often carry large loads of mud and rock fragments. Flash flooding is common in the arid desert areas of California, Arizona, Nevada and New Mexico.

Objective:

- Prevent damage to water distribution facilities
- Protect loss of critical facilities
- Mitigate cost of damages during and after a flash flood

Mitigation Projects:

- Install block or concrete diversion walls
- Deepen pipelines
- Install concrete protection of pipelines at critical locations

6.2.6 Freezing Event, Impact Rating (4) from Table 3, Page 20

Description: A period of cold temperatures that can freeze still or slow-moving water. Pipelines that are above ground, or above the frost line, small diameter, and with low flow rates are most susceptible to freeze damage. When water freezes inside of a pipe, the water expands and ruptures the pipe. Water will not flow through an ice blockage.

Objectives:

None, as freezing events are a rarity in this service area

Mitigation Projects:

None

6.2.7 Mitigation Priorities

Mitigation measures are identified for District’s critical facilities. Each measure is presented with an estimated budget. This list is in the order of priority.

Main Office/ Maintenance Yard

- **Mitigation to Earthquake:**
 1. Block Wall around facility
 2. Estimated Mitigation Budget: \$300,000
 3. Redundant SCADA system Budget: \$40,000
 4. Redundant Two-Way Radio System: \$10,000
 5. Estimated Mitigation Budget: \$10,000
 6. Generator hook-up: Budget \$40,000
 7. Generator Budget: \$200,000

- **Mitigation to Flooding:**
 1. Block Wall Around Facility Budget: \$300,000
 2. Block Diversion Wall at Front West side \$75,000
 3. Redundant SCADA Estimated Mitigation Budget: \$40,000
 4. Redundant Two-Way Radio System Budget: \$10,000
 5. Estimated Mitigation Budget: \$10,000

- **Mitigation to Terrorist Events:**
 1. Security Windows and Door on front and sides of main office, Budget: \$50,000
 2. Redundant SCADA system Budget: \$40,000
 3. Redundant Two-Way Radio System Budget: \$10,000
 4. Estimated Mitigation Budget: \$10,000

5. Generator hook-up: Budget \$50,00

Fluoride Removal, Water Treatment Plant:

- **Mitigation to Earthquake**

1. Flex Couplings Chemical Feed Lines. Budget: \$75,000
2. Flex Couplings on Water Feed and System Lines. Budget \$50,000
3. Back up SCADA System. Budget: \$40,000

- **Mitigation to Flooding:**

1. Flood Diversion Wall. Budget: \$250,000
2. Backup Generator and Transfer Switch. Budget. \$225,000

- **Terrorist Events:**

1. Block Wall and Iron Gates Around Facility. Budget: 2.5 Million
2. Backup Generator and Transfer Switch. Budget: \$225,000

Cactus Booster Station

- **Mitigation to Earthquake:**

1. Flex Coupling. Budget: \$35,000
2. Generator and Transfer Switch. Budget: \$225,000

- **Mitigation to Flooding:**

1. Block Wall Around Facility. Budget: \$150,000

- **Mitigation to Terrorist Events:**

1. Block Wall Around Facility. Budget: \$150,000
2. Security Camera's and alarm System. Budget: \$20,000

Lupine Booster Station

- **Mitigation to Earthquake:**
 1. Flex Couplings on Piping. Budget: \$10,000
 2. Generator and Transfer Switch. Budget: \$ 25,000

- **Mitigation to Flooding:**
 1. Block Diversion Wall. Budget: \$150,000

- **Mitigation to Terrorist Events**
 1. Video Surveillance and Alarm System. Budget: \$20,000

Two Mile Booster Station

- **Mitigation to Earthquake:**
 1. Flex Couplings on Piping. Budget: \$10,000
 2. Generator and Transfer Switch. Budget: \$225,000

- **Mitigation to Flooding:**
 1. Block Diversion Wall. Budget: \$150,000

- **Mitigation to Terrorist Events:**
 1. Video Surveillance System. Budget: \$20,000
 2. Alarm system for gate and Reservoir: \$10,000

