TORRES MARTINEZ DESERT CAHUILLA INDIANS

TRIBAL MULTI-HAZARD MITIGATION PLAN

December 2024

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Torres Martinez Desert Cahuilla Indians
66725 Martinez Road
Thermal, California 92274

Prepared by:

JAMIE CAPLAN CONSULTING LLC
Emergency Management Services

351 Pleasant Street, Suite B #208, Northampton, MA 01060
Phone: 413-586-0867 Fax: 413-727-8282 Web: www.jamiecaplan.com

ACKNOWLEDGEMENTS

The Torres Martinez Desert Cahuilla Indians would like to thank the following people and organizations for supporting the development of this plan.

TRIBAL COUNCIL

- Thomas Tortez Jr., Tribal Chairman
- Joseph Mirelez, Vice Chairman
- Altrena Santillanes, Secretary
- Elena Loya, Treasurer
- Gary Resvaloso, Tribal Council Member
- Brandon Butcher, Tribal Council Member
- Desiree Franco, Tribal Council Proxy

TRIBAL PRE-DISASTER MITIGATION PLANNING TEAM

- Rodney Bonner, Assistant Emergency Response Manager
- Andrea Diaz, Administrator Specialist
- Shawn Isaac, Tribal Administrator
- William "Jedi" Jeide, Natural Resources Manager
- Angel I. Ortega, Emergency Response Manager
- Robert Powell, Planning Director

CERTIFICATE OF TRIBAL ADOPTION

TORRES MARTINEZ DESERT CAHUILLA INDIANS
Resolution #XXX

WHEREAS the Torres Martinez Desert Cahuilla Indians have historically experienced severe damage from natural and human-caused hazards such as flooding, wildfire, earthquake, drought, thunderstorms/high winds, and hazardous materials incidents on many occasions in the past century, resulting in loss of property and life, economic hardship, and threats to public health and safety;

WHEREAS the Torres Martinez Desert Cahuilla Indians has developed and received conditional approval from the Federal Emergency Management Agency (FEMA) for its All Hazard Mitigation Plan under the requirements of 44 CFR 201.7;

WHEREAS the Plan specifically addresses hazard mitigation strategies and plan maintenance procedures for Torres Martinez Desert Cahuilla Indians;

WHEREAS the Plan recommends several hazard mitigation actions/projects that will provide mitigation for specific natural and human caused hazards that impact Torres Martinez Desert Cahuilla Indians, with the effect of protecting people and property from loss associated with those hazards;

WHEREAS, adoption of this plan will make the Torres Martinez Desert Cahuilla Indians eligible for funding to alleviate the impacts of future hazards on the Reservation,

NOW THEREFORE BE IT RESOLVED by the General Council of the Torres Martinez Desert Cahuilla Indians that:

The Plan is hereby adopted as an official plan of Torres Martinez Desert Cahuilla Indians.
The respective officials identified in the mitigation strategy of the Plan are hereby directed to pursue implementation of the recommended actions assigned to them.

Future revisions and Plan maintenance required by 44 CFR 201.7 and FEMA, are hereby adopted as a part of this resolution for a period of five (5) years from the date of this resolution.

An annual report on the progress of the implementation elements of the Plan shall be presented to the Tribal Council by [insert date] of each calendar year.

The Torres Martinez Desert Cahuilla Indians will comply with all applicable Federal statutes and regulations in effect with respect to the periods for which it receives grant funding, in compliance with 44 CFR 13.11 (c); and will amend our Plan whenever necessary to reflect applicable changes in Tribe, State or Federal laws and statutes as required in 44 CFR 13.11. (d).

PASSED by the [insert appropriate title], this ___ day of ____ (month), _____(year).
[Provide various signature blocks as required]

RECORD OF CHANGES

This 2024 Torres Martinez Desert Cahuilla Indians Tribal Multi-Hazard Mitigation Plan, including Appendices, will be reviewed and approved on a bi-annual basis by the Tribal Pre-Disaster Mitigation Team and following any major disasters. All updates and revisions to the plan will be tracked and recorded in the following table. This process will ensure the most recent version of the plan is disseminated and implemented by the Tribe.

Table 1. Record of Changes.

Date of Change	Entered By	Summary of Changes

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CHAPTER 1. INTRODUCTION

The Federal Emergency Management Agency (FEMA) defines mitigation as "the effort to reduce loss of life and property by lessening the impact of disasters. Mitigation is taking actions now – before the next disaster – to reduce human and financial consequences later (analyzing risk, reducing risk, insuring against risk.)"[1]

"The purpose of mitigation planning is to identify policies and actions that can be implemented over the long term to reduce risk and future losses. Mitigation plans form the foundation for a community's long-term strategy to reduce disaster losses and break the cycle of disaster damage, reconstruction, and repeated damage. The planning process is as important as the plan itself. It creates a framework for risk-based decision-making to reduce damages to lives, property, and the economy from future disasters."[2]
"The Disaster Mitigation Act of 2000 (DMA 2000, Public Law 106-390) provides the legal basis for FEMA mitigation planning requirements for State, local and Indian Tribal governments as a condition of mitigation grant assistance. DMA 2000 amended the Robert T. Stafford Disaster Relief and Emergency Assistance Act by repealing the previous mitigation planning provisions and replacing them with a new set of requirements that emphasize the need for State, local, and Indian Tribal entities to closely coordinate mitigation planning and implementation efforts."[3]

The Torres Martinez Desert Cahuilla Indians (TMDCI) decided to update their FEMA-approved hazard mitigation plan. They hired a consulting team led by Jamie Caplan Consulting LLC, to develop the plan update.

1.1 PURPOSE OF THE PLAN

The purpose of hazard mitigation is to reduce potential losses from future disasters. The intent of mitigation planning, therefore, is to maintain a process that leads to hazard mitigation actions. Tribal mitigation plans identify the natural hazards that affect the Tribal government, identify actions to reduce losses from those hazards, and establish a coordinated process to implement the plan (44 CFR § 201.1(b)).

The Torres Martinez Desert Cahuilla Indians developed this plan to meet the requirements of the Disaster Mitigation Act of 2000. More importantly, the plan was created to reduce loss of life, land and property due to natural hazards that affect the Tribe. It is difficult to predict when natural hazards will impact the Tribe, but it is accurate to say that they will. By implementing the mitigation actions listed in this plan, the impact of natural hazards will be lessened.

[1] https://www.fema.gov/what-mitigation
[2] https://www.fema.gov/media-library-data/1478260600306-117bda8ab179bd301b0b61b52a143485/StateMitigationPlanning_MS_Bulletin_V9_508.pdf
[3] https://www.fema.gov/media-library/assets/documents/4596

The Tribal Council and the Tribal Pre-Disaster Mitigation Team (TPDMT) are dedicated to improving safety and sustainability of the Tribe. The contractors worked closely with these leaders to create this mitigation plan.

1.2 TRIBAL – FEMA RELATIONSHIP

FEMA's Tribal Policy[4] outlines the commitment by the Agency to enhance its nation-to-nation relationship with federally-recognized Indian Tribal governments (Tribal governments), and to ensure FEMA works together to build, sustain, and improve every Tribal governments' capacity to prepare for, protect against, respond to, recover from, and mitigate against all hazards.

FEMA's Guiding principles for reviewing Tribal mitigation plans are as follows:[5]

- **Nation to Nation.** In compliance with the FEMA Tribal Policy, FEMA commits itself to building a stronger and lasting partnership with Tribal governments to assist them in preparing for the hazards they face, to reduce their disaster vulnerabilities, to respond quickly and effectively when disasters strike, and to assist in recovering in their aftermath. FEMA recognizes that the Tribal right of self-governance flows from the inherent sovereignty of American Indian and Alaska Native Tribal governments, and that federally-recognized Tribal governments have a unique and direct relationship with the United States government. Tribal governments are not political subdivisions of states but are recognized by the United States as distinct sovereign entities.
- **Foster cooperation and understanding.** FEMA is committed to communicating plan reviews in a constructive and positive manner. Communicating plan reviews in a constructive manner that enhances Tribal government capabilities is an important goal of the mitigation planning program and will always be considered by FEMA when communicating with a Tribal government.
- **Focus on mitigation strategy.** Plan reviews will emphasize actions and implementation of the hazard mitigation strategy. All other sections of the plan contribute to and result in the hazard mitigation strategy and specific hazard mitigation actions. For example, a sound hazard identification and risk assessment are an important part of the plan and serves as the basis for the strategy, which is the primary focus of the Tribal mitigation plan.
- **Consider intent while reviewing the plan.** FEMA will review and consider the plan as a whole (Planning Process, Hazard Identification and Risk Assessment, Mitigation Strategy, etc.), as well as the individual requirements. A comprehensive review of the plan helps FEMA validate that the plan meets the overall purpose of mitigation planning.
- **Process is as important as the plan itself.** FEMA will accept the planning process as defined by the Tribal government. In mitigation planning, as with most other planning efforts, the actual planning process is as important as the plan itself. One of the most critical elements of a

[4] https://www.fema.gov/media-library/assets/documents/25324
[5] Tribal Mitigation Plan Review Guide 2017, FEMA, p.2-3.

successful mitigation plan is participation by a wide range of Tribal members or other affected parties who play a role in setting mitigation goals and identifying and implementing mitigation actions. Therefore, it is important to have a clear description of *what* and *who* were involved in the planning process and of how the process met the needs of the Tribal government.

- **This is the Tribe's plan.** Plan reviews will recognize the efforts, interests, and cultural beliefs of each Tribal government that develops a mitigation plan. For example, FEMA recognizes that some resources vulnerable to hazards, including those having religious and cultural significance (such as sacred sites), may not be identified specifically or shown on maps included in publicly available plans.

1.3 CHANGES IN DEVELOPMENT

D1. Was the plan revised to reflect changes in development? [44 CFR § 201.7(d)(3)]

The Torres Martinez Reservation has not seen many changes in development since the last plan update in 2018. This is primarily due to slow population growth and very limited new construction in the community. The lack of growth and development pressure has helped the Tribe avoid development in hazard-prone areas and other changes that could increase its vulnerability to natural hazards. The Tribe also benefits from the fact that growth and development on the Reservation are monitored and managed by the Planning Department, Natural Resources Department, Cultural Department, and others who support the Tribal goals of preserving cultural traditions, protecting and caring for the natural environment, and ensuring the social, cultural and economic stability and prosperity of community members.

Several new buildings have been constructed on the Reservation since the last plan update, including a new school, and there have been numerous infrastructure improvements which have likely helped decrease hazard vulnerability and/or increased public safety. These include roadway improvements that have led to quicker response times for first responders and a series of utility upgrades which have brought vital services (i.e., water, sewer, electrical) to rural areas that had previously been lacking adequate infrastructure for public health and safety. These positive changes in development have helped decrease the risk and vulnerabilities created by the existing checkerboard pattern of development across the Reservation, though the impacts of infrastructure failure during a major disaster event, such as a large earthquake, remain an ongoing concern.

In terms of future trends, the Tribe anticipates increased opportunities for solar power developments in addition to continued infrastructure improvements that will support sustainable and resilient patterns of community growth. New development within hazard prone areas is generally not expected to occur, though a large mixed-use planned development has been proposed at Travertine point, partially on Reservation lands, near the Imperial County/Riverside County boundary. A portion of the development within the Reservation's boundaries lies within a mapped flood hazard area, however, according to existing development plans this floodplain area will be preserved as open space.

The TMDCI's existing land use plan is outdated and considered insufficient for guiding growth and development in ways that can significantly reduce hazard vulnerability, but as noted within this plan update, the Tribe is interested in preparing a new master plan which can help address this concern. The creation of such a plan that incorporates long-term resilience to hazards and climate change is identified as an immediate opportunity to improve the Tribe's capabilities to reduce risk.

