Local Hazard Mitigation Plan

Joshua Basin Water District

Joshua Tree, California

Joshua Basin Water District's Board Adoption Date: XX-XX-XXXX

Approved by FEMA: XX-XX-XXXX

Revised: XXXX

PRIMARY POINT OF CONTACT UNTIL FEMA APPROVAL

GARY STURDIVAN

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SECTION 1: INTRODUCTION

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 well-organized public education and awareness efforts.

The purpose of this Local Hazard Mitigation Plan (LHMP) is to identify potential hazards to the Joshua Basin Water District (District) and formulate mitigation measures for the 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 the State of California Office of Emergency Services (CalOES) 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.

2. Authority

The Joshua Basin Water District is a consolidated, independent Special District, formed in, and operating pursuant to, the provisions of the Joshua Basin Water District Law. The legal authority for Joshua Basin 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-member Board of Directors, elected at-large from within the District's service area.

The Board of Directors employs a general manager. 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 general manager employs an assistant general manager of operations, assistant general manager of finance, executive secretary, human resources/contracting, and GIS/ development coordinator. There are 21 full-time employees at the District, and of these, 13 employees are union employees 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 years. This is the District's first LHMP.

3. Community Profile

The Joshua Basin Water District serves the unincorporated area known as Joshua Tree, California. The District pumps water from two underground aquifers and distributes it to the customer. The available water supply is local ground water. There is a system intertie with Hi-Desert Water District. The District imports water through the Mojave Water Agency, who is the wholesaler of the State Water Project in the area.

The District serves a population of approximately 9,814 residents within a 96-square-mile area and maintains approximately 5,400 metered services, 310 miles of pipeline, and 14 million gallons of water storage capacity. When physical operations began in 1963, the District served residents within an area of 26.7 square miles and 1,422 metered 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

Joshua Tree is a unique High Desert community on the southern boundary of the Mojave Desert in San Bernardino County, just north of Little San Bernardino and the Pinto Mountains. Located 35 miles north of Palm Springs at an elevation between 2,280 and 4,920 feet, the area is known for its pure water, crystal clear air, and deep blue skies. It is nestled between Joshua Tree National Park to the south and the Marine Corps Air Ground Combat Center, the largest Marine Corps Base in the world, to the north.

1.3.2 Community of Joshua Tee

The community of Joshua Tree consists of an eclectic mix of retirees, artisans, and low-income citizens. Joshua Tree is the primary gateway to Joshua Tree National Park, with over 3 million visitors transiting through Joshua Tree into the park annually.

<u>County of San Bernardino</u>

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.

3. Demographics

The area of Joshua Tree is considered a disadvantaged community by the State of California. Per the 2010 United States census, Joshua Tree had a Median Household Income (MHI) of $34,976 with 30% of the population living below the federal poverty line. The MHI is approximately 55% of the State MHI of $63,783.

1.3.4 Existing Land Use

The existing land use is housing, commercial, and light industry. The County of San Bernardino is responsible for land use, as Joshua Tree is an unincorporated area in the county. The District does not have authority to regulate land use in the area.

1.3.5 Development Trends

Development in the Joshua Tree area was reduced during the housing industry crash of 2008. Currently, the Joshua Tree area is seeing only individual or speculation homes being built primarily as vacation rentals and part-time second homes. There are no housing tracks being developed within the District's service boundary. Home prices in the area are increasing at a higher rate than other communities in the High Desert area and at a much lower rate than in the State of California overall.

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

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.

2.2 Promulgation Authority

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

Ms. Mickey Luckman
Board President
Description of Involvement: President, Joshua Basin Water District Board of Directors

Mr. Robert (Bob) Johnson
Vice-President
Description of Involvement: Vice-President, Joshua Basin Water District Board of Directors

Mr. Tom Floen
Director
Description of Involvement: Director, Joshua Basin Water District Board of Directors

Mr. Geary Hund
Director
Description of Involvement: Director, Joshua Basin Water District Board of Directors

Ms. Rebecca Unger
Director

Description of Involvement: Director, Joshua Basin Water District Board of Directors

Mr. Curt Sauer
General Manager
Description of Involvement: General Manager, Joshua Basin Water District

Mr. Curt Sauer
Board Secretary
Description of Involvement: Board Secretary, Joshua Basin Water District

2.3 Primary Point of Contact

The Point of Contact for information regarding this plan prior to approval by FEMA is:

Gary Sturdivan

Sturdivan Emergency Management Consulting, Inc.

gsturdivan@me.com

909-658-5974

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 Joshua Basin Water District staff and representatives from the local community. These team members have a vested interest in the performance and resiliency of the District. Team members from the local community are part of the Joshua Basin Water District's Citizens Advisor Committee (CAC) and are residents of the community. 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.

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. 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 Board of Directors' meetings
- Conducting public outreach

During the 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.

- Bighorn Desert View LHMP
- Twentynine Palms Water District LHMP
- San Bernardino County HMP
- USGS Golden Guardian Shake Out 2008
- Joshua Basin Water District's Water Master Plan
- California HMP 2013
- San Bernardino County Flood Control
- FEMA Flood Insurance Study for San Bernardino County

Table 1 Plans Reviewed

Study Plan	**Key Information**
Bighorn Desert View LMHP	Layout of an LHMP for water agencies
Twentynine Palms Water District LHMP	Hazard identification, mitigation measures
San Bernardino County HMP	Hazards, mitigation goals and measures
USGS Golden Guardian Shake Out 2008	Earthquakes, effects, planning
Joshua Basin Water District's Water Master Plan	Land use for area, future projects
California HMP 2013	Goals for the State of California
San Bernardino County Flood Control	Future flood control projects
FEMA Flood Insurance Study for San Bernardino County	Flood history

Table 2 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
Prop. One Grants	District has not applied for this grant in the past	None

3.2 Planning Team

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

Mr. Curt Sauer

Joshua Basin Water District, General Manager and Board Secretary

Description of Involvement: Internal Planning Team Member

Mr. Sauer is the General Manager and Board Secretary for the District. He has been employed with the District since February 2014, bringing over 25 years of successful management to the District. Mr. Sauer supervises and coordinates the involvement of internal staff and external CAC input from involved citizens.

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. Thomas S. Carpenter
Maintenance and Construction 1
Description of Involvement: Internal Planning Team Member:

Mr. Carpenter serves as a Maintenance and Construction 1. He has been employed at the Joshua Basin Water District since June 2017. Previously Mr. Carpenter served as Senior Non-Commissioned in the United States Army for over 23 years, where he was involved in daily risk assessment planning, as well as, risk assessment and risk mitigation during three deployments to Iraq.

Mr. Stephen J. Corbin
Water Production Operator II
Description of Involvement: Internal Planning Team Member

Mr. Corbin is currently working with the Pumping Plant as a Water Production Operator II. He has 10 years of experience in water works and 34 years of experience in electro-mechanical manufacturing and repair, and metal fabrication and welding.

Ms. Gail Emery

Accounts Receivable Technician

Description of Involvement: Internal Planning Team Member

Ms. Emery began working at the District in 2016. Some of her primary responsibilities include preparing monthly water statements, reviewing account aging and maintaining the parcel database. She also serves as a customer service representative for the District. Ms. Emery holds a B.A. in Communications and has 10 plus years of bookkeeping experience. She has resided in the desert since 2008 and has lived 23 years in California, during which time she witnessed the widespread damage caused by the 1989 Loma Prieta earthquake.

Ms. Gayle Austin

Joshua Tree Resident and Business Owner

Description of Involvement: External Planning Team Member

Gayle Austin has resided in Joshua Tree and 29 Palms for over 20 years. She became a full-time resident in Joshua Tree three years ago and has two businesses. Ms. Austin is active in community non-governmental organizations (NGOs) and became a member of the (CAC) in December of 2017.

Mr. Tom Kayne

Retired

Description of Involvement: External Planning Team Member

Tom Kayne is retired and moved to Joshua Tree in 2016. He became a member of the CAC in June of 2017.