Well TP-1

- **Mitigation to Earthquake:**
 1. Generator and Transfer Switch. Budget: \$225,000
 2. Flex Coupling. Budget: \$ 100,000
 3. Seismic Shut Off Valve. Budget: \$35,000

- **Mitigation to Flooding:**

1. Flood Control walls to direct floodwater away from property. Budget: \$150,000

- **Mitigation to Terrorist Events:**

1. Block Wall Around Facility. Budget: \$250,000
2. Video Surveillance Camera and Alarm System. Budget: \$20,000

Well 14

- **Mitigation to Earthquake:**

1. Generator and Transfer Switch. Budget: \$225,000
2. Flex Coupling. Budget: \$10,000
3. Seismic Shut Off Valve. Budget: \$35,000

- **Mitigation to Flooding:**

1. Flood Control walls to direct floodwater away from property. Budget: \$ 150,000
2. Enclose facility with block walls. Budget: \$250,000

- **Mitigation to Terrorist Events:**

1. Block Wall Around Facility. Budget: \$250,000
2. Video Surveillance Camera and Alarm. Budget: \$20,000

Reservoir 18

- **Mitigation to Earthquake:**

1. Generator and Transfer Switch. Budget: \$225,000
2. Flex Coupling. Budget: \$10,000
3. Seismic Shut Off Valve. Budget: \$35,000

- **Mitigation to Flooding:**

1. Flood Control walls to direct floodwater away from property. Budget: \$150,000
2. Enclose facility with block walls. Budget: \$250,000

- **Mitigation to Terrorist Events:**

1. Block Wall Around Facility. Budget: \$250,000
2. Video Surveillance Camera and Alarm. Budget: \$20,000

Well 17

- **Mitigation to Earthquake:**

1. Generator and Transfer Switch. Budget: \$225,000
2. Flex Coupling. Budget: \$10,000
3. Seismic Shut Off Valve. Budget: \$35,000

- **Mitigation to Flooding:**

1. Flood Control walls to direct floodwater away from property. Budget: \$150,000
2. Enclose facility with block walls. Budget: \$250,000

- **Mitigation to Terrorist Events:**

1. Block Wall Around Facility. Budget: \$250,000
2. Video Surveillance Camera and Alarm. Budget: \$20,000

Well 16

- **Mitigation to Earthquake:**

1. Generator and Transfer Switch. Budget: \$225,000
2. Flex Coupling. Budget: \$ 10,000
3. Seismic Shut Off Valve. Budget: \$35,000

- **Mitigation to Flooding:**

1. Flood Control walls to direct floodwater away from property. Budget: \$150,000
2. Enclose facility with block walls. Budget: \$250,000

- **Mitigation to Terrorist Events:**

1. Block Wall Around Facility. Budget: \$250,000
2. Video Surveillance Camera and Alarm. Budget: \$20,000

Well 12

- **Mitigation to Earthquake:**

1. Generator and Transfer Switch. Budget: \$225,000
2. Flex Coupling. Budget: \$10,000
3. Seismic Shut Off Valve. Budget: \$35,000

- **Mitigation to Flooding:**

1. Flood Control walls to direct floodwater away from property. Budget: \$150,000
2. Enclose facility with block walls. Budget: \$250,000

- **Mitigation to Terrorist Events:**

1. Block Wall Around Facility. Budget: \$250,000
2. Video Surveillance Camera and Alarm. Budget: \$20,000

Well 15

- **Mitigation to Earthquake:**

1. Generator and Transfer Switch. Budget: \$225,000
2. Flex Coupling. Budget: \$10,000
3. Seismic Shut Off Valve. Budget: \$35,000

- **Mitigation to Flooding:**

1. Flood Control walls to direct floodwater away from property. Budget: \$150,000
2. Enclose facility with block walls. Budget: \$250,000

- **Mitigation to Terrorist Events:**

1. Block Wall Around Facility. Budget: \$250,000
2. Video Surveillance Camera and Alarm. Budget: \$20,000

Campbell Reservoir

- **Mitigation to Earthquake:**
 1. Generator and Transfer Switch. Budget: \$225,000
 2. Flex Coupling. Budget: \$10,000
 3. Seismic Shut Off Valve. Budget: \$35,000