1.4 MITIGATION GOALS

D2. Was the plan revised to reflect progress in Tribal mitigation efforts? [44 CFR §§ 201.7(d)(3) and 201.7(c)(4)(iii)]

Through several meetings with the Tribal Pre-Disaster Mitigation Planning Team (TPMPT), the goals shown below were chosen. For the mitigation actions developed to support these goals, see Chapter 6, Mitigation Strategy.

Cultural Assets	• Identify and protect cultural assets from natural hazards and a changing climate.
Wildfires	• Protect people and the Reservation land and buildings from wildfires.
Drought, Flood, and other Natural Hazards	• Protect people and the Reservation from the impact of drought, flood and other natural hazards.
Education and Preparedness	• Implement education and preparedness programs on the reservation to increase Tribal resilience to natural hazards and impacts of climate change.
Regulatory Actions	• Enact administrative or regulatory actions to reduce hazard losses.
Regional Collaboration	• Build capacity for hazard mitigation through regional collaboration.

Figure 1. Hazard Mitigation Plan Goals.

D3. Was the plan revised to reflect changes in priorities? [44 CFR § 201.7(d)(3)]

This plan reflects the current priorities of the TMDCI. The priorities of the Tribe have not changed significantly since the previous plan was written. As the above goals indicate the Tribe remains focused on mitigating their highest risk hazards (wildfire, flood, drought) and protecting their cultural assets. The Tribe has shifted focus a bit more on climate adaptation. They are acutely aware of how wind-blown debris, especially from the Salton Sea, is impacting the health of people living and working on the Reservation.

While mitigation priorities have not shifted significantly, the Tribe has begun to build a more robust and capable staff. They recognize the need for expanding their technical expertise with well-trained staff who have the equipment necessary for their positions. In addition, they are expanding their networking capacity with regional, state, and federal agencies, such as the Bureau of Indian Affairs (BIA). These relationships reflect the Tribes commitment to working with their neighbors to mitigate risk.

The status of each mitigation action from the Tribe's previous plan is included in Chapter 6: Mitigation Strategy. The text in this chapter includes a designation of Completed, Completed & To Be Continued, Partially Completed/In Progress, Delayed, or Cancelled with a description. In addition, if the mitigation action was moved forward into this plan's list of actions that is indicated.

The TMDCI are working on integrating mitigation principles, vulnerability information, and mitigation actions into other planning mechanisms to leverage activities that have co-benefits, reduce risk, and increase resilience. The Natural Resource Department had undertaken many projects with these co-benefits. The Tribe has not integrated the previous mitigation plan into many planning mechanisms because the Tribe does not develop many formalized plans that are typically seen in a City or State government.

1.5 PLAN ADOPTION AND ASSURANCES

1.5.1 ADOPTION BY THE TRIBAL GOVERNING BODY

E1. Does the plan include assurances that the Tribal government will comply with all applicable Federal statutes and regulations in effect with respect to the periods for which it receives grant funding, including 2 CFR Parts 200 and 3002, and will amend its plan whenever necessary to reflect changes in Tribal or Federal laws and statutes? [44 CFR § 201.7(c)(6)]

E2. Does the plan include documentation that it has been formally adopted by the governing body of the Tribal government requesting approval? [44 CFR § 201.7(c)(5)]

Following the two-week public review process, the Tribe sent the plan to FEMA for their review. Upon FEMA's review and designation that the plan was "Approved-Pending-Adoption," the Tribe scheduled a Tribal Council meeting for the Tribe to formally adopt the plan. The adoption resolution is included in the first few pages of this document. The adoption resolution demonstrates the Tribe's commitment to fulfilling the hazard mitigation goals outlined in this plan and authorizes the authority to implement the mitigation actions as possible.

The Torres Martinez Desert Cahuilla Indians assures that the Tribal government will comply with all applicable Federal statutes and regulations in effect with respect to the periods for which it receives grant funding, including 2 CFR Parts 200 and 3002, and will amend its plan whenever necessary to reflect changes in Tribal or Federal laws and statutes.

1.6 DOCUMENT OVERVIEW

Below is a summary of the Hazard Mitigation Plan chapters, including appendices. The FEMA guidelines and requirements for each portion of this Plan are included in their respective chapters. The planning process closely adhered to FEMA guidelines and to the intent of those guidelines.

Chapter 2: Planning Area Profile
The Planning Area Profile chapter describes the Torres Martinez Desert Cahuilla Indians completely, including geography and the built environment. Also included is a description of the Tribal government, economy and utilities. The critical facilities for the Tribe are identified in this chapter.

Chapter 3: Planning Process
The Planning Process chapter documents the methods and approach of the hazard mitigation planning process. The chapter summarizes the TPMPT meetings, the public outreach process, and the Public Survey. This chapter guides the reader through the process of generating this Plan and reflects the open and inclusive public involvement process.

Chapter 4: Risk Assessment
The Risk Assessment identifies the natural hazard risk to the Torres Martinez Desert Cahuilla Indians and its residents. The risk assessment looks at current as well as future vulnerabilities based on development of structures and infrastructure.

Chapter 5: Capability Assessment
The Capability Assessment looks at the Tribe's ability to mitigate risk prior to and post-disaster. This chapter is structured around four categories: planning and regulatory, administrative and technical, financial, and education and outreach.

Chapter 6: Mitigation Strategy
This chapter provides a blueprint for reducing losses identified in the Risk Assessment. The chapter presents the overall hazard mitigation goals and objectives and then identifies mitigation actions in priority order. Where applicable, funding sources are identified, as are responsible persons or departments.

Chapter 7: Plan Maintenance and Implementation
The Plan Maintenance and Implementation chapter establishes a system and mechanism for periodically monitoring, evaluating, and updating the Hazard Mitigation Plan. It also includes a plan for continued public outreach and monitoring the implementation of the mitigation actions identified.

Appendices

The Appendices includes documentation regarding the planning process, such as Mitigation Planning Team and public meeting presentations and the Public Survey results. In addition, resources supporting the risk assessment are included.

CHAPTER 2. PLANNING AREA PROFILE

The Torres Martinez Desert Cahuilla Indian Reservation was federally established on May 15, 1876, and currently consists of a checkerboard of 24,822 acres.[6] The Reservation lies in the lower Coachella Valley where their ancestors, the Cahuilla Indians, lived. The Torres Martinez Tribe has only 700 members, making it one of the most 'land rich' tribes, headquartered in Thermal, California. Sitting just above the man-made Salton Sea, the inland southern location experiences a hot and dry climate.[7] The Torres-Martinez Historical District houses three of the oldest standing Indian Agency Buildings in California, and remain a California Point of Historical Interest.[8] The Tribe is run by a general council and operates the Red Earth Casino in Salton City, California.

[6] "California Indians and Their Reservations." San Diego State University Library and Information Access. (retrieved May 17, 2010.
[7] "Thermal, California." *City-Data.com.* 2010.
[8] "Torres Martinez Desert Cahuilla Indian Nation." *California Parks.* Pdf.

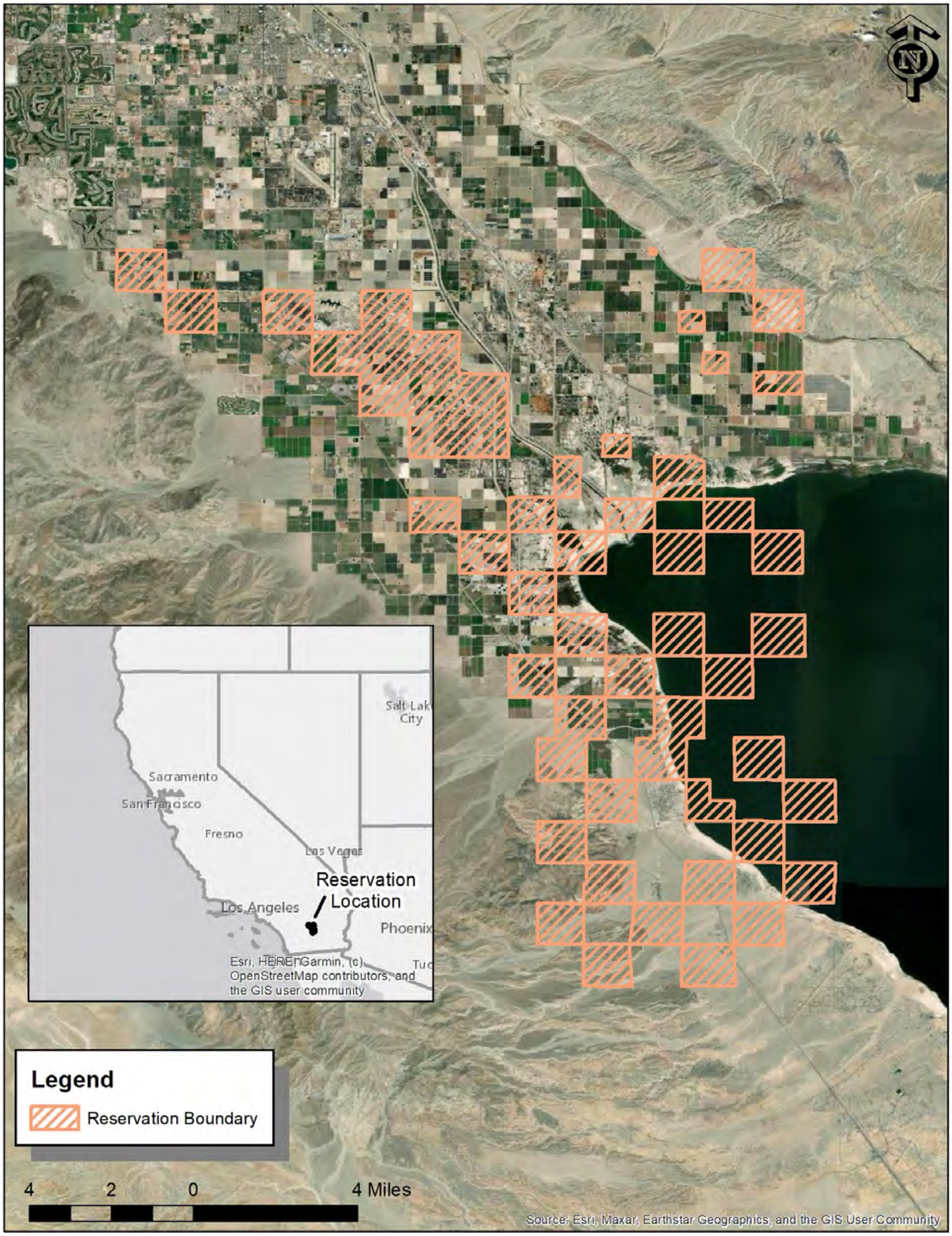

Figure 2. Torres Martinez Desert Cahuilla Indians Reservation Location.

2.1 CLIMATE & GEOGRAPHY

The Reservation of Torrez-Martinez Desert Cahuilla Indians is in southern California in the Coachella Valley in the counties of Imperial and Riverside. The terrain ranges from fine sand in the north to rocky in the south, excluding the land near the Salton Sea.[9] The Salton Sea takes up over 10,000 acres of the Reservation (almost half of the total acreage), land that was expected to become available when the sea evaporated. However, due to agricultural run off the land has remained flooded and will likely be a dry lake bed if evaporated.[10] The climate is arid with little rain (3 inches annually), and an average high year-round of 80-90 degrees, sometimes reaching 120 degrees Fahrenheit in the summer.[11]

2.2 HISTORY & CULTURE

The Torres-Martinez Cahuilla ancestors have lived in the Martinez Canyon since the early 1800s, and the Torres and Martinez Reservations were specifically established in 1876 by President Ulysses S. Grant. The two Reservations were later combined in 1891 under the Relief of Mission Indians Act. In 1907 funding was obtained for a Reservation school building, one of the oldest in California.[12] Around the time the school was built, the Salton Sink was filled to create the Salton Sea eventually covering ~11,000 acres of Tribal land by 1909.[13] There has been a recent effort to revitalize the culture through the language of the Cahuilla people and participation in Tribal events such as wakes and dinners.[14] The Tribal moto is “Chem Te’ma Pit’chem max’win ‘Iv’al,” meaning “Empowering our Nation.”[15] The Tribe identified a list of cultural resources and sacred sites showed in the table below.