Dr. Karen Tracy

Resident

Description of Involvement: External Planning Team Member

Karen Tracey is a long-time resident of Joshua Tree and has been on the CAC for 10 years. She serves as Chairperson of the Committee.

3.3 Coordination with Other Jurisdictions, Agencies, and Organizations

The County of San Bernardino OES was invited to be on the Planning Team, but were unable to attend. However, the County OES provided 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. Mr. Sturdivan contacted Mr. Wagner by phone. Mr. Sturdivan contacted by phone and in person, Mr. Ray Kolisz, General Manager of Twentynine Palms Water District. Marina West, General Manager of Bighorn Desert View Water Agency was also contacted by Mr. Sturdivan by phone and email. Mr. Kolisz and Ms. West reviewed the completed LHMP, before the plan was sent for review to CalOES.

3.4 Public Involvement/Outreach

The Planning Team, which included three water system customers who expressed interest to the Board of Directors, participated in monthly meetings to coordinate efforts, provide input, and receive support for the LHMP. The External Planning Team consisted of Dr. Karen Tracy, Ms. Gayle Austin and Mr. Tom Kayne all of whom attended meetings and reviewed all content of the document as the documents was developed.

The support included receiving technical expertise, resource materials, and tools. The District 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.jbwd.com. This site allowed access to the information by all participants and the public. All questions comments or concerns were directed to Mr. Gary Sturdivan. The Public was informed about the development of the plan and could attend the monthly Board of Directors meetings where the public could make comments directly to Mr. Sturdivan and the Board of Directors.

The 2018 board meeting agendas, meeting minutes, and sections of the LHMP were posted on the District's website as the LHMP was written. Requests were made on the website for public comments and informed 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.

See the Appendices for the details of the public involvement process such as the meetings dates, purpose, agendas, sign-in sheets, minutes and public comments, as well as a screen shot of the webpage showing requests for public participation.

3.5 Assess the Hazards

A critical component of the LHMP process is to assess the likely hazards that may impact the District's facilities and 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 other sources such as FEMA Hazard Maps, San Bernardino County Hazard Map, as well as 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 Joshua Tree in Landers and Flamingo Heights, California.

Joshua Basin Water District sustained more than $1M in damages as a result of the 1992 Landers Earthquake. The most significant damage was at two reservoirs on the south side of the District that were critically damaged and were replaced. The District offices had foundation damage and other more minor interior damage. Well over 100 leaks occurred over a period of weeks as a result of the earthquake and the District incurred material costs as well as substantial overtime to make repairs.

3.6 Set Mitigation Goals

The Planning Team set the goals for the 2018 LHMP. The team members understand the issues facing the District with respect to the District's Mission Statement:

Our mission is to provide a high standard of water quality and customer service at responsible cost; to protect the water resources of Joshua Basin Water District; to promote cooperation and respect with customers, employees, neighboring communities and public – private agencies.

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 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.

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 critical piece of infrastructure. Each meeting focused on specific hazards, risk assessment, and mitigation strategy. Three meetings were held each month, one for the internal team, one for the external team, and one public meeting at the beginning of the monthly Board of Directors meetings. It took seven months from the kick-off meeting to the completion of the review and adoption by the Board.

3.8 Draft Local Hazard Mitigation Plan

The District's consultant led the Planning Team and prepared the draft LHMP with input from the Planning Team, Board of Directors, and the public. The Planning Team 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 agendas, meeting minutes, and draft documents were posted on the District's website. Notices were sent to all water customers in the service area stating that all LHMP documents were posted on the website and asked for comments. Each board meeting was opened with a public comment period. The consultant, Gary Sturdivan, addressed all comments and concerns.

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 and 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 website for 30 days, asking for comments from the public. The public could comment by e-mail, telephone, or in person at the monthly 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 2018 LHMP was adopted at the District's regularly scheduled Board of Directors Meeting on XXXXX. 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) 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 Agency's 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: with (1) being a "Highly Likely" event, (2) being "Likely" (3) being "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 ranked list.

Hazards:

- Earthquake = 1
- Terrorist Event = 1
- Lightning Strikes = 2
- Flash Flooding = 2
- Climate Change/Drought = 3
- Freezing = 3

The following natural hazards were considered not to affect or be a risk to the District and were given a ranking of 4 or not applicable to the District's location.

- Volcanoes

- Tsunami
- Windstorms
- Wildfire

4.1.2 Hazard Assessment Matrix

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

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

The screening assessment matrix was used for the District's hazards. The hazards have been placed in the appropriate/corresponding box/cell of the corresponding "Screening Assessment Matrix" based on the Planning Team's collective experience as shown in Table 3 below. Prioritization of the hazards is discussed in the following section.

Table 3 Screening Assessment Matrix

		Impact		
		Catastrophic	**Critical**	**Limited**
Probability	**Highly Likely 1 (100 – 75 %)**	Earthquake Terrorist Event		
	Likely 2 (75 – 50%)			Lightning Strikes Flash Flooding
	Somewhat Likely 3 (Less than 50%)		Climate Change/ Drought	Freezing

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.

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 and Hi-Desert Water District wells and reservoirs. The District also incurred significant damages of more than $1M. FEMA funding replaced portions of the pipelines after the 1992 Landers Earthquake. The local faults running around, through, and near the service area could potentially damage 100% of the District's critical facilities.

Terrorist Event: The largest Marine Corp base in the world is located within four miles of the District's northern boundary. There are two off-base housing structures in the District's service area that receive water from the District. A major terrorist event at the Marine Base could have a negative effect on the water supply or damage 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, governmental agencies have had to rethink their security precautions of buildings, infrastructure, staff, and the public.

Lightning Strikes: The High-Desert's weather is much different than most of Southern California's weather. This area is cooler than the communities in the low desert area of Palm Springs. The winters in the Palm Springs area are mild; however, the winters in the High-Desert can be much colder and often result in lightning storms during the warmer monsoon seasons. Lighting strikes on wells, pumps, motors, and electrical equipment is common during the spring and fall.

Flash Flooding: Flash flooding is very common in the San Bernardino County deserts and happens almost yearly. The last flooding event in the Joshua Basin was in 2017 and prior to that in 2015. These events uncovered pipelines installed within paved and unpaved roads throughout the distribution system.

Climate Change/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. The State has been in a prolonged drought; however, the winter of 2016/2017 delivered more snow pack and rain, which relieved most of the State from the drought restrictions of the last seven years. The District 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 recharge the underground aquifer and groundwater. Over time the District could experience increased pumping costs and water supply wells may become too shallow and will need to be replaced with deeper wells. Climate change, could also, mean that the ground water becomes higher in the aquifer, which would mean that Joshua Basin Water District has an overabundance of water.

Freezing: The temperature range in the Joshua Basin is quite extreme. Temperatures range from a low of 20 degrees in the winter to a high of 115 degrees in the summer months. The District experienced a major freezing event during the winters 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. Any pipe or structures such as backflow devices are subject to freezing in the winter months.

4.2 Hazard Profiles

4.2.1 Earthquake

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 and 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 - mostly 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).

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.