- **Mitigation to Flooding:**
 1. Flood Control walls to direct floodwater away from property. Budget: \$150,000
 2. Enclose facility with block walls. Budget: \$250,000

- **Mitigation to Terrorist Events:**
 1. Block Wall Around Facility. Budget: \$250,000
 2. Video Surveillance Camera and Alarm. Budget: \$20,000

Hanson Reservoir

- **Mitigation to Earthquake:**

Donnell Reservoir

- **Mitigation to Earthquake:**
 1. Generator and Transfer Switch. Budget: \$225,000
 2. Flex Coupling. Budget: \$10,000
 3. Seismic Shut Off Valve. Budget: \$35,000
 4. Diversion Channels in Case of Reservoir failure. Budget: \$1.5 Million
 5. Block Wall for Water Containment. Budget: \$1.0 Million

- **Mitigation to Flooding:**
 1. Flood Control walls to direct floodwater away from property. Budget: \$150,000
 2. Enclose facility with block walls. Budget: \$250,000

- **Mitigation to Terrorist Events:**
 1. Block Wall Around Facility. Budget: \$250,000
 2. Video Surveillance Camera and Alarm. Budget: \$20,000

2260 Reservoir

- **Mitigation to Earthquake:**
 1. Generator and Transfer Switch. Budget: \$225,000
 2. Flex Coupling. Budget: \$10,000
 3. Seismic Shut Off Valve. Budget: \$35,000

- **Mitigation to Flooding:**
 1. Flood Control walls to direct floodwater away from property. Budget: \$150,000
 2. Enclose facility with block walls. Budget: \$250,000

- **Mitigation to Terrorist Events:**
 1. Block Wall Around Facility. Budget: \$250,000
 2. Video Surveillance Camera and Alarm. Budget: \$20,000

Plant 11- A/B Reservoirs

- **Mitigation to Earthquake:**
 1. Generator and Transfer Switch. Budget: \$225,000
 2. Flex Coupling. Budget: \$10,000
 3. Seismic Shut Off Valve. Budget: \$35,000

- **Mitigation to Flooding:**
 1. Flood Control walls to direct floodwater away from property. Budget: \$150,000
 2. Enclose facility with block walls. Budget: \$250,000

- **Mitigation to Terrorist Events:**
 1. Block Wall Around Facility. Budget: \$250,000
 2. Video Surveillance Camera and Alarm. Budget: \$20,000

Plant 11 A/B Boosters

- **Mitigation to Earthquake:**

1. Generator and Transfer Switch. Budget: \$225,000
2. Flex Coupling. Budget: \$10,000
3. Seismic Shut Off Valve. Budget: \$35,000

- **Mitigation to Flooding:**

1. Flood Control walls to direct floodwater away from property. Budget: \$150,000
2. Enclose facility with block walls. Budget; \$250,000

- **Mitigation to Terrorist Events:**

1. Block Wall Around Facility. Budget: \$250,000
2. Video Surveillance Camera and Alarm. Budget: \$20,000

Reservoir 2400 and Booster

- **Mitigation to Earthquake:**

1. Generator and Transfer Switch. Budget: \$225,000
2. Flex Coupling. Budget: \$10,000
3. Seismic Shut Off Valve. Budget: \$35,000

- **Mitigation to Flooding:**

1. Flood Control walls to direct floodwater away from property. Budget: \$150,000
2. Enclose facility with block walls. Budget: \$250,000

- **Mitigation to Terrorist Events:**

1. Block Wall Around Facility. Budget: \$250,000
2. Video Surveillance Camera and Alarm. Budget: \$20,000

Worthing Reservoir

- **Mitigation to Earthquake:**

1. Generator and Transfer Switch. Budget: \$225,000

2. Flex Coupling. Budget: \$ 10,000
3. Seismic Shut Off Value. Budget: \$35,000

- **Mitigation to Flooding:**

1. Flood Control walls to direct floodwater away from property. Budget: \$150,000
2. Enclose facility with block walls. Budget: \$ 250,000