Figure 3. Area of Oldest Buildings.

Table 2. List of Cultural Resources in Reservation.

Name	Latitude	Longitude
Agency (Historic District)	33.5629	-116.1540
Catholic cemetery	33.5594	-116.1446
Catholic cemetery	33.5599	-116.1440
Cemetery	33.5882	-116.2312
Cemetery	33.5605	-116.1530

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[9] “Geography and Location.” Torres Martinez Desert Cahuilla Indians. 2009.
[10] “Mayton, Holly. “The Torres-Martinez Band of Desert Cahuilla Indians.” *Salton Sea Sense.* August 5, 2015.
[11]“Geography and Location.” Torres Martinez Desert Cahuilla Indians. 2009.
[12] “Cultural Resources.” Torres Martinez Desert Cahuilla Indians. 2009.
[13] Mayton, Holly. “The Torres-Martinez Band of Desert Cahuilla Indians.” *Salton Sea Sense.* August 5, 2015.
[14] “Cultural Preservation.” Torres Martinez Desert Cahuilla Indians. 2009.
[15] “Home.” Torres Martinez Desert Cahuilla Indians. 2009

Name	Latitude	Longitude
Church of Sacred Hearts of Jesus and Mary	33.5606	-116.1447
Cultural Landmark	33.4328	-116.0769
Dilapidated Structure (Historic District)	33.5626	-116.1539
Fish Traps (4 sites total)	33.5707	-116.2170
Headmaster's House (Historic District)	33.5627	-116.1539
Oasis Community Park	33.4994	-116.1135
Old Stagecoach Water Tank	33.5624	-116.1541
Petroglyphs at the fish traps	33.5700	-116.2159
School (Historic District)	33.5625	-116.1537
Travertine Point (2 sites)	33.4232	-116.0579
The Body of Christ Church (3 buildings)	33.5885	-116.2324

2.3 DEMOGRAPHICS

The Torres-Martinez Tribe has 606 recognized members, including 48 minors and 558 adults. With almost 25,000 acres on the Reservation, the density of the Tribe is 35 acres per Tribal member, a relatively land rich Reservation. Sixty percent of its Tribal members live on the Reservation and 40 percent live off the Reservation throughout the Inland Empire, Riverside, San Bernardino and Los Angeles Counties in California. There are 485 voting members of the Tribe, with elders making up 30 percent of the Tribe.

2.4 GOVERNMENT

The federally recognized Torres-Martinez Tribal Reservation has had a Tribal Council since its establishment in 1876. There are seven Tribal Council members elected every two years by eligible members of the Tribe.[16] The council works to promote Tribal goals, such as the preservation of culture and the environment for future generations, ensuring social cultural and economic stability by developing community resources, upholding the Tribal Constitution to protect basic rights, and maintain fair distribution of services and entitlements.[17] The government also consists of several departments, notably the Temporary Assistance to Needy Families (TANF) program, which is federally and state funded 5 year program that increases the employability of families and provides family assistance.[18]

[16] "Governance." Torres Martinez Desert Cahuilla Indians. 2009.
[17] "About Us: Tribal Goals." Torres Martinez Desert Cahuilla Indians. 2009.
[18] "TANF."Torres Martinez Desert Cahuilla Indians. 2009.

2.5 ECONOMY

Figure 4. Red Earth Casino Entrance.

The economy of the Torres Martinez Reservation is primarily based on the Red Earth Casino, located between Indio and Brawley on Highway 86, as well as government grants. The Casino itself is small (14,000 feet) with 350 gaming machines and 8 table games, open 24 hours a day.[19] The Tribe also owns and operates the Torres Martinez Travel Center, which contains a large mini mart, gas station, wash rooms and café. The Tribal Employment Rights Ordinance (TERO) gives Tribal members preference in employment in all business operated/undertaken on or near the Reservation, including the Casino.[20] The Torres Martinez Finance Department (TMDCI) is responsible for the financial activities of the Tribe.[21]

2.6 TRANSPORTATION & UTILITIES

> The Tribal Mitigation Planning Handbook (FEMA, 2019) explains that Critical facilities *"include gathering spaces, schools, police and fire stations, healthcare facilities, and Tribal offices."*

Highway 86 runs from north to south through the Torres Martinez Reservation, with access to Highway 111 and Interstate 10 nearby. The California Highway Patrol Air Operations Unit and Thermal Sheriff Station are located approximately 8 miles from the Reservation. The Tribe provides transportation for its elders. The closest hospital is the JFK Memorial Hospital in India, CA. Torres-Martinez Tribe currently has sustainable groundwater system of 21 wells throughout the Reservation, which are used in Tribal households and properties, drinking water quality tests are done periodically on these wells. Water sampling for Arsenic, Chromium, Barium, Nitrate are done quarterly for water quality and Tribal headquarters is hooked up to Coachella Valley Water District.

2.7 LAND USE

The Torres-Martinez Indian Reservation is a checkerboard of 24,800 acres of land in the Coachella Valley of California that lies next to the man-made Salton Sea. The Tribe was granted over 11,000 acres of flooded land in the Salton Sea in 1909, which was expected to dry up in the next 25 years.

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19 "Red Earth Casino." *500 Nations.* 1999-2017.
20 "TERO Department." Torres Martinez Desert Cahuilla Indians.2013
21 "Finance Department." Torres Martinez Desert Cahuilla Indians. 2009.

Unfortunately, due to agricultural needs, the land has remained flooded, with the Reservation acting in 2002 to protect the potentially dry lakebed. The Tribe has developed an 85-acre wetland project at the juncture of Whitewater River and Salton Sea to stabilize the land.[22] The Sea is to be reduced by 50% beginning in 2017, with the wetlands working to filter the dry lakebed of pesticides, selenium and other problematic sediments.[23] The Torres Martinez Tribe always plans from seven generations in the future, working to protect the "Tribe's land base and resources, safeguard the Tribe's cultural heritage, and promote the existing and future well-being of all Tribal Members."[24]

2.7.1 CRITICAL FACILITIES

The term "critical facilities" is used to describe structures necessary for a community to respond and recover in emergency situations. These facilities often include emergency response facilities (fire stations, police stations, rescue squads, and emergency operation centers [EOCs]), custodial facilities (jails and other detention centers, long-term care facilities, hospitals, and other health care facilities), schools, emergency shelters, utilities (water supply, wastewater treatment facilities, and power), communications facilities, and any other assets determined by the community to be of critical importance for the protection of the health and safety of the population. The adverse effects of damaged critical facilities can extend far beyond direct physical damage. Disruption of health care, fire, and police services can impair search and rescue, emergency medical care, and even access to damaged areas.

Figure 5. New Health Clinic.

[22] "Mayton, Holly. "The Torres-Martinez Band of Desert Cahuilla Indians." *Salton Sea Sense.* August 5, 2015.
[23] "Water Resources." Torres Martinez Desert Cahuilla Indians. 2017.
[24] "Planning Department." Torres Martinez Desert Cahuilla Indians. 2017.

The number and nature of critical facilities in a community can differ greatly from one jurisdiction to another, and usually includes both public and private facilities. Each community needs to determine the relative importance of the publicly and privately owned facilities that deliver vital services, provide important functions, and protect special populations. The Torres Martinez Steering Committee identified the list of critical facilities shown in the table below.

The last items in the table list "proposed critical facilities," these are buildings or infrastructure the Tribe intends to develop over the next five years.

Table 3. List of Critical Facilities in Reservation.

Name	Type	Value ($)	Generator
Administration / A'avutem Senior Center	Seniors	2,030,044	Yes
Cash Assistance	Administrative	1,590,281	No
Classroom #1	Education	563,848	No
Classroom #2	Education	572,861	No
Cell Tower	Communications	N/A	N/A
Child Development and Education Department / Library Center	Education	1,607,734	No
Committee #36 Building	Administrative	197,191	No
Committee #37 Building	Administrative	197,191	No
Family Preservation / Family Perseverance	Education	588,205	No
Health Clinic	Medical	10,800,900	Yes
Human Resources	Administrative	424,804	No
IT Department	Administrative	147,099	No
La Chicanita Gas station / Market	Gas & Food	962,219	No
Language Building	Education	226,498	No
Maintenance Shop	Utility	86,251	No
Mobile Home Park	Residential	11,039,895	No
Oasis Mobile Home Park	Residential	2,603,430	No
Planning Building	Administrative	294,390	No
Procurement / Compliance / Finance / Grants	Administrative	1,061,913	No
Red Earth Casino	Economic	4,278,566	No
Shipping and Receiving	Administrative	144,030	No
Social Services Building	Administrative	298,226	No
Tameka Gymnasium	Recreational	3,559,002	No
Tanf Executive / Facilities / Security	Administrative	578,615	No
Travel Center	Administrative	1,540,550	No
Tribal Hall	Cultural	1,078,599	No
Tribal Member Housing (68 total)	Residential	3,665,385	No
Tribal Pool	Recreational	N/A	No
Well / Water Tanks	Utility	N/A	N/A
Proposed Emergency Equipment Carport	Emergency Services	193,388	No
Proposed IT Building	Administrative	747,962	No

CHAPTER 3. PLANNING PROCESS

The planning process was developed in full compliance with the current planning requirements of the Federal Emergency Management Agency (FEMA) per the following regulations:

- Robert T. Stafford Disaster Relief and Emergency Assistance Act (Public Law 93-288), as amended by the Disaster Mitigation Act of 2000
- Code of Federal Regulations – §201.7: Tribal Mitigation Plans
- Federal Emergency Management Agency Tribal Mitigation Plan Review Guide, Effective December 5, 2018
- Federal Emergency Management Agency Tribal Mitigation Planning Handbook, May 2019

A priority through the planning process was equity, which FEMA defines as the “consistent and systematic fair, just and impartial treatment for all individuals.” This was a central theme through the planning process and effort was made to develop an inclusive planning process. The whole community (individuals, communities, private and nonprofit sectors, faith-based organizations, and all levels of government) were given an opportunity to participate.

The hazard mitigation planning process followed the guidance and requirements provided by the FEMA with the following aim: “Reduce or eliminate risk to people and property from natural hazards.” Hazard Mitigation Plans form the foundation for a Tribe’s long-term strategy to reduce disaster losses and break the cycle of disaster damage, reconstruction, and repeated damage. The planning process is just as important as the plan itself. It creates a framework for risk-based decision-making to reduce damage to lives, property, and the economy. Developing the Hazard Mitigation Plan included a process of public outreach and stakeholder engagement.

The Torres Martinez Desert Cahuilla Indians (TMDCI) Tribal Multi-Hazard Mitigation Plan eases the burden of keeping the Tribal Territory safe by identifying and communicating hazard risks, developing actions to reduce or eliminate those risks, and making the Tribe eligible for FEMA mitigation program funding. In addition, the mitigation planning process educated the community, Tribal employees and multiple stakeholders about disaster mitigation and climate adaptation.

3.1 PROJECT TIMELINE

A1. Does the plan document the planning process, including how it was prepared and who was involved in the process? [44 CFR § 201.7(c)(1)]

The project timeline with associated tasks is shown in the figure below.