Table 4 Historic Southern California Earthquakes

Date	Area	Location	Mag	MI	Total damage / notes
3/28/2014	Los Angeles Area		5.1 M_w	VI	$10.8 million
5/13/2013	Eastern	Canyon dam Earthquake	5.7 M_w	VIII	Damage at Canyon dam
7/29/2008	Los Angeles Area	Chino Hills Earthquake	5.5 M_w	VI	Limited
10/16/1999	Eastern	Hector Mine Earthquake	7.1 M_w	VII	Limited
1/17/1994	Los Angeles Area	Northridge Earthquake	6.7 M_w	IX	$13–$40 billion
6/28/1992	Inland Empire	Big Bear Earthquake	6.5 M_w	VIII	Moderate/Triggered
6/28/1992	Inland Empire	Landers Earthquake	7.3 M_w	IX	$92 million
4/22/1992	Inland Empire		6.3 M_s	VII	Light–moderate
6/28/1991	Los Angeles Area	Sierra Madre Earthquake	5.6 M_w	VII	$33.5–40 million
2/28/1990	Los Angeles Area	Upland Earthquake	5.7 M_w	VII	$12.7 million
11/24/1987	Imperial Valley		6.5 M_w	VII	Triggered
11/23/1987	Imperial Valley		6.1 M_w	VI	$3 million
10/1/1987	Los Angeles Area	Whittier Narrows Earthquake	5.9 M_w	VIII	$213–358 million
7/21/1986	Eastern	Chalfant Valley Earthquake	6.2 M_w	VI	$2.7 million / sequence
7/13/1986	South Coast		5.8 M_w	VI	$700,000
7/8/1986	Inland Empire	North Palm Springs Earthquake	6.0 M_w	VII	$4.5–6 million
4/26/1981	Imperial Valley		5.9 M_w	VII	$1–3 million
5/25/1980	Eastern		6.2 M_w	VII	$1.5 million/Swarm
10/15/1979	Imperial Valley	Imperial Valley Earthquake	6.4 M_w	IX	$30 million
2/21/1973	South Coast	Point Magu Earthquake	5.8 M_w	VII	$1 million
2/9/1971	Los Angeles Area	San Fernando Earthquake	6.5–6.7 M_w	XI	$505–553 million

Date	Area	Location	Mag	MI	Total damage / notes
3/28/2014	Los Angeles Area		5.1 M_w	VI	$10.8 million
5/13/2013	Eastern	Canyon dam Earthquake	5.7 M_w	VIII	Damage at Canyon dam
7/29/2008	Los Angeles Area	Chino Hills Earthquake	5.5 M_w	VI	Limited
10/16/1999	Eastern	Hector Mine Earthquake	7.1 M_w	VII	Limited
4/8/1968	Imperial Valley		6.5 M_w	VII	Damage / rockslides
12/4/1948	Inland Empire	Desert Hotsprings Earthquake	6.4 M_w	VII	Minor
11/14/1941	Los Angeles Area		5.4 M_s	VIII	$1.1 million
6/30/1941	Central Coast		5.9 M_w	VIII	$100,000
5/18/1940	Imperial Valley	El Centro Earthquake	6.9 M_w	X	$6 million
3/10/1933	South Coast	Long Beach Earthquake	6.4 M_w	VIII	$40 million
6/21/1920	Los Angeles Area		4.9 M_L	VIII	More than $100,000
4/21/1918	Inland Empire	San Jacinto Earthquake	6.7 M_w	IX	$200,000
6/22/1915	Imperial Valley		5.5 M_w	VIII	Additional damage / doublet
6/22/1915	Imperial Valley		5.5 M_w	VIII	$900,000 / doublet
4/18/1906	Imperial Valley		6.3 M_w	VIII	Damage / triggered