- **Mitigation to Terrorist Events:**

1. Block Wall Around Facility. Budget: \$250,000
2. Video Surveillance Camera and Alarm. Budget: \$20,000

Desert Heights Reservoir

- **Mitigation to Earthquake**

1. Generator and Transfer Switch. Budget: \$225,000
2. Flex Coupling. Budget: \$ 10,000
3. Seismic Shut Off Value. Budget: \$35,000

- **Mitigation to Flooding:**

1. Flood Control walls to direct floodwater away from property. Budget: \$150,000
2. Enclose facility with block walls. Budget: \$250,000

- **Mitigation to Terrorist Events:**

1. Block Wall Around Facility. Budget: \$250,000
2. Video Surveillance Camera and Alarm. Budget: \$20,000

6.3 Implementation Strategy

The implementation strategy is intended to successfully mitigate the hazards identified in this plan within a reasonable amount of time. The District is currently operating within its annual budget and has been fortunate that the recession of the past 10 years didn't cause major issues with the budget or revenue. The District's revenues have remained strong throughout the recession. Capital improvement projects have remained a priority. The District Staff will review the Mitigation Plan each year before obtaining the next years Fiscal Budget. The plan will also be reviewed by the Board of Directors for items to be included in the new fiscal budget. District staff will also look for ways to obtain Hazard Mitigation Grants each year to off-set the impacts to the fiscal budget and to show some relief for the residents of a disadvantaged community.

Mitigation Projects Funding Source

There is currently no mitigation money in the District's budget. The District will include mitigation into the budgeting process when funding becomes available and look at what mitigation projects could be funded in future budget cycles.

Timeframe

Over the next five years, the District will incorporate mitigation into all capital improvement projects that the District undertakes. The District has a Capital Improvement Program. When money is available for CIP, the District replaces outdated pipelines, reservoirs, wells, and buildings.

The District will apply for mitigation grants as the opportunities become available in the State of California, County of San Bernardino each year. The District will consider all mitigation items during the annual budget workshops, conducted each spring.

SECTION 7: PLAN MAINTENANCE

7.1 Monitoring, Evaluating, and Updating the Plan

The LHMP will be reviewed as part of the annual Budget workshop in the spring of each year. At that time, staff and elected Board of Directors will review funding and capital improvement projects to be included into the next fiscal year's budget. The District's budget is a public document and is reviewed by the public before the Board of Directors adopt the LMHP. A full review of the plan will be performed on 5-year intervals. At this time, the public will be asked to participate on the LHMP update committee.

7.2 Implementation through Existing Programs

Once the State of California OES and FEMA approve the LHMP, the District will incorporate the LHMP into capital improvement projects, capital replacement program, building design and any updates or repairs to the water distribution system. The District will submit Notice of Intent to the State of California to help facilitate funding opportunities in obtaining FEMA and State funding to mitigate hazards within the service area. The District's General Manager or his/her appointee will be responsible for the implementation of the LHMP and ensuring the LHMP recommended goals and objectives are met. The General Manager or his/her appointee will be responsible to place the LHMP on District's website and incorporate the LHMP into the annual budget workshops. The General Manager or his/her appointee will verify that the LHMP is updated and rewritten on a 5-year cycle.

7.3 Continued Public Involvement

The approved LHMP will be posted on the District's website with contact information. In the spring of each year at the agency's Board of Directors budget workshop, public comments will be taken in regard to the LHMP and projects will be considered that could possibly be included in the next year's budget. As new facilities are incorporated into the District, the LHMP will be updated to include new facilities, as well as new hazards, if warranted.

Appendix A
Internal/External Meeting Agendas,
Meeting Minutes and sign-in sheets

Appendix B
Board of Directors Meeting Minutes
LHMP Public Comment Period

Appendix C
Screen Shot of District
Website LHMP Page

Appendix D
Water Conservation Ordinance

Appendix E
Special District Incorporation
Documentation