Project Tasks	JUN '24	JUL '24	AUG '24	SEP '24	OCT '24	NOV '24	DEC '24	JAN '25
Task 1. Planning Process								
1.1 Project Initiation - Kick-off Meeting	Kick-Off Mtg							
1.2 Planning Team Meetings (4)		Mtg 1		Mtg 2		Mtg 3	Mtg 4	
1.3 Conduct Public/Stakeholder Engagement		Stakeholder Interviews	Stakeholder Interviews	Stakeholder Interviews Survey Distribution	Survey Distribution		Plan Review	
1.4 Draft Plan and Document Planning Process								
Task 2. Hazard Analysis and Risk Assessment								
2.1 Data Collection								
2.2 Hazard Identification								
2.3 Hazard Profiles								
2.4 Inventory of Tribal Assets								
2.5 Vulnerability Assessment								
2.5 Summarize Findings and Conclusions								
Task 3. Capability Assessment								
3.1 Review Existing Capabilities								
3.2 Summarize Findings and Conclusions								
Task 4. Mitigation Strategy								
4.1 Develop Mitigation Plan Goals								
4.2 Develop and Prioritize Mitigation Action Plan								
Task 5. Plan Review, Evaluation, and Implementation								
5.1 Develop Plan Maintenance Procedures								
5.2 Develop Procedures for Continued Public Involvement								
Task 6. Plan Approval and Adoption								
6.1 Prepare Plan for FEMA Review								
6.2 Assist Tribe with Adoption After FEMA Approval								

Figure 6. Timeline for plan development.

The planning process began in June 2024 with a virtual Kick-off Meeting and concluded in December 2024 following a public review of the plan. The above timeline does not indicate the total time needed for FEMA to review the plan and for the Tribe to adopt the plan. The Tribal Pre-Disaster Mitigation Planning Team (TPMPT) met four times throughout the planning process.

Angel I. Ortega, Emergency Response Manager was the lead for the planning process working closely with the consulting team. Toward the end of the planning process, Rodney Bonner, Assistant Emergency Response Manager was hired and became a co-lead in the planning process.

3.2 TRIBAL PRE-DISASTER MITIGATION PLANNING TEAM (TPMPT)

The Tribal Pre-Disaster Mitigation Planning Team (TPMPT) was developed to support the planning process. This Planning Team included the following staff members:

- Rodney Bonner, Assistant Emergency Response Manager
- Andrea Diaz, Administrator Specialist
- Shawn Isaac, Tribal Administrator
- William Jeide, Natural Resources Manager
- Angel I. Ortega, Emergency Response Manager
- Robert Powell, Planning Director

The PPTMPT met three times in addition to the Kick-off Meeting. The fourth meeting was to review the draft plan. In addition to these meetings, members of this group met several times a month through the planning process.

Table 4. TPMPT Meeting Notes.

Meeting Date	Key Topics
6/17/2024	The Kick-off Meeting centered around developing a detailed Work Plan for the project and specific updates and changes to include in the Mitigation Plan Update. Re-establishing the TPMPT was decided, public engaged was discussed, and attendees described experiences with hazard events in the past several years. The Tribe reported that due to staff turn-over, Covid-19, and competing priorities the Hazard Mitigation Plan did not receive tremendous attention.
7/11/2024	The focus of this meeting was to identify new buildings and infrastructure on the Reservation and changes since the previous plan was adopted. In addition, a list of stakeholders to include in interviews wad developed. Finally, it was determined to develop a Fact Sheet for the project for the Emergency Response Department to distribute. The list of hazards was finalized and the list of critical facilities updated.
9/10/2024	The focus of this meeting was public engagement. The TPMPT agreed that utilizing a survey for public engagement was favorable to in-person meetings due in part to the extreme temperatures faced by the community. They determined that outreach for the survey would be multi-pronged and include the most vulnerable members of the community specifically the seniors and youth.
11/21/2024	The TPMPT reviewed the list of mitigation actions during this meeting and discussed the essential details for each. In addition, they discussed the prioritization process used. The TPMPT agreed that the quantitative and qualitative process of identifying and developing the mitigation actions and then prioritizing them made a lot of sense. Rodney Bonner, Assistant Emergency Response Manager was recently hired in this role, and he was brought up to speed during this meeting. In addition, the TPMPT discussed the process of reviewing the draft plan and engaging the whole Tribal community in that process. The Emergency Response Department agreed to make the plan available to the "public" online and via hard copy. Their intent is to get in front of as many Tribal members as possible.

3.3 STAKEHOLDER ENGAGEMENT

A3. Does the plan document, as appropriate, an opportunity for neighboring communities, Tribal and regional agencies involved in hazard mitigation activities, agencies that have the authority to regulate development as well as other interests to be involved in the planning process? [44 CFR § 201.7(c)(1)(ii)]

The consulting team worked with the TPMPT to develop a strategy to effectively engage stakeholders throughout the planning process. Stakeholder engagement had the purpose of two-way communication between the project team and the Tribal community. Generating interest, soliciting input and engaging partners in the plan development process provided an opportunity for project leaders to gain significant insight into the needs and capabilities of the Tribe. It also enabled the Tribal community to participate in the project and become invested in its success. One of FEMA's "opportunities for improvement" from the previous Hazard Mitigation Plan was to engage the wider Tribal community. This was a priority for the TPMPT so meetings with the Bureau of Indian Affairs were held. The Tribe also engaged with the Coachella Valley Association of Governments, Riverside County Emergency Management, and East Coachella Valley Emergency Services.

The consulting team held meetings with many stakeholders. Sitting down with these stakeholders provided an opportunity to develop a deeper understanding of each Tribal department's needs and their ideas about mitigating risk. A list of questions was developed (shown below) and distributed prior to each meeting.

1. How does your position relate to natural hazards and climate change?
2. In your position, what local, regional, or statewide groups do you collaborate with? Are there others you think the Tribe should work with? Why?
3. Have you noticed a change in the frequency or intensity of natural hazards over the last 5-10 years? Do you attribute climate change to these changes?
4. Do you think development on the Reservation has increased or decreased vulnerability to natural hazards? We need specifics.
5. Are you aware of actions the Tribe has taken or plans to take to reduce the impact of natural hazards to buildings, natural resources, and the health of people?
6. What are some good ways for us to include Tribal members in the mitigation planning process? Will they respond to a survey? Will they come to a meeting? How should we advertise these opportunities? What do you anticipate are their concerns regarding natural hazards?
7. What would you like to see implemented to mitigate risks of natural hazards on people and property?
8. Where are the culturally sensitive areas on the Reservation? Have these areas been impacted because of natural hazards? How would the Tribe like to protect these areas from natural hazards?
9. What else would you like us to know about the Tribe and the Reservation?
10. Who else do you recommend we interview?

The table below lists key points gleaned from each stakeholder meeting. It should be noted that multiple meetings regarding the mitigation actions and public engagement were held with Robert Powell and William Jeide.

Table 5. Stakeholder Meeting Key Points.

Stakeholder Meetings	Key Points from Each Stakeholder Meeting
Robert Powell, Planning Director and Brian Toro, GIS Trainee	Robert Powell was the lead in the development of the original Hazard Mitigation Plan and took a lead in this plan's development as well. He shared that GIS systems were not well maintained since the last plan was developed. The Tribe recently hired Brian Toro who hopes to expand the Tribes GIS capacity. Robert shared maps and data regarding new buildings on the Reservation and plans for additional buildings. A mitigation action regarding investment in GIS is included in this plan.
William Jeide, Natural Resources Manager, Diana Navarro, Environmental Specialist	William Jeide and his associate Diana Navarro provided expertise regarding Tribal activity related to climate change and hazard mitigation. They also offered input regarding mitigation actions, stakeholder engagement, and potential funding opportunities. Their participation was invaluable in terms of getting specifics regarding Tribal activities.
Joseph Lavergne, Facilities Director	The Facilities Director is responsible for the grounds, grass, janitorial staff and buildings. Joseph reports that the department responds when things break or as needed. For instance, they put out sand bags to prevent flooding as necessary. He indicated that many of the Tribal buildings at Tribal Headquarters are old and need regular maintenance.
Hugh Mirelez, Water Operator and Ricardo Chavez representing Natural Resources and Water	Hugh described his responsibility for all water infrastructure including pipelines and storage tanks. He makes sure they can withstand natural hazards such as floods and earthquakes. He is concerned that heavy rains and flooding could contaminate water sources but that has not happened. The conduct water samples regularly. They mentioned coordinating with the Rural Community Assistance Corporation, California Rural Water Association, and Indian Health Services. He described how Tribal homes are on well water, but the Tribal Offices have City water. He sees development on the Reservation as having both a positive and negative impact on vulnerability. Development puts a strain on infrastructure and loss of natural buffers but also gives an opportunity for new more resilient design standards.
Ray Ruiz, BIA Liaison and Acting Fire Management Officer and Earl Welson, BIA	The BIA is concerned about wildfire risk from the tremendous the amount of vegetation and dumping on the Reservation. The BIA has money dedicated for fuel reduction on the Reservation and would like to continue working with Natural Resources and Planning to identify areas for fuel reduction. Maps are necessary to indicate which land is fee and which is trust. The checkerboard boundaries of the Reservation make firefighting a challenge because the BIA is responsible for trust land and Riverside County responds to fires on fee land.

Stakeholder Meetings	Key Points from Each Stakeholder Meeting
Jose Roadriguez Jr., Senior Center Coordinator	Jose indicated that the Salton See is the main cause of asthma on the Reservation due to the poor air quality. He organizes activities for the seniors and can assist them during a power outage. This assistance may include transportation, food, and lodging. He mentioned that the extreme heat has increased and can hit 120 degrees. The Tribe is available to help seniors purchase air conditioning if they need it. During the Covid-19 pandemic the Senior Center distributed air purifiers to Tribal members, now these devices need new air filters.
Ryan Swier, Grants Administrator, Rose Duro, Grants Specialist	The Tribal Grants Department has a track record of success and the Tribe functions primarily on grant funding. Individual departments frequently apply on their own for recurring grants, whereas the Grants Department assists with new grants. They collaborate with Cahuilla Consortium, Amina for housing, and other tribes such as Agua Caliente. The Grants Department has a sub-award with the Coachella Water District that will include outreach to residents with wells.
Shawn Isaac, Tribal Administrator, Andrea Diaz, Administrator Specialist	The Tribal Administrator oversees all staff across seven locations, approximately 500 people. Some of these locations are rental properties far from the Reservation. The biggest concerns on the Reservation are wildfires followed by floods. Staff on the Reservation are increasing in number and expertise which is leading to an improved ability to mitigate risk. The Tribe has also started to work more efficiently with CAL FIRE and the BIA. Tribal Administration is focused on being more prepared to handle disasters and they are doing this through maintenance check lists, relationships with regional and Federal partners, funding, and staff training.
Jesus Arguelles, Economic Development	Jesus reports focusing on building Tribal revenue in a significant way through mining and possibly cannabis. The Tribe needs an influx of capital to generate maximum return on land investments. The goal is to reduce the Tribe's risk while increasing their economic stability. Flooding to economic assets is a concern as is water quality. The wells on the Reservation are contaminated with arsenic. It is possible to dig deeper wells to access clean water. The Tribe is working with the Coachella Valley Water District. Jesus reports trying to build sustainable partnerships with outside investors.
Manuel Montez, CERT Lead	Manuel has been the CERT lead for many years. He is working toward increasing the amount of training offered on the Reservation. In the past they have collaborated with CAL FIRE for training. The CERT team needs more equipment and would like to see the CERT team educate residents about home safety.

Figure 7. Stakeholder Meetings Key Points.

3.4 PUBLIC ENGAGEMENT

A2. Does the plan document an opportunity for public comment during the drafting stage and prior to plan approval, including a description of how the Tribal government defined "public"? [44 CFR § 201.7(c)(1)(i)]

The public engagement part of the planning process included three areas, a fact sheet, a public survey, and plan review feedback. The TPMPT chose not to have public meetings during the planning process. They decided to expand survey distribution and the opportunity to review the draft plan. Most of the planning process took place during times of extreme heat on the Reservation. It was not deemed safe to call people out of their homes to come to meetings.

3.4.1 FACT SHEET

A double-sided, one-page Project Fact Sheet was developed to describe the plan development process and to solicit public participation. The cover of the Fact Sheet includes FEMA's Guiding Principles, and the focus of the Fact sheet is encouraging public involvement. The Fact Sheet was distributed by the TPMPT. It was also posted in several buildings on the Reservation and distributed at the Senior Center. A full copy of the Fact Sheet is in Appendix A: Planning Process Supporting Materials.