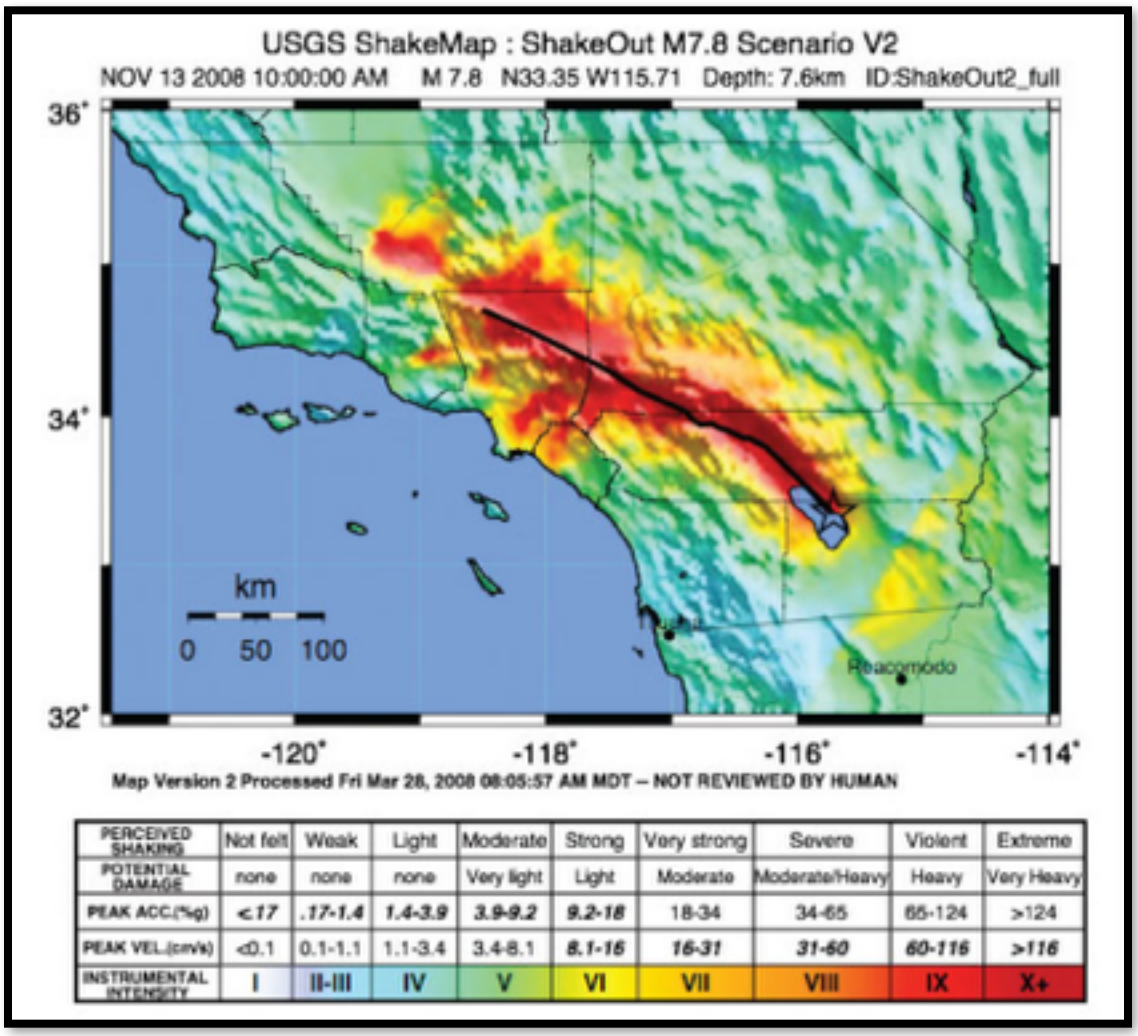

Figure 1 USGS ShakeMap: ShakeOut M7.8 Scenario

Figure 2 Examples of Earthquake Damage to Water Utility Facilities

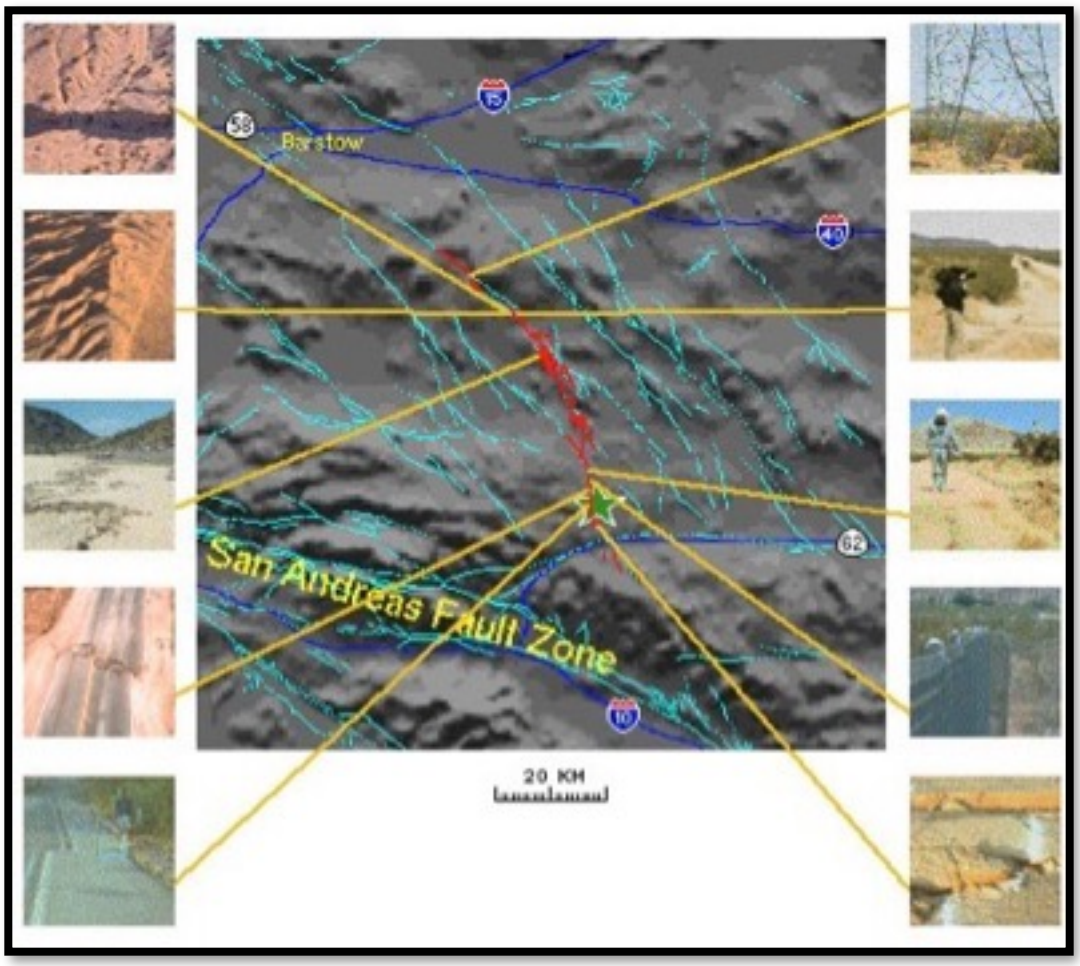

Figure 3 Landers Earthquake 1992

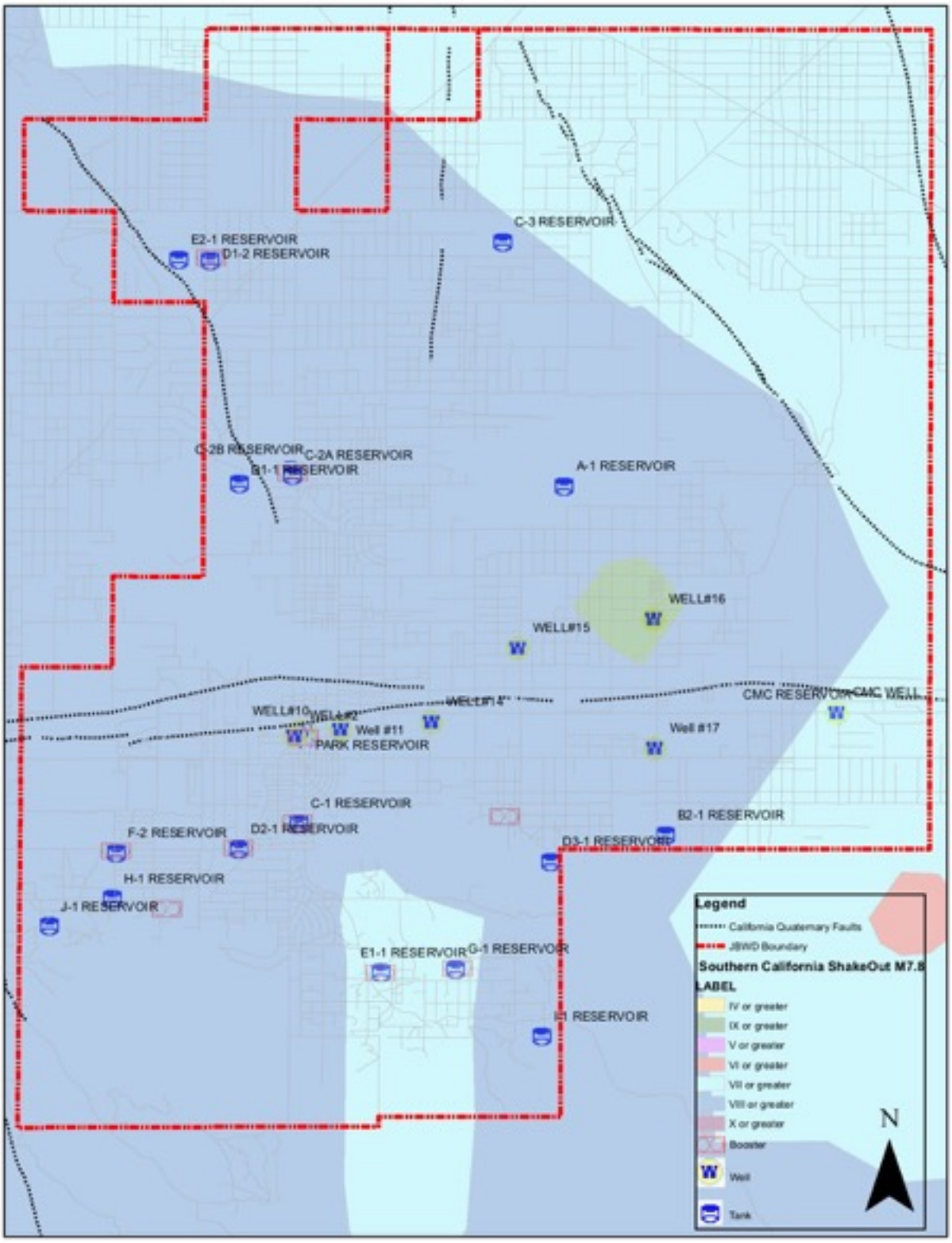

Figure 4 Earthquake Faults with District Boundaries

Description: There are several earthquake faults located within the District's service area. The District sustained more than $1M in damages as a result of the 1992 Landers Earthquake. The most significant damage was at two reservoirs on the south side of the District that were critically damaged and were replaced. The District offices had foundation damage and other more minor interior damage. In excess of 100 leaks occurred over a period of weeks as a result of the earthquake and the District incurred material costs as well as substantial overtime costs to make repairs.

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 ensure 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.

4.2.2 Terrorist Event

Probability: **Highly Likely**
Impact: **Catastrophic**

General Definition: When a person or group of people strikes 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.

Description: 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. As this document is a public document, discussion of what could be impacted and how it could be impacted will not be discussed.

Mitigation: This document will not discuss the mitigation measures determined upon by the Project Team. This is a public drinking water system and will not discuss contamination or ways to contaminate a drinking water system.

4.2.3 Lightning Strikes

Probability: **Likely**
Impact: **Limited**

General Definition:

A lightning strike is an electric discharge between the atmosphere and an earth-bound object, such as the ground, tree, building equipment or a person standing outside of a building. Lightning is a sudden electrostatic discharge that occurs typically during a thunderstorm.

Description:

During electrical storms lightning either transfers the electrical current between each group of clouds or transfer the lightning to the ground or objects on the ground. When lightning strikes a water well, electrical panel of a booster pump a large amount of electrical current enters the electrical system of the motor and power system of the equipment. This surge of energy burns out the pump, booster pump and related equipment and even feeds back into the Southern California Edison system. This surge of electricity causes thousands of dollars of damage to the water infrastructure each year.

Mitigation:

To mitigate lightning from striking well motors and related infrastructure, all wells, pumps, motors and electrical panels need to be housed inside a structure. These structures need to be built of wood or block and have grounding ability built into the structure.

4.2.4 Flash Flooding

Probability: **Likely**
Impact: **Limited**

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. San Bernardino County Flood Control currently has no flood control infrastructure in the Joshua Tree area. Many roads in the District's service area are unpaved, dirt roads.

As shown below on the FEMA 500-year Flood Map, 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's motors are installed on elevated concrete pads that raise the well's motor to a height above the 500-year high water elevation. The District's Office and Shop are in the middle of the 100/500-year flood plain, as identified by FEMA. Raising the elevation of the land the buildings are built on would mitigate 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 riverbed 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 Figure 5 below. These washes run from the south to the north through the District's service area.

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

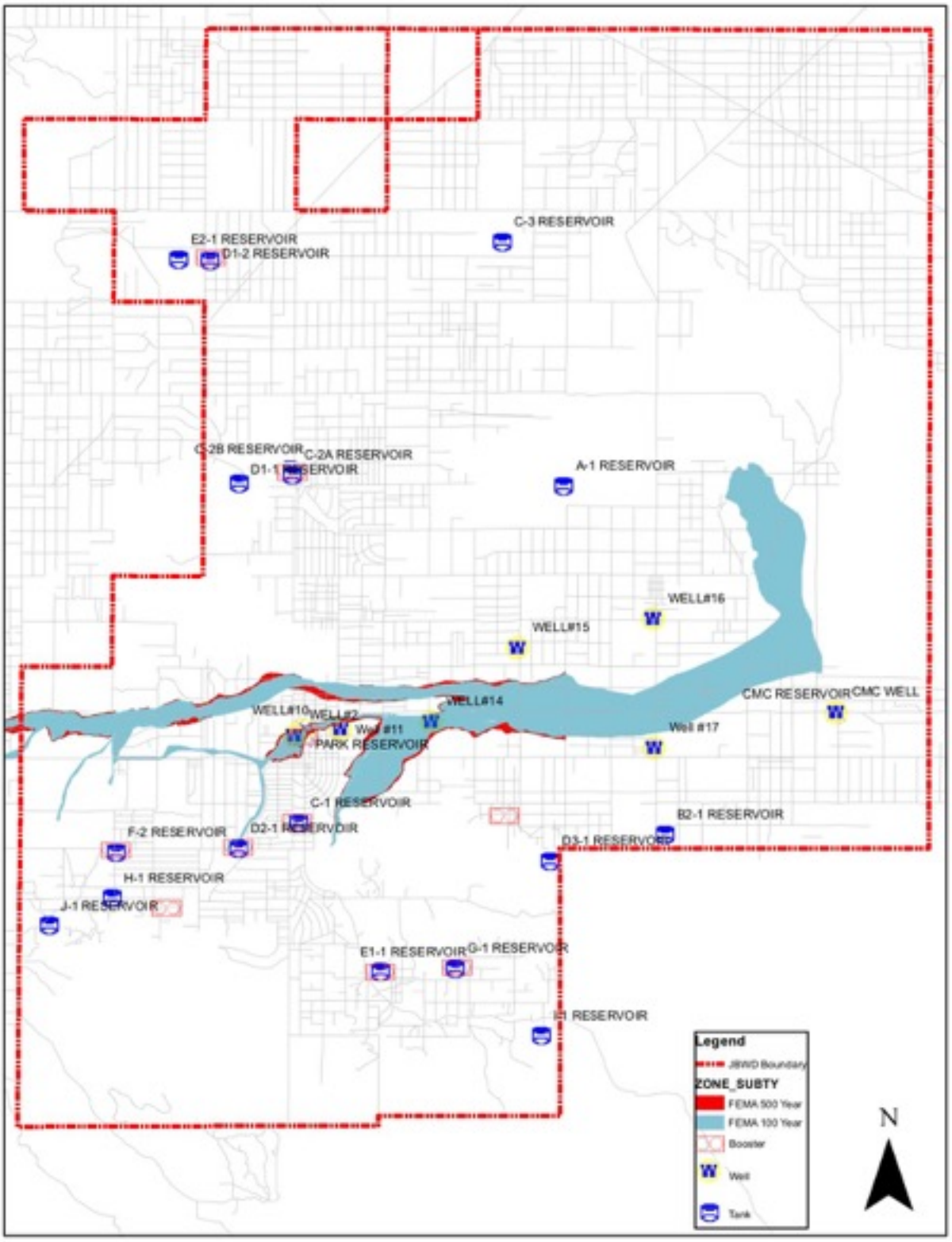

Figure 5 District Facilities in 100/500-Year Flood Plain

4.2.5 Climate Change/Drought

Climate Change

Probability: **Somewhat Likely**
Impact: **Critical**

General Definition: 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.

Description: 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 recharge in the aquifer.

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 Project (SWP). See Water Master Plan for other options to supply more water to the area.

Long-Term Drought

Probability: Somewhat Likely
Impact: Critical

General Definition: 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 a result of El Niño and La Niña weather patterns. A drought is a prolonged period of below-average precipitation in a given region resulting in prolonged shortages in water supply. 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 Niño effect 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; however, the recent 2017 winter season did improve drought conditions somewhat.

Table 5 California Drought History
(extracted from USGS, California Drought History

1841	The drought was so bad that "a dry Sonoma was declared entirely unsuitable for agriculture"[1]
1864	This drought was preceded by the torrential floods of 1861-1862, showing the fluctuation in climate back in the 1800s.
1924	This drought encouraged farmers to start using irrigation more regularly because of the fluctuation in California weather the need for consistent water availability was crucial for farmers.
1929–1934	This drought was during the infamous Dust Bowl period that ripped across the plains of the United States in the 1920s and 1930s. The Central Valley Project was started in the 1930s in response to drought.
1950s	The 1950s-drought contributed to the creation of the State Water Project.
1976–77	1977 had been the driest year in state history to date. According to the Los Angeles Times, "Drought in the 1970s spurred efforts at urban conservation and the state's Drought Emergency Water Bank came out of drought in the 1980s."
1986–1992	California endured one of its longest droughts ever observed from late 1986 through early 1992. Drought worsened in 1988 as much of the United States also suffered from severe drought. In California, the six-year drought ended in late 1992 as a significant El Niño event in the Pacific Ocean (and the eruption of Mount Pinatubo in June 1991) most likely caused unusual persistent heavy rains.
2007–2009	2007–2009 saw three years of drought conditions, the 12th worst drought period in the state's history, and the first drought for which a statewide proclamation of emergency was issued. The drought of 2007–2009 also saw greatly reduced water diversions from the state water project. The summer of 2007 saw some of the worst wildfires in Southern California history.
2011-2017	From December 2011 to March 2017, the state of California experienced one of the worst droughts to occur in the region on record. The period between late 2011 and 2014 was the driest in California history since record keeping began.

Progression of the Drought from December 2013 to July 2014

(extracted from USGS, California Drought History)

The period between late 2011 and 2014 was the driest in California history since record keeping began. In May 2015, a state resident poll conducted by Field Poll found that two out of three respondents agreed that it should be mandated for water agencies to reduce water consumption by 25%.

The 2015 prediction of El Niño to bring rains to California raised hopes of ending the drought. In the spring of 2015, the National Oceanic and Atmospheric Administration named the probability of the presence of El Niño conditions until the end of 2015 at 80%. Historically, sixteen winters between 1951 and 2015 had created El Niño. Six of those had below-average rainfall, five had average rainfall, and five had above-average rainfall. However, as of May 2015, drought conditions had worsened, and above average ocean temperatures had not resulted in large storms.

The drought led to Governor Jerry Brown's instituting mandatory 25 percent water restrictions in June 2015.

Many millions of California trees died from the drought - approximately 102 million, including 62 million in 2016 alone. By the end of 2016, 30% of California had emerged from the drought, mainly in the northern half of the state, while 40% of the state remained in the extreme or exceptional drought levels. Heavy rains in January 2017 were expected to have a significant benefit to the state's northern water reserves, despite widespread power outages and erosional damage in the wake of the deluge. Among the casualties of the rain was 1,000 year-old Pioneer Cabin Tree in Calaveras Big Trees State Park, which toppled on January 8, 2017.

The winter of 2016–17 turned out to be the wettest on record in Northern California, surpassing the previous record set in 1982–83. Floodwaters caused severe damage to Oroville Dam in early February, prompting the temporary evacuation of nearly 200,000 people north of Sacramento in response to the heavy precipitation, which flooded multiple rivers and filled most of the state's major reservoirs, Governor Brown declared an official end to the drought on April 7.

Description: The District is not as affected by drought because it receives most of the water supply from groundwater and is dependent on underground water aquifers. The District does purchase water from the State Water Project (SWP) and has a physical connection to the SWP. 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.