HAZARD MITIGATION PLAN UPDATE

TORRES MARTINEZ DESERT CAHUILLA INDIANS

Stakeholder Meetings

- One-on-one meetings with Tribal leaders to solicit their input and gather their priorities.
- This process will provide insights into the needs and capabilities of the Tribe and encourage community investment in the project's success.

Wildfires may impact the Reservation.

MISSION STATEMENT

Reduce the impact of natural hazards and a changing climate on tribal lands, residents, businesses, facilities, and infrastructure through risk reduction strategies.

WHAT IS HAZARD MITIGATION?

- **Hazard Mitigation**: Any action taken to reduce or eliminate long-term risk to life and property from hazards.
- **Mitigation Actions:** Activities that reduce risk, such as strengthening buildings to withstand high winds, clearing brush and debris to reduce fire risk, and developing plans to care for vulnerable residents during extreme heat.

Cultural assets are recognized in the plan.

CONTACT INFORMATION

For more information:
Angel I. Ortega
Emergency Response Manager
760-442-2401
aiortega@tmtci-nsn.gov

Figure 8. Page 2 of the Fact Sheet.

3.4.2 PUBLIC SURVEY

An opportunity for public participation was developed through the *Torres Martinez Mitigation Planning Survey*. The sixteen-question survey was produced in Google Forms and distributed in hard copy and online to the TPMPT and the public. A flyer was distributed announcing the availability of the survey. The survey was available online from September through November 2024. The survey was distributed and made available in hard copy at the following locations:

- Administration Building

- All Facility Departments and Front Offices
- Finance Building
- General Council Meeting
- Human Resources Building
- Senior Center
- Tribal Health Clinic
- Youth Committee

Figure 9. Disaster Planning Survey Flyer.

The survey included questions regarding disaster preparedness, experience with natural hazards, and priorities for mitigating risk. Open-ended and multiple-choice questions were included. The complete survey and results are included in Appendix A: Planning Process Supporting Materials, under the heading "Survey Results." Thirty-three surveys were collected, and 46% of those were Tribal members. Seventy-eight percent of respondents would like to learn more about disaster preparedness and hazard mitigation. The majority said they would like to attend a community meeting to learn more about the Tribe's Hazard Mitigation Plan and disaster risk on the Reservation.

Forty-seven percent said they have experienced flooding in or near their home and only 51% keep their home clear of brush and debris to mitigate wildfire risk. Exactly 50% said they would like assistance cleaning up around their property. Extreme heat is a significant hazard on the Reservation and 28% reported they do not have a place to go if their air conditioner fails. This translates to an opportunity for the Tribe to educate people about cooling centers it has available. The majority, 85% say the access the internet for information. For those who don't access the internet, they prefer to receive text message or mail. Their biggest hazards of concern, consistent with those identified in the risk assessment, were extreme heat, earthquake, wildfire, drought, and flood.

The survey included several open ended questions. The first asked, "What can the Tribe do to reduce the risk of wildfires impacting the Reservation?" Thirty people responded to the question and their responses included clearing brush and debris, education, monitoring, and enforcing Tribal ordinances. A similar question was asked regarding what people recommend the Tribe do to curb illegal dumping. These answers included, policing the area, a free dump day, street lighting, posting signs, surveillance cameras, and enforcement of Tribal ordnances.

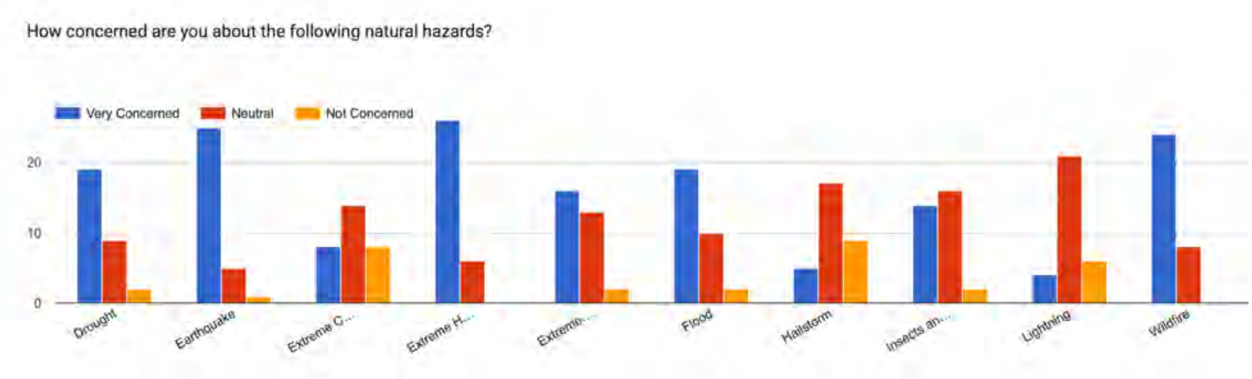

Figure 10. Survey Result: How concerned are you about the following natural hazards?

Participants were also asked, “what can the Tribe do to protect seniors, children, and vulnerable residents from the impacts of natural hazards?” Responses to this question included, educating caregivers, having community meetings, providing shelter during outages, having an emergency plan in place for vulnerable individuals, and having a Reservation-wide emergency alert system.

The TPMPT reviewed the survey responses carefully and added several mitigation actions to support the suggestions made by participants. This included, developing a program to remove brush and debris from around senior homes, expanding the emergency alert system, prevent illegal dumping on the Reservation. The survey also brought to light the need to assist residents with installing smoke alarms, only 72% reported having working smoke alarms.

3.4.3 PUBLIC FEEDBACK

The TPMPT had the opportunity to review the plan in November and by-way of a digital version distributed to all members. The plan was available in hard copy in the Emergency Management office for several weeks for anyone interested in reviewing it.

The TPMPT defined “public” for the purposes of this planning process as any Tribal stakeholder, Tribal member, or Tribal employee. The public had the opportunity to contribute data and comments as well as mitigation actions throughout the planning process by taking the public survey, participating in stakeholder meetings and reviewing the draft plan. They were given an opportunity to review the draft plan electronically or in hard copy prior to the plan being submitted to FEMA for their review. The Tribe put out a notice (included in the Appendix) on December xx that the plan was available for review in the Emergency Management office. The notice was posted at the Tribal Hall, on the bulletin board in the Administration Building and on the window of the Emergency Management office. All comments received were considered by the TPMPT.

CHAPTER 4. RISK ASSESSMENT

B1. Does the plan include a description of the type, location, and extent of all natural hazards that can affect the Tribal planning area? [44 CFR § 201.7(c)(2)(i)]

B2. Does the plan include information on previous occurrences of hazard events and on the probability of future hazard events for the Tribal planning area? [44 CFR § 201.7(c)(2)(i)]

B3. Does the plan include a description of each identified hazard's impact as well as an overall summary of the vulnerability of the Tribal planning area? [44 CFR § 201.7(c)(2)(ii)]

4.1 HAZARD IDENTIFICATION

***RISK** for the purpose of hazard mitigation planning, is the potential for damage or loss created by the interaction of natural hazards with assets, such as buildings, infrastructure, or natural and cultural resources.*

The development of a comprehensive natural hazard risk and vulnerability assessment is necessary to gain an understanding of the risks of natural disasters to the Torres Martinez Desert Cahuilla Indians Reservation and people within. This risk assessment examines the vulnerability of current and future populations and structures (including critical facilities and infrastructure) to various natural hazards. The risk assessment includes a compilation of available information and data sets to support this planning requirement. The risk assessment answers questions regarding hazard history, probability, and impacts. These answers are then used to establish mitigation actions for the Reservation. The ultimate purpose is to save lives and reduce property losses in future disasters.

The first step in the risk assessment was to review and evaluate the hazards identified for study and inclusion in the 2018 Torres Martinez Hazard Mitigation Plan (HMP), 2023 Riverside County Hazard Mitigation Plan (https://rivcoready.org/sites/g/files/aldnop181/files/2023-08/MJLHMP%208.7.23.pdf), the 2021 Imperial County Hazard Mitigation Plan (https://firedept.imperialcounty.org/wp-content/uploads/2021/01/Imperial-County-MHMP-2021-Plan-Update-2021_01_11.pdf), and the 2023 California State Hazard Mitigation Plan (https://www.caloes.ca.gov/wp-content/uploads/Hazard-Mitigation/Documents/2023-California-SHMP_Volume-1_11.10.2023.pdf). This was a key topic of discussion at the first Steering Committee meeting, along with the consideration of any additional hazards to include in the risk assessment. While only natural hazards are required to be addressed by FEMA, other hazards such as technological and human-caused hazards may be included if they are of significant concern to the community and determined to be a mitigation priority. Table 6 shows the hazards identified in other HMPs covering this area.

It was determined that some of the coastal hazards such as sea-level rise would be removed due to the Reservation's proximity to the coastline. Hazards occurring due to proximately to the Sulton Sea, tsunami, coastal flooding and seiche, would be captured in the flood hazard section. Landslides would be assessed in the earthquake and flood hazard sections while snow avalanche and volcano were removed because they are not present in the region. Dam failure is assessed in the flood section. Table 7 indicates the hazards from the California State Hazard Mitigation Plan that were excluded from this plan and provides a justification for exclusion.

Table 6. Hazards Identified in HMPs (CAOES, 2023; Riverside County, 2023; Imperial County, 2021).

Torres Martinez HMP Identified Hazards	California SHMP Identified Hazard?	Riverside County HMP Identified Hazard?	Imperial County HMP Identified Hazard?
Drought	Yes	Yes	Yes, Extreme Weather
Dust Storm and Wind Erosion	Yes, Extreme Weather	Yes, Extreme Weather	No
Earthquakes (Including Liquefaction)	Yes	Yes	Yes
Extreme Cold/Freeze	Yes	Yes, Extreme Weather	Yes, Extreme Weather
Extreme Heat	Yes	Yes, Extreme Weather	Yes, Extreme Weather
Extreme Wind	Yes	Yes, Extreme Weather	Yes, Extreme Weather
Flood	Yes	Yes	Yes
Hailstorm	Yes, Severe Wind, Weather, and Storms	Yes	Yes, Extreme Weather
Lightning	Yes, Severe Wind, Weather, and Storms	Yes	Yes, Extreme Weather
Subsidence	Yes	No	No
Tornado	Yes, Severe Wind, Weather, and Storms	Yes	Yes, Extreme Weather
Wildfire	Yes	Yes	Yes
Agricultural Pests and Diseases, and Invasive Species	Yes, Invasives and Nuisance Species	Yes	Yes
Hazardous Materials Incident	Yes	Yes	Yes

Torres Martinez HMP Identified Hazards	California SHMP Identified Hazard?	Riverside County HMP Identified Hazard?	Imperial County HMP Identified Hazard?
Human-Caused Hazard (Civil Disturbance, Terrorism, Etc.)	Yes	Yes	Yes
Levee Failure	Yes	Yes, Flood	Yes, Dam Failure
Pandemic	Yes, Epidemic, Pandemic, and Vector-Borne Disease	Yes	Yes

Table 7. Justification for Excluded Hazards.

California SHMP Identified Natural Hazards (Excluded from 2025 Torres Martinez Plan)	Justification
Sea-level Rise, Coastal Flooding, and Erosion	• Not relevant to planning area; no ocean coastal land • Salton Sea coastal flooding will be captured in flood section
Snow Avalanche	• Lack of snow accumulation and steep slopes • Not covered by Imperial or Riverside County HMPs
Volcano	• Not relevant to planning area; no volcanoes identified

The hazards identified were then categorized for ease of use in this Plan. Table 8 shows the list of hazards and the categories used to sort them in this chapter.

Table 8. TMDCI Hazards Included in this Chapter.