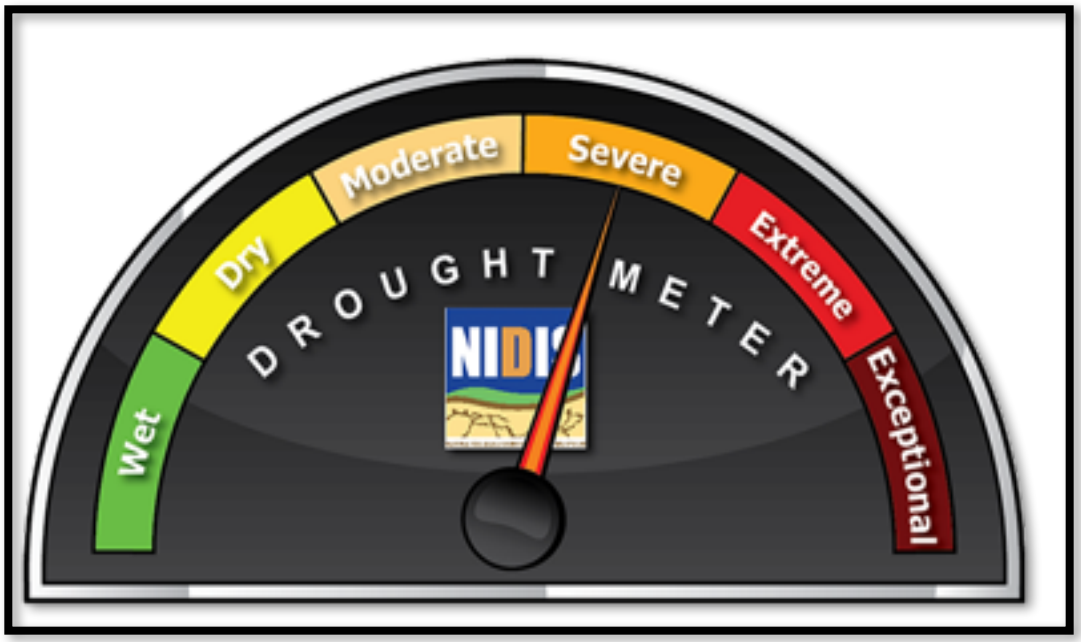

Figure 6 Current Drought Condition for Joshua Tree, May 19, 2018

Mitigation: Construct more water storage capacity. Drill more wells. Develop ways to capture rainwater from the higher elevations 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.

4.2.6 Freezing

Probability**:** **Somewhat Likely**

Impact: **Limited**

General Definition: High Desert locations are known to have a wide range between summer and winter temperatures. The temperature range in the Morongo Basin is quite extreme, ranging from a low of 20 degrees in the winter to a high of 115 degrees in the summer months. Winter storms coming down from Alaska cause rain and cold weather: however, in the High Desert at elevations over 3,000 feet, these storms cause snow and freezing temperatures.

Description: The District experienced a major freezing event during the winters of 2010 and 2013. Freezing can cause damage to the pump motor and rupture the pipe. Water froze in the pipes coming out of a wellhead. Additionally, freezing temperatures cause pipes to burst or restrict water flow to residents and businesses resulting in "no water" calls from customers. Although the District warns customers each year to protect their pipes from freezing, the District receives hundreds of calls during a freezing event. Responding to the "no water" calls results in manpower loss from other issues and redirects District 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.

4.3 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 May 2018, the District operates and maintains the following facilities:

- 14 pressure zones
- 16 existing reservoirs including the hydro pneumatic tank with a total storage capacity of 13.58 million gallons
- 5 existing wells with a total maximum pumping capacity of 7.28 MGD
- 1 waste water treatment plant owned by Hi-Desert Medical Center (Maintenance only)

- 310 miles of distribution and transmission facilities of pipe sizes of 2 inches to 20 inches in diameter

Figure 7 is a map of the District's facilities. The map 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 on groundwater for their raw water supply, but has the ability to take water from the State of California Department of Water.

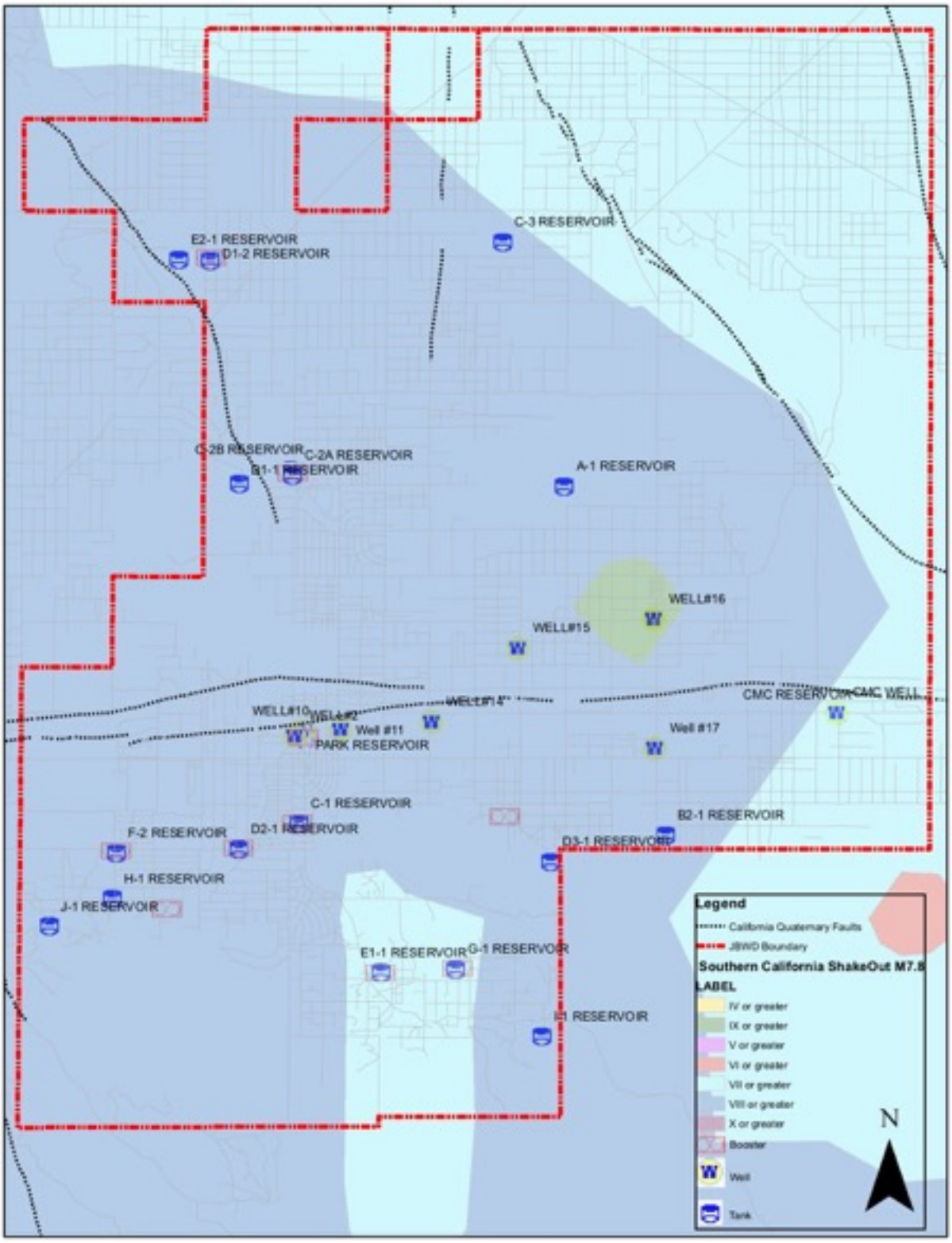
E2-1 RESERVOIR
D1-2 RESERVOIR
C-3 RESERVOIR
C-2B RESERVOIR
C-2A RESERVOIR
G1-1 RESERVOIR
A-1 RESERVOIR
WELL#16
WELL#15
WELL#10
Well #11
PARK RESERVOIR
Well #17
CMC RESERVOIR
C-1 RESERVOIR
D2-1 RESERVOIR
F-2 RESERVOIR
B2-1 RESERVOIR
D3-1 RESERVOIR
H-1 RESERVOIR
J-1 RESERVOIR
E1-1 RESERVOIR
G-1 RESERVOIR
I-1 RESERVOIR
Legend
California Quaternary Faults
JBWD Boundary
Southern California ShakeOut M7.8
LABEL
IV or greater
IX or greater
V or greater
VI or greater
VII or greater
VIII or greater
X or greater
Booster
Well
Tank
N

Figure 7 Joshua Water District Facilities Map

4.3.2 Critical Facility List

This section provides a listing of the District's critical facilities as developed by the Planning Team.