TMDCI Hazards	
Hydrological Hazards	Drought Flood
Geological Hazards	Earthquake Subsidence
Meteorological Hazards	Dust Storm and Wind Erosion Extreme Cold

TMDCI Hazards	
	Extreme Heat Severe Storm, Hail, Extreme Winds, Lightning Tornadoes
Biological Hazards	Agricultural Pests and Diseases, and Invasive Species Infectious Disease, Pandemic Wildfire/Brushfire
Technological Hazards	Hazardous Materials Incident

4.2 HAZARD PROFILES

Profiles have been developed for each identified hazard, organized by hazard category. Hazard profiles include the following sections: Hazard Description, Location, Previous Occurrences, Extent, Probability of Future Events, and Vulnerability Assessment; these are described in Table 9 below.

Table 9. Hazard Characterization.

Category/Method	Definition
Description	Description of hazard, its characteristics, and potential effects.
Location	Describes geographic areas within the Reservation that are affected by the hazard.
Previous Occurrences	Provides information on the history of previous hazard events for the region, including their impacts on people and property.
Extent	Describes potential strength or magnitude of a hazard. Where possible, extent is described using established scales.
Probability of Future Events	Describes likelihood of future hazard occurrences in the Reservation based on best available and climate-informed science.
Vulnerability Assessment	Describes potential impact on the community, including estimated potential losses and the anticipated effects of climate change.

__VULNERABILITY__ is a description of which assets, including structures, systems, populations and other assets as defined by the community, within locations identified to be hazard prone, are at risk from the effects of the identified hazard(s).

To describe previous occurrences, this plan update highlights major events from history but relies primarily on a roughly ten-year lookback (2013 through 2023) ending with any events from the date of plan development (2024). This helps maintain a concise narrative. Where applicable, narratives about warning times (i.e., floods, heat advisories, and wildfires) are incorporated into the *"Extent"* subsections.

The vulnerability assessment characterizes how hazards have impacted and may impact the different aspects of the community. In the vulnerability assessment sub-sections, the magnitude and likelihood of a hazard event are evaluated, and impacts are quantified using hazard models. Some hazards, like earthquakes and winter storms, will impact the entire community while other hazards, like floods and landslides, impact specific locations in the community. The areas that could be impacted are defined as the community's exposure. The results of the vulnerability assessment are used to help identify mitigation measures the community may take to lessen the impact.

***IMPACTS** are the consequences or effects of each hazard on the participant's assets identified in the vulnerability assessment. For example, impacts could be described by referencing historical disaster damages with an estimate of potential future losses (such as percentage of damage vs. total exposure).*

4.2.1 HYDROLOGICAL HAZARDS

4.2.1.1 DROUGHT

Droughts are typically defined as periods of deficient precipitation. How this deficiency is experienced can depend on factors such as land use change, the existence of dams, and water supply withdrawals or diversions. Droughts can vary widely in duration, severity, and local impact.

DESCRIPTION

Drought is a normal occurrence in virtually all climatic regions, including areas with high and low average rainfall. Drought is the consequence of a natural reduction in precipitation expected over an extended period, usually lasting a season or more. High temperatures, high winds, and low humidity can exacerbate drought conditions. In addition, human actions and demands for water resources can hasten drought-related impacts.

The National Centers for Environmental Information (NCEI) identifies drought as a "creeping phenomenon that slowly sneaks up and impacts many sectors of the economy, and operates on many different time scales."[25] Further, the National Drought Mitigation Center has classified droughts into five types: 1) meteorological, 2) hydrologic, 3) agricultural, 4) socioeconomic, or 5) ecological.[26] The definition for each of these drought classifications is shown in Table 10.

Table 10. Drought Classification Definitions.

[25] National Centers for Environmental Information (2017). "Definition of Drought." National Oceanic and Atmospheric Administration. Retrieved from https://www.ncdc.noaa.gov/monitoring-references/dyk/drought-definition.

[26] The National Drought Mitigation Center, Types of Drought. (2017). Retrieved June 19, 2017, from http://drought.unl.edu/DroughtBasics/TypesofDrought.aspx.

Drought Classification	Description
Meteorological Drought	The degree of dryness or departure of actual precipitation from an expected average or normal amount based on monthly, seasonal, or annual time scales. (Dry weather patterns dominate an area; can begin/end rapidly).
Hydrological Drought	The effects of precipitation shortfalls on stream flows and reservoir, lake, and groundwater levels. (Low water supply is evident; conditions take longer to develop and then recover).
Agricultural Drought	Soil moisture deficiencies relative to water demands of plant life, usually crops. (Crops significantly affected).
Socioeconomic Drought	The effect of demands for water exceeding the supply because of a weather-related supply shortfall.
Ecological Drought	A prolonged and widespread deficit in naturally available water supplies — including changes in natural and managed hydrology — that create multiple stresses across ecosystems

The U.S. Drought Monitor records drought in the U.S. and categorizes drought into five categories as shown in the table below.[27]

Table 11. Drought Monitor Categories.

Drought Code	Drought Severity	Drought Description and Impacts
D0	Abnormally Dry	Going into drought: short-term dryness slowing planting, growth of crops or pastures. Coming out of drought: some lingering water deficits; pastures or crops not fully recovered
D1	Moderate Drought	Some damage to crops, pastures; streams, reservoirs, or wells low, some water shortages developing or imminent; voluntary water-use restrictions requested
D2	Severe Drought	Crop or pasture losses likely; water shortages common; water restrictions imposed
D3	Extreme Drought	Major crop/pasture losses; widespread water shortages or restrictions

[27] The National Drought Mitigation Center, U.S. Drought Monitor Classification Scheme. (n.d.). Retrieved June 20, 2017, from http://droughtmonitor.unl.edu/AboutUs/ClassificationScheme.aspx.

Drought Code	Drought Severity	Drought Description and Impacts
D4	Exceptional Drought	Exceptional and widespread crop/pasture losses; shortages of water in reservoirs, streams, and wells creating water emergencies

Drought should not be viewed as merely a physical phenomenon or natural event. Its impacts on society result from the interplay between a natural event and the demand people place on water supply. Human activities often exacerbate the impact of drought. For example, excessive water use can deplete ground water supply.

One dry year does not normally constitute a drought in California, but it serves as a reminder of the need to plan for droughts. California's extensive water supply infrastructure—reservoirs, groundwater basins, and inter-regional conveyance facilities—mitigate the effect of short-term dry periods for most water users.[28] Defining when a drought begins is a function of drought impacts to water users. Hydrologic conditions constituting a drought for water users in one location may not constitute a drought for water users elsewhere or for water users having a different water supply. Individual water suppliers may use criteria such as rainfall/runoff, amount of water in storage, or expected supply from a water wholesaler to define their water supply conditions.

The Tribe utilizes groundwater and Coachella Valley Water Authority (CVWA) water for their domestic and commercial water needs. It should also be noted that the Torres Martinez Reservation is in an area considered as dry, with an average annual precipitation of less than three inches.

Drought conditions can cause a shortage of water for human consumption and reduce local firefighting capabilities. Public water suppliers may struggle to meet system demands while maintaining adequate pressure for fire suppression and meeting water quality standards.

Private well owners can be vulnerable to droughts. With declining groundwater levels, well owners may experience dry wells or sediment in their water due to the more intense pumping required to pull water from the bedrock or overburden aquifer. Wells may also develop a concentration of pollutants, which may include nitrates and heavy metals depending on local geology.

The loss of clean water for consumption and for sanitation may be a significant impact depending on the affected population's ability to quickly use a different water supply. During a drought, dry soil and the increased prevalence of wildfires can increase the number of irritants (such as pollen or smoke) in the air. Reduced air quality can have widespread deleterious health impacts but is particularly significant to the health of individuals with pre-existing respiratory health conditions like asthma (CDC).

[28] State of California Multi-Hazard Mitigation Plan, Chapter 6. (2013). Retrieved June 28, 2017, from http://www.caloes.ca.gov/HazardMitigationSite/Documents/007-SHMP%202013%20Chapter%206.pdf.

Lowered water levels can result in direct environmental health impacts, as the concentration of contaminants in swimmable bodies of water will increase when less water is present. Harmful algal blooms may occur, closing recreational areas.

One primary hazard in this plan that is commonly associated with drought is wildfire/brushfire. A prolonged lack of precipitation dries out soil and vegetation, which becomes increasingly susceptible to ignition as the duration of the drought extends. A drought may increase the probability of a wildfire occurring.

LOCATION

A drought is a regional event that is not confined to geographic or political boundaries; it can affect several areas at once. It can also range in severity across those areas. All areas of the Torres Martinez Reservation are at risk to drought occurrence.

PREVIOUS OCCURRENCES

To understand the conditions of past drought, it can be helpful to understand the typical precipitation received each year. The Western Regional Climate Center reports an annual average of 2.96 inches of precipitation at the Jacqueline Cochran Airport in Thermal (listed as the Desert Resorts Regional Airport by the Western Regional Climate Center), and monthly precipitation averages are shown in Figure 11.

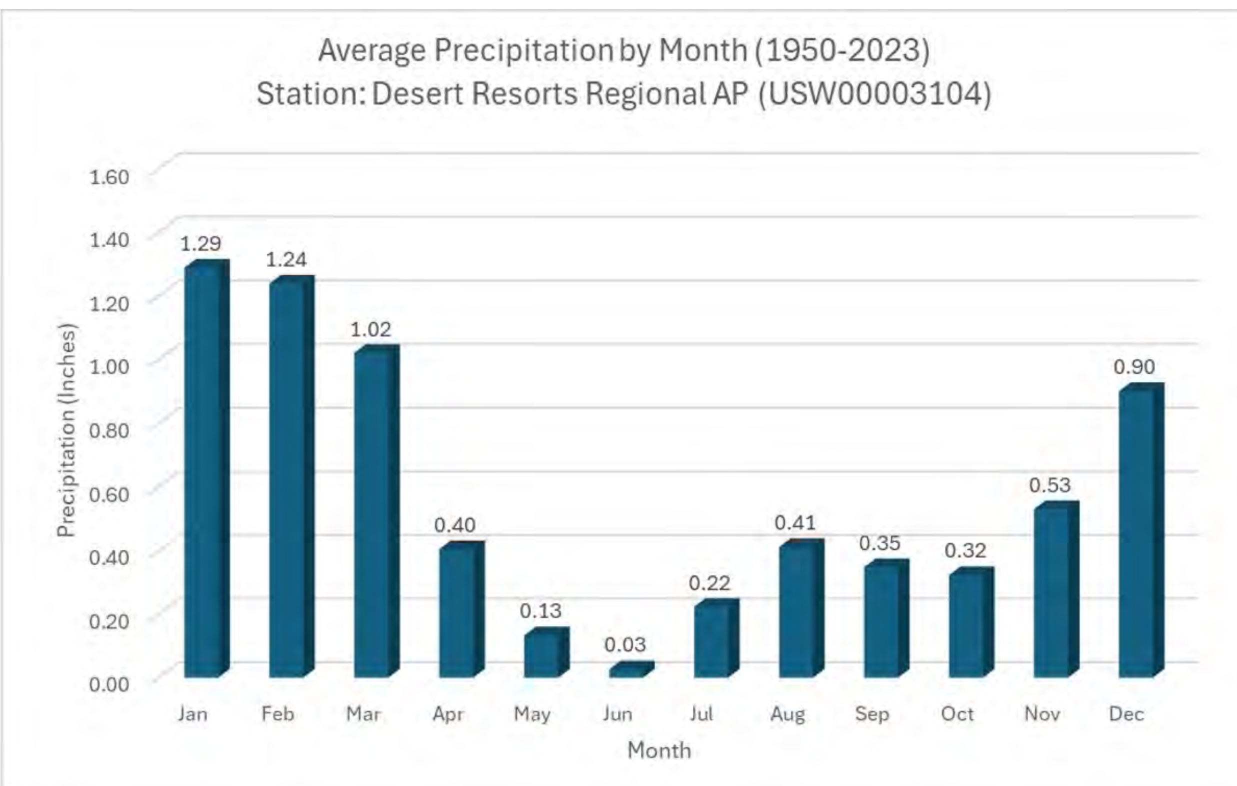

Figure 11. Average Monthly Precipitations at the Desert Resorts Regional Airport Monitoring Station in Thermal, CA.

The U.S. Drought Monitor was used to ascertain historical drought levels for Riverside and Imperial Counties. Because the U.S. Drought monitor reports drought occurrences by county, drought occurrences specific to the Reservation could not be obtained. However, due to the regional nature of drought occurrences, it can be assumed that when one or both counties was experiencing a drought, all or part of the Reservation was also experiencing similar drought conditions. The U.S. Drought Monitor reports data on drought conditions from 2000 through 2016. Drought conditions are reported by category as percentages. Therefore, it is possible that more than one drought category was reported in each week. In such cases, the highest drought category reported was used. This information is compiled and presented in the table below.

Table 12. Historic Drought Occurrences.

Abnormally Dry **Moderate Drought** **Severe Drought** **Extreme Drought** **Exceptional Drought**

Year	Imperial County	Riverside County
2000	**Moderate** (up to 4 weeks)	**Moderate** (up to 2 weeks)
2001	**Normal** (52 weeks)	**Abnormal** (up to 2 weeks)
2002	**Extreme** (up to 26 weeks)	**Extreme** (up to 32 weeks)
2003	**Extreme** (up to 9 weeks)	**Extreme** (up to 10 weeks)
2004	**Severe** (up to 19 weeks)	**Severe** (up to 28 weeks)
2005	**Moderate** (up to 6 weeks)	**Moderate** (up to 6 weeks)
2006	**Severe** (up to 2 weeks)	**Abnormal** (52 weeks)
2007	**Extreme** (up to 38 weeks)	**Extreme** (up to 38 weeks)
2008	**Severe** (up to 22 weeks)	**Severe** (up to 25 weeks)
2009	**Severe** (up to 28 weeks)	**Severe** (up to 31 weeks)
2010	**Moderate** (up to 3 weeks)	**Severe** (up to 2 weeks)
2011	**Abnormal** (up to 52 weeks)	**Abnormal** (up to 27 weeks)

Year	Imperial County	Riverside County
2012	**Moderate** (up to 48 weeks)	**Severe** (up to 41 weeks)
2013	**Severe** (up to 21 weeks)	**Severe** (52 weeks)
2014	**Extreme** (up to 22 weeks)	**Exceptional** (up to 27 weeks)
2015	**Severe** (52 weeks)	**Exceptional** (52 weeks)
2016	**Severe** (52 weeks)	**Exceptional** (up to 51 weeks)
Source: US Drought Monitor		

A search of the National Centers for Environmental Information (NCEI) Storm Events Database for the period January 2016 through September 2024 resulted in no (zero) reported drought events for Imperial County and Riverside County.[29]
The USDA declares agricultural disasters as needed for a variety of hazards. Information can be found at https://www.fsa.usda.gov/programs-and-services/disaster-assistance-program/disaster-designation-information/index.

A search of the State and County Level Records of Disaster Designation Information Made by the US Secretary of Agriculture revealed that the State of California is not listed for 2024. The table below lists the Events by the calendar year they appear in the Farm Service Agency (FSA) data files (Excel) on the USDA website.

Table 13. USDA Disasters Events That Refer to Drought.

Year	County	Event	Event "Begin Dates"
2023	Riverside	Drought - FAST TRACK	10/1/2022
2023	Imperial	Drought - FAST TRACK	10/1/2022
2022	Riverside	Drought - FAST TRACK	1/1/2022
2022	Imperial	Drought - FAST TRACK	1/1/2022

29

https://www.ncdc.noaa.gov/stormevents/listevents.jsp?eventType=%28Z%29+Drought&beginDate_mm=01&beginDate_
dd=01&beginDate_yyyy=2016&endDate_mm=09&endDate_dd=24&endDate_yyyy=2024&county=IMPERIAL%3A25&county=RIVERSIDE%3A65&hailfilter=0.00&tornfilter=0&windfilter=000&sort=DT&submitbutton=Search&statefips=6%2CCALIFORNIA).

Year	County	Event	Event "Begin Dates"
2022	Riverside	Drought - FAST TRACK	10/1/2021
2022	Imperial	Drought - FAST TRACK	10/1/2021
2022	Imperial	Drought - FAST TRACK	3/1/2022
2021	Imperial	Drought - FAST TRACK	1/1/2021
2021	Riverside	Drought - FAST TRACK	1/1/2021
2021	Imperial	Drought - FAST TRACK	10/1/2020
2021	Riverside	Drought - FAST TRACK	10/1/2020
2021	Imperial	Drought - FAST TRACK	4/6/2021
2021	Riverside	Drought - FAST TRACK	4/6/2021
2020	Riverside	Drought - FAST TRACK	10/1/2019
2020	Imperial	Drought - FAST TRACK	9/8/2020
2020	Riverside	Drought - FAST TRACK	9/8/2020
2020	Imperial	Drought - FAST TRACK	9/8/2020
2019	Imperial	Drought - FAST TRACK	10/1/2018
2019	Riverside	Drought - FAST TRACK	10/1/2018
2019	Imperial	Drought - FAST TRACK	9/10/2019
2019	Riverside	Drought - FAST TRACK	9/10/2019
2018	Imperial	Drought - FAST TRACK	1/30/2018
2018	Imperial	Drought - FAST TRACK	2/13/2018
2018	Riverside	Drought - FAST TRACK	2/13/2018
2018	Imperial	Drought - FAST TRACK	1/30/2018
2018	Riverside	Drought - FAST TRACK	1/30/2018
2018	Imperial	Drought - FAST TRACK	3/6/2018
2018	Riverside	Drought - FAST TRACK	3/6/2018

Year	County	Event	Event "Begin Dates"
2017	Imperial	Drought - FAST TRACK	1/1/2017
2017	Riverside	Drought - FAST TRACK	1/1/2017
2017	Imperial	Drought - FAST TRACK	1/1/2017
2017	Riverside	Drought - FAST TRACK	1/1/2017
2017	Imperial	Drought - FAST TRACK	1/1/2017
2017	Riverside	Drought - FAST TRACK	1/1/2017
2016	Imperial	Drought - FAST TRACK	1/1/2016
2016	Riverside	Drought - FAST TRACK	1/1/2016
2016	Imperial	Drought - FAST TRACK	1/1/2016
2016	Riverside	Drought - FAST TRACK	1/1/2016
2016	Imperial	Drought - FAST TRACK	3/8/2016
2016	Imperial	Drought - FAST TRACK	3/22/2016
2016	Riverside	Drought - FAST TRACK	3/22/2016

The severity of a drought depends on the degree of moisture deficiency, duration, spatial extent, and location relative to resources or assets.

EXTENT

Exceptional Drought is the label the U.S. Drought Monitor gives for the most severe level of drought. Since the U.S. Drought Monitor began in 2000, there have been no reported weeks where all or part of Imperial County experienced Exceptional drought, and there have been 154 weeks in which all or part of Riverside County experienced Exceptional drought conditions (2014, 2015, 2016, and 2021). The highest drought category experienced by Imperial County was Extreme drought (154 weeks) in 2002, 2003, 2007, 2014, 2018, 2020, 2021, and 2022. Figure 12 shows the drought time series developed by the U.S. Drought Monitor for Torres Martinez by 2000 to 2024. The figure shows drought severity, and the percent of the area impacted.

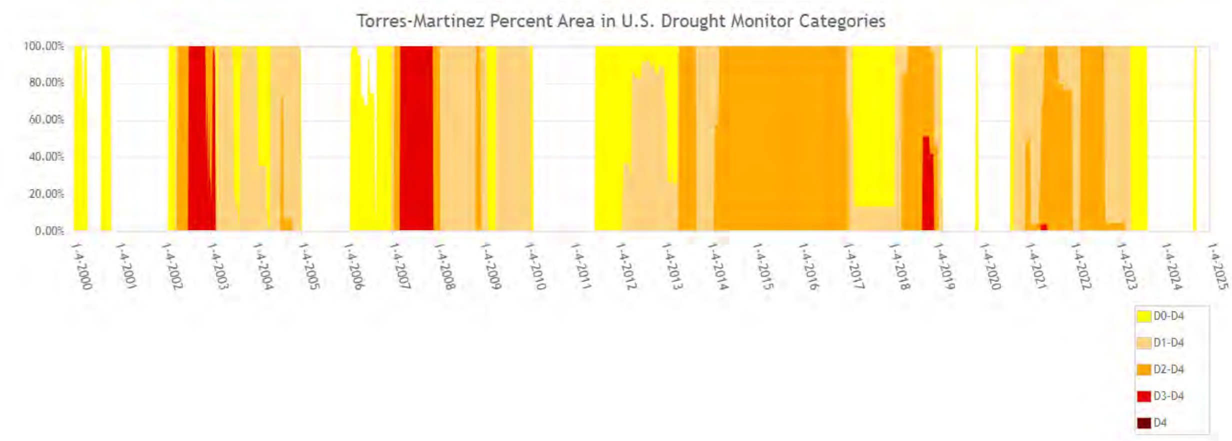

Figure 12. Drought Time Series for Torres Martinez.[30]

Droughts develop over long periods of time relative to other hazards. However, flashy droughts are changing these norms (AMS, 2017). Flashy droughts may develop quickly or quickly intensify a developing or existing drought.

NOAA and others are advancing the science of early warning for droughts like the early warnings for floods and earthquakes to better project flashy droughts. Based on projected climate change, the distributions of precipitation events will continue to become more extreme, with periods of minimal rain alternating with extreme rain events. Therefore, developing ways to project and adapt to flash droughts may be critical for sectors such as agriculture and water supply.

PROBABILITY OF FUTURE EVENTS

The US Drought Monitor provides weekly drought status reporting which was used to project an approximate probability. There have been reported drought conditions in every year on record for at least one of the two counties containing Reservation lands. Based on reported information, a probability of "highly likely" (greater than 90 percent annual probability) was assigned to the drought hazard. It should be noted that drought events are likely to span several months, or even years, adding to the probability of occurrence. Further, there is evidence that drought may be more common during El Niño years, when summers are typically warmer and drier in the western United States. El Niño occurs approximately every two to seven years.[31]Although projections of drought have not been quantified, late-summer, short-term droughts are projected to become more frequent toward the end of the century, while the risk of multiyear droughts may not change (ClimAID, 2014). The effects of drought will be exacerbated by increased evaporation of surface moisture caused by higher temperatures.

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[30] https://droughtmonitor.unl.edu/DmData/TimeSeries.aspx

[31] National Drought Mitigation Center. ENSO and Drought Forecasting. Retrieved March 30, 2014, http://drought.unl.edu/DroughtBasics/ENSOandForecasting.aspx.

The incidence of droughts over the last twenty years indicates the probability of future droughts is low to moderate.

VULNERABILITY ASSESSMENT

The atmospheric nature of drought and lack of specific boundaries make it more conducive to a qualitative assessment as opposed to a quantitative analysis, such as GIS analysis, when considering vulnerability.

EXPOSURE

It is assumed that all current and future buildings, populations, agricultural lands, critical facilities, and cultural resources on the Reservation are at risk to drought. Most drought impacts, however, are not structural but societal in nature.

BUILT ENVIRONMENT IMPACTS

Drought presents a major concern in terms of water supply for commercial, household, safety, and landscaping needs. For instance, the Reservation relies on groundwater; during times of significant drought, the water table may be drawn down, which could impact the flow of artesian wells or make the Reservation more susceptible to sinkholes, especially during an earthquake event.

Water is also needed to manage wildfires. A lack of, or limited, water supply presents wildfire management vulnerability. Substantial water is needed to fight wildfires, which are also more frequent in dry conditions. While water for firefighting is a priority and no restrictions are in place, a lack of availability could slow this capability.

Regarding agriculture, drought may impact water supply, prompt water conservation measures, and damage agricultural crops and landscaping. Drought may increase the rate of wind erosion or occurrence of dust storms if soils become dry and loosened. Drought may also place stress on crops and landscaping, making them more susceptible to pests and disease.