Table 6 Critical Facilities List

Facility Name	Site Information	Economic Value
District Offices	Staff and Operations	$1.5 Million
Shop/warehouse	Operations and Maintenance	$1.1 Million
SCADA System	System control	$800,000
K-1	Hydromatic Station	$200,000
Reservoirs		
D-2	520,000 gallons	$710,000
D-3	110,000 gallons	$1.1 Million
C-3	400,000 gallons	$600,000
F-2	431,000 Gallons	$600,000
H-1	225,000 Gallons	$500,000
J-1	577,000 Gallons	$800,000
E-1	304,000 Gallons	$500,000
G-1	257,000 Gallons	$200,000
I-1	169,000 Gallons	$300,000
B-1	1.2 Million Gallons	$1.1 Million
A-1	272,000 Gallons	$500,000
C-1	441,000 Gallons	$700,000
D-1-2	577,000 Gallons	$800,000
E-2	272,000 Gallons	$400,000
D-1-1	441,000 Gallons	$600,000
C-2-B	5.6 Million Gallons	$3.5 Million
Wells		
Well-16	Well Only	$250,000
Well-17	Well Only	$250,000
Well 10	Well Only	$250,000
Well 14	Well Only	$250,000

Well 15	Well Only	$250,000
Booster Stations		
E-1 Booster @ C-1	Booster Station	$150,000
D-2 Booster @ C-1	Booster Station	$150,000
H-1 Booster @ F-2	Booster Station	$150,000
J-1	Booster Station	$150,000
G-1	Booster Station	$200,000
D-1-1	Booster Station	$150,000
D-3	Booster Station	$150,000
I-1	Booster Station	$150, 000
E-2-1	Booster Station	$150,000
F2	Booster Station	$150,000

4.4 Vulnerability Assessment

The Planning 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 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 Planning 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 six high priority hazards. A percentage based on ranking was applied to the District's projected 2017-2018 annual operating revenue of $5.7 million to obtain the annual economic impact for each facility.

4.4.2 Earthquake Vulnerability Analysis

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

Critical Facilities: Approximately 100% of the 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 fault. If any of these faults experience a rupture of 6.5 magnitude or more, it would have a negative effect on the 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. All of the District's critical facilities are at risk, including 80% of the District's pipelines
2. Without the critical facilities, no revenue can be generated for the District
3. Time to restore the system to full function is 24 months
4. Lost revenue from water sales for 12 months based upon the 2017-2018 projected Joshua Basin Water District revenue

4.4.3 Terrorist Event Vulnerability Analysis

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

The Joshua Basin Water District has a large population of U.S Marines living in the community due to the close proximity of the world's largest U.S Marine Base. There are two large apartment complexes in the service area that are owned by the Marine Base that house the military and their families. Terrorist events could happen at any time. This region is vulnerable since an event could have a big impact on 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 Planning Team.

Cyber hacking and attacks have now become our nation's number one threat to utility infrastructure, including water and wastewater, from terrorism and criminal organizations. The ability for a foreign terrorist group, hostile government or criminal group to hack into our county's computer and network system is an increasing and forever changing risk. Hackers can steal information, control SCADA systems, hold ransom a complete computer network or damage and delete critical files and programs.

Loss from an attack of this type has the potential to stop water production completely, damage or destroy computer files and programs, steal personal information of customers and employees, and interfere with operations.

Critical Facilities: 75% of the District's facilities are vulnerable to terrorist activity due to the fact that most are in remote locations. The most vulnerable are the wells and reservoirs, as this is a major concern and potential entry point for contamination to the potable water system.

Estimated Losses: Losses to the system are difficult to determine as the source and type of contamination will determine the extent of damage; however, the team estimated the damage to the system at the highest cost possible, which would be the worst case scenario. This estimate is $50 million.

4.4.4 Lightning Strikes Vulnerability Analysis

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

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

During Monsoon season, cumulous clouds cause lighting to appear. During lightning storms, lightning strikes objects on the ground, sometimes people. During these events it is not uncommon for lightning to strike a water well motor and or an electrical panel control. When this happens, the motor and all controls are destroyed and must be replaced. Sometimes taking

several days for Southern California Edison to make the repairs to their equipment, before the repairs to the water system can be accomplished.

Estimated Losses: Losses to the system can range into the hundreds if thousands of dollars. Well pumps, electric motors and controls vary in cost from $20,000 to $75,000 not including labor to install or repair. The loss of pumping water into the system, means a loss of revenue from water sales, but also, means there is a lack water being delivered to the residents that depend on the agency for water service.

4.4.5 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. The District is in the foothills of 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 areas, mostly on the south side of the valley.

The District has not utilized the National Flood Insurance Program (NFIP), and there has not been any repeated District infrastructure damage from flooding in the past.

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. Need info on NFIP Insured structures.

4.4.6 Climate Change/Drought Vulnerability Analysis

Climate Change

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.

In the inland desert regions of California, climate change is a long-term concern. As the weather becomes hotter and drier 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.

Drought

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

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

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 decreased water level has not been significant, although pumping costs increased 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, 5 are wells. Currently, these wells are operating without significant hardship during the ongoing drought. Reservoirs are not considered critical into a drought; however, pipelines can collapse if the system is left with no water.

The District adopted Resolution 14-8 and 15-9, passed on August 20, 2014, and June 3, 2015, respectively, which established the policy and conservation measures needed during drought conditions. California Governor Jerry Brown declared a Water State of Emergency for the entire State in 2014 and 2015. The mandate was lifted in 2016. The District continues conservation measures with a recommended voluntary goal to conserve 20 percent compared to the 2013 baseline figures.

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.

4.4.7 Freezing Vulnerability Analysis

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

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

Freezing

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.

4.4.8 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 7 summarizes the economic impacts on the critical facilities within the District.

Table 7 Economic Impacts on Critical Facilities for the District

Facility Name	Site Information	Economic Value
District Offices	Staff and Operations	$1.5 Million
Shop/warehouse	Operations and Maintenance	$1.1 Million
SCADA System	System control	
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Well 15	Well Only	$250,000
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H-1 Booster @ F-2	Booster Station	$150,000
J-1	Booster Station	$150,000

G-1	Booster Station	$200,000
D-1-1	Booster Station	$150,000
D-3	Booster Station	$150,000
I-1	Booster Station	$150, 000
E-2-1	Booster Station	$150,000
F2	Booster Station	$150,000

SECTION 5: COMMUNITY CAPABILITY ASSESSMENT

5.1 Agencies and People

To help mitigate the potential impacts of disasters, the 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 member respond and 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 staff attends quarterly meetings with the ERNIE group and also attends twice yearly meetings at the American Water Works Association meetings with CalWARN and Arizona WARN members.

The District employs 21 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.

The District participates in the following groups to help plan, detect, prevent, respond and mitigate cyber and terrorist attacks. The District's Terrorism Liaison Officer (TLO) works with the different groups to ensure the safety and security of the water and the community the District serves.

InfraGard: InfraGard is a partnership between the FBI and members of the private sector. The InfraGard program provides a vehicle for seamless public-private collaboration with government that expedites the timely exchange of information and promotes mutual learning opportunities relevant to the protection of Critical Infrastructure. With thousands of vetted members nationally, InfraGard's membership includes business executives, entrepreneurs, military and government officials, computer professionals, academia and state and local law enforcement; each dedicated to contributing industry specific insight and advancing national security.

Joint Regional Intelligence Center (JRIC): The Joint Regional Intelligence Center (JRIC) is the fusion center collaboration between federal, state, and local law enforcement and public safety agencies to integrate criminal and terrorism threat intelligence and provide intake, analysis, fusion, synthesis, and dissemination of that information. The JRIC converts the information into operational intelligence to detect, deter, and defend against terrorist attacks and

major criminal threats within the seven county jurisdiction of the FBI Los Angeles field office. The JRIC is a 24-hour reporting center.

Water Information Sharing and Analysis Center (WaterISAC): WaterISAC was authorized by Congress in 2002 and is managed by the water sector. It is a nationwide center with the mission to keep drinking water and wastewater utility managers informed about potential threats and risks to the nation's water infrastructure from all hazards, such as intentional contamination, terrorism and cyber-crime, and to provide information about response, mitigation and resilience.

San Bernardino / Riverside Counties (Inland) Terrorism Early Warning Group (TEWG): TEWG is co-hosted by the San Bernardino County Sheriff's Department and the Riverside County Sheriff's Department and provides information to local response agencies through a network of membership representatives. Membership network members include Law enforcement, Fire service, Hazmat teams, EMS, Hospitals, Public Health, Highway Patrol, Transportation agencies, FBI, CIA, Military, Water and Power utilities, private companies and railroads. The District meets with this group monthly with the goal to share information related to terrorism and crime.

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 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 though the American Water Works Association. District staff attends the San Bernardino County Office of Emergency Services quarterly meetings at various locations in the County.

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 participates with other local area water agencies in preparing Water Master Plans that benefit all of the regional water agencies.

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), the National Incident Management System (NIMS), and the Incident Command System (ICS) when responding to emergencies.

5.4 Mitigation Programs

The District is always looking for mitigation ideas and new techniques and attends workshops conducted by the ERNIE group, Rural Water Authority and the American Water Works Association, vendor fairs, and meetings with other water organizations.

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, and 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 obtaining 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 Assess the Hazards, the process of identifying goals began with a review and validation of the San Bernardino County 2010 Operational Area LHMP. Using the County's 2015 LHMP, the District's Planning Team completed an assessment/discussion of whether each of the goals was valid.

Overall, the primary goal 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
- 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's facilities and developments in high-risk areas to verify that these areas are appropriately protected from potential hazards

The six high-profile hazards for the District are earthquake, terrorist events, lightning strikes, flash flooding, climate change/drought, and freezing. The District's priority and focus for the mitigation projects will be for the six high-profile hazards.

6.2.1 Earthquake - Impact Rating (1)

Description: 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
- Encourage property protection measures for structures located in the area
- Adopt cost-effective codes/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:

- Install flexible pipe joints at wellheads, pump stations, and reservoirs
- Install seismic shut-off valves
- Bolt down reservoirs
- Tie down equipment
- Generators and generator hookups

6.2.2 Terrorist Events - Impact Rating (1)

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.

Objectives:

- 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 hookup

6.2.3 Lightning Strikes - Impact Rating (2)

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.

Objectives:

- 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
- Promote public education in water conservation during power outages
- Develop outreach to the public to educate residents on the hazards to the utility and operation of the utility in emergencies
- Put all wells and electrical panels and controls inside of block or wood buildings

6.2.4 Flash Flooding - Impact Rating (2)

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 amounts of mud and rock fragments. Flash flooding is common in the arid desert areas of California, Arizona, Nevada, and New Mexico.

Objectives:

- 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

6.2.5 Climate Change and Long-Term Drought, Impact Rating (3)

Description: Due to Climate Change, the District can expect greater fluctuations in weather patterns, including prolonged dry periods which can be mitigated 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.

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 costs for the District

Mitigation Projects:

- Increase public awareness of water conservation
- Develop water run-off peculation ponds for flood waters
- Monitor groundwater elevations and evaluate trends
- Increase water pumping capabilities
- Increase groundwater supplies
- Study system interties with other water systems in the area
- Generators and generator hookups

6.2.6 Freezing - Impact Rating (3)

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:

Prevent pipes and valves that are located above ground from freezing.

Mitigation Projects:

- Move above ground pipes and valves into buildings
- Build housing units around all outdoor pipes, valves and booster pumps

6.2.7 Mitigation

Mitigation measures, budget and timeline are listed in Table 8 below.

Table 8 Mitigation Measures

Facility Name	Mitigation	Budget	Timeline (Approximate)
District Offices	Block wall, gates, security	$150,000	1-2 years
Shop/warehouse	Block wall, gates, security	$700,000	1-2 years
SCADA System	Redundant scada sytem	$80,000	1-year
Reservoirs	*Seismic valve, tiedowns, flex couplings, and reservoir venting		
D-2	Earthquake retrofit*	$60,000	1-3 years
D-3	Earthquake retrofit*	$335,000	1-3 years
C-3	Earthquake retrofit*	$40,000	1-3 years
F-2	Earthquake retrofit*	$80,000	1-3 years
H-1	Earthquake retrofit*	$55,000	1-3 years
J-1	Earthquake retrofit*	$80,000	1-3 years
E-1	Earthquake retrofit*	$80,000	1-3 years
G-1	Earthquake retrofit*	$35,000	1-3 years
I-1	Earthquake retrofit*	$150,000	1-3 years
B-1	Earthquake retrofit*	$250,000	1-3 years
A-1	Earthquake retrofit*	$55,000	1-3 years
C-1	Earthquake retrofit*	$75,000	1-3 years
D-1-2	Earthquake retrofit*	$85,000	1-3 years
E-2	Earthquake retrofit*	$75,000	1-3 years
D-1-1	Earthquake retrofit*	$75,000	1-3 years
C-2-B	Earthquake retrofit*	$450,00	1-3 years
Wells			
Well-16	Building	$35,000	1-2 years
Well-17	Building	$35,000	1-2 years
Well 10	Building and block wall	$135,000	1-2 years
Well 14	Building and block wall	$135,000	1-2 years
Well 15	Building and block wall	$135,000	1-2 years
Booster Stations			
E-1 Booster @ C-1	Block wall, flood diversion wall	$150,000	1-2 years

D-2 Booster @ C-1	Block wall, gates, security	$150,000	1-2 years
H-1 Booster @ F-2	Flex couplings	$40,000	1-2 years
J-1	Flex couplings	$40,000	1-2 years
G-1	Security, flex couplings	$45,000	1-2 years
D-1-1	Flex couplings	$35,000	1-2 years
D-3	Flood diversion wall	$150,000	1-2 years
I-1	Building, security, flex couplings	$150,000	1-2 years
F2	Building, security, flex couplings	$150,000	1-2 years

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 8 years did not 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 LHMP each year before obtaining the next year's 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 offset the impacts to the fiscal budget and to provide 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 which 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 (CIP). When money is available for the 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 monitored and evaluated by staff during the year and progress will be reported as part of the annual budget workshop each spring. Annually, staff and the Board of Directors will review funding and determine the Capital Improvement Projects to be included in the next fiscal year's budget.

The Board Secretary will include the LHMP in all budget workshops and grant planning meetings. This will allow open discussion, evaluation, and assessment of the plan at achieving goals, allowing addition and removal of mitigated items.

A full review of the plan will be performed at 5-year intervals by staff in the same manner as the initial LHMP. Progress in reaching mitigation goals, assessment of new and existing hazards, development of new mitigation strategies and goals will be tackled by a planning team that will include the District's staff and the community served by the District. The public will be asked to participate in the update process. The District's budget is a public document and is reviewed by the public before the Board of Directors adopts the updated LMHP.

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 programs, building design, and any updates or repairs to the water distribution system. The District will submit Notice of Intents 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's recommended goals and objectives are met. The General Manager or his/her appointee will be responsible to place the LHMP on the 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. The District will start the update process one and a half years before the expiration date on this document.

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 District'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. When the LHMP is rewritten and updated, a public committee will be utilized to review and concur on the changes in the document.