Limited damage reports make estimating dollar loss to drought challenging. While some direct losses are possible (particularly to agriculture or landscaping), indirect losses may be more severe, e.g. impacts to business and water prices. There may also be increased damage in the event of a wildfire given reduced water capacity.

POPULATION IMPACTS

Populations considered most vulnerable to drought impacts are identified based on a number of factors including their physical and financial ability to react or respond during a hazard. The senior and low-income populations in the Reservation are described in the flood vulnerability assessment. It should be noted that there may be overlap within the two categories, so that the total number of persons exposed may be lower than what is shown in the table. However, the Tribe should be aware of the potential needs of residents within these population segments in the event of a hazard occurrence. Socioeconomic impacts of the drought may also include anxiety and depression about economic impact, health problems associated with poor water quality, fewer recreational activities, higher incidents of heat stroke, and even loss of human life.

ENVIRONMENT IMPACTS

The agriculture in and around the Reservation would be impacted by drought conditions and there are some natural areas which may also be impacted. Drought amplifies the risk of loss of biodiversity and affects animal and plant species. Economic impacts include higher food prices. Drought can shrink the food supplies of animals and plants dependent on water and damage their habitats. Sometimes the environmental damage caused by a drought is temporary, and other times it is irreversible.

Climate Change Impacts

Climate change can be expected to increase drought frequency and severity on the Reservation. Warmer temperatures cause drought conditions by reducing soil moisture. Average maximum temperatures on the Reservation are projected to increase from a baseline of 88.9°F to upwards of 93.8 by 2050°F and 96.7°F by 2099. Figure 49, located in the Extreme Heat hazard profile, shows the projected increase in average maximum temperatures on the Reservation under different emissions scenarios and timelines). Further, it is unlikely that the effects of warmer temperatures on drought will be offset by increased precipitation; precipitation is projected to remain the same under a lower emissions scenario and an increase of up to 0.4 inches is projected under a high emissions scenario (from 2070 to 2099).[32]

This information indicates that droughts on the Torres Martinez Reservation could be more frequent and pronounced, which could lead to increased drought-related impacts on water quality and quantity, regional agriculture, local flora, and the local economy.

PROBLEM STATEMENTS FOR DROUGHT

Table 14. Problem Statements for Drought.

Assets	Problems Associated with Drought
People (including underserved communities and socially vulnerable populations)	• Vulnerable communities may have difficulty accessing potable water during an emergency drought event. If the water levels are at emergency levels, having a plan to get vulnerable people water should be considered.

[32] Annual Averages. (2017). Cal Adapt. Retrieved July 19, 2017 from http://cal-adapt.org/tools/annual-averages/#climatevar=pr&scenario=rcp85&lat=33.53125&lng=-116.09375&boundary=locagrid&units=inches%20per%20day.

Assets	Problems Associated with Drought
Structures (including facilities, lifelines, and critical infrastructure)	• Water supply infrastructure may need to be shut down and water quality may become substandard. Businesses requiring water for daily operations may have their operations limited due to water restrictions. • Some of the water infrastructure is aging and needs to be replaced.
Systems (including networks and capabilities)	• Outdoor water use restrictions and other water conservation measures during periods of extreme drought can be challenging to enforce, even when mandated through Tribal declaration.
Natural, historic, and cultural resources	• Rivers and wetlands may be adversely impacted by the drought. • Younger trees and dwarf tree varieties may be adversely impacted since they have a smaller root system.
Activities that have value to the community	• Water-based activities may be impacted.

4.2.1.2 FLOODING

Nationally, flooding causes more damage annually than any other severe weather event. In terms of recent disasters and the probability of future destruction at increasing magnitudes, floods represent one of California's most destructive sources of hazard, vulnerability, and risk (source: 2023 California State Hazard Mitigation Plan).

DESCRIPTION

Flooding is a very frequent, dangerous, and costly hazard. Globally, it accounts for 40 percent of all-natural disasters and results in an average of over 5,000 deaths annually.[33] In 2023, flooding in the U.S. resulted in 79 deaths with 10 deaths in California.[34] Nearly 90 percent of all presidential disaster declarations result from natural events where flooding was a major component.

Flooding is the most common environmental hazard, due to the widespread geographical distribution of valleys and coastal areas, and the population density in these areas. The severity of a flooding event is typically determined by a combination of several major factors, including stream and river basin topography and physiography; precipitation and weather patterns; recent soil moisture conditions; and the degree of vegetative clearing and impervious surface. Flooding events can be brought on by severe (heavy) rain. There are several types of flooding which are presented below:

- Flash Flooding:

[33] Data from 1980-2023. https://www.emdat.be/.

[34] https://www.weather.gov/arx/usflood.

  - Flash floods occur within a few minutes or hours of heavy amounts of rainfall and can destroy buildings, uproot trees, and scour out new drainage channels. Heavy rains that produce flash floods can also trigger mudslides and landslides. Most flash flooding is caused by slow-moving thunderstorms or cyclones, repeated thunderstorms in a local area, or by heavy rains from hurricanes and tropical storms. Although flash flooding often occurs in mountainous areas, it is also common in urban centers where much of the ground is covered by impervious surfaces.

- Sheet Flooding:
  - Sheet flooding is a condition where storm water runoff forms a sheet of water to a depth of six inches or more. Sheet flooding and ponding are often found in areas where there are no clearly defined channels, and the path of flooding is unpredictable. It is also more common in flat areas. Most floodplains are adjacent to streams or oceans; although almost any area can flood under the right conditions where water may accumulate.
- Urban Flooding:
  - Urban flooding is usually caused by heavy rain over a short period of time. As land is converted from fields or woodlands to roads and parking lots, it loses its ability to absorb rainfall. Since sidewalks and roads are non-absorbent, rivers of water flow down streets and into sewers. Roads and buildings generate more runoff than tropical forestland. Fixed drainage channels in urban areas may be unable to contain the runoff that is generated by relatively small but intense rainfall events. Urbanization increases runoff two to six times over what would occur on natural terrain. This high volume of water can turn parking lots into lakes, flooding basements and businesses, and cause lakes to form in roads where drainage is poor or overwhelmed.
  - Urban flooding occurs where there has been development within stream floodplains. This is partly a result of the use of waterways for transportation purposes in earlier times. Sites adjacent to rivers and coastal inlets provided convenient places to ship and receive commodities. The price of this accessibility has increased flooding in the ensuing urban areas. Urbanization intensifies the magnitude and frequency of floods by increasing impermeable surfaces, amplifying the speed of drainage collection, reducing the carrying capacity of the land and, occasionally, overwhelming sewer systems.
- Riverine Flooding:
  - Periodic flooding of lands adjacent to non-tidal rivers and streams is a natural and inevitable occurrence. When stream flow exceeds the capacity of the normal watercourse, some of the above-normal stream flows onto adjacent lands within the floodplain. Riverine flooding is a function of precipitation levels and water runoff volumes within the watershed of a stream or river. The recurrence interval of a flood is defined as the average time interval, in years, expected to take place between the occurrence of a flood of a particular magnitude and an equal or larger flood. Flood

magnitude increases with increasing recurrence interval. The flooding around the Salton Sea is considered riverine flooding by FEMA.

Tribal members have also noted flooding associated with flowing artesian wells occurring on the Reservation. An artesian well taps into a confined aquifer, or an aquifer that is confined by an impervious layer of rock or sediments. Water in a confined aquifer is under pressure; therefore, when water in a confined aquifer is tapped, pressure causes the water to rise without using a pump. A flowing artesian well occurs when the pressure in the confined aquifer is great enough to cause the water to rise above the surface of the land. These events can be continuous or intermittent.[35] Flowing artesian wells can result in localized flooding or pooling water. They can also waste groundwater and cause lower pressure at other wells tapping the same aquifer, causing reduced flows.

In addition to flooding types, there are several types of floodplains. All the flood types described above may occur within a floodplain. However, the flooding may not occur in a designated floodplain.
As noted above, the periodic flooding of lands adjacent to rivers, streams and shorelines (land known as floodplain) is a natural process that has some chance of occurrence each year. Flood frequencies such as the 100-year flood are determined by plotting a graph of the size of all known floods for an area and determining how often floods of a particular size occur. Another way of expressing the flood frequency is the chance of occurrence in a given year, which is the percentage of the probability of flooding each year. For example, the 100-year flood has a 1.0-percent chance of occurring in any given year, and the 500-year flood drops to a 0.2-percent chance of occurring in any given year. Therefore, they are commonly referred to as the 1.0-percent annual chance flood and 0.2-percent annual flood, respectively. It should be noted that flooding is possible every year and even multiple times each year. Floodplains are designated by the frequency (and severity) of the flood that is large enough to cover them. For example, the 10-percent annual chance floodplain (10-year floodplain) will be covered by the 1.0-percent annual chance floodplain (100-year floodplain) and the 1.0-percent annual chance floodplain by the 0.2-percent annual chance floodplain and 0.1-percent annual chance floodplains (500-year and 1,000-year floodplains).

The U.S. Army Corps of Engineers (USACE) and FEMA have a role in defining floodplain. The USACE calls a 100-year (1.0-percent annual chance flood) an Intermediate Regional Flood, while a Standard Project Flood describes a major flood that could be expected to occur from a combination of severe meteorological and hydrologic conditions. FEMA develops Flood Insurance Rate Maps (FIRMs) to indicate areas where mandatory flood insurance requirements apply (the 100-year flood). They are also used for planning purposes to identify hazard areas. The FIRM, a paper document, has been digitized to permit mapping (known as a digital FIRM, a DFIRM). Although an all-inclusive description of FEMA flood zones is not included in this document, brief descriptions of the zones appearing on the FIRMs for the planning area are as follows:

- Zone A, AE, AO

[35] British Columbia. (n.d.) Flowing Artesian Wells. Retrieved June 30, 2017 from http://www.env.gov.bc.ca/wsd/plan_protect_sustain/groundwater/flowing_artesian_wells.pdf.

- Zone A is the flood insurance rate zone that corresponds to the 1.0-percent annual chance floodplains determined in the Flood Insurance Study by approximate methods. Because detailed hydraulic analyses are not performed for such areas, no Base Flood Elevations (BFEs) or depths are shown within this zone. Mandatory flood insurance purchase requirements apply.
- Zones AE is the flood insurance rate zone that corresponds to the 1.0-percent annual chance floodplains determined in the Flood Insurance Study by detailed methods. In most instances, BFEs derived from the detailed hydraulic analyses are shown at selected intervals within this zone. Mandatory flood insurance purchase requirements apply.
- Zone AO is a flood insurance rate zone that corresponds to the 1.0-percent annual chance shallow flooding (usually sheet flow on sloping terrain) where average depths are between one and three feet. Average flood depths derived from detailed hydraulic analyses are shown in this zone. Mandatory flood insurance purchase requirements apply.

- 0.2-percent-annual-chance (or 500-year) flood
  - This area corresponds to the 0.2-percent annual chance flood areas.
- Zone D
  - The Zone D designation is used for areas where there are possible but undetermined flood hazards, as no analysis of flood hazards has been conducted. The designation of Zone D is also used when a community incorporates portions of another community's area where no map has been prepared. Flood insurance is available in Zone D and property owners are encouraged to purchase it, but flood insurance is not mandatory.
- Zones B, C, and X
  - Zones B, C, and X are the flood insurance rate zones that correspond to areas outside the 1.0-percent annual chance floodplains, areas of 1.0-percent annual chance sheet flow flooding where average depths are less than one foot, areas of 1.0-percent annual chance stream flooding where the contributing drainage area is less than one square mile, or areas protected from the 1.0-percent annual chance flood by levees. No base flood elevations or depths are shown within this zone. Typically, B and X (shaded) are moderate flood hazard areas, while C or Zone X (unshaded) or minimal flood hazards areas. Note: shade zone X is used in place of Zone B on new maps, and unshaded Zone X is used in place of Zone C on new maps. It should be noted that flooding is possible outside of any defined flood zone. In fact, areas subject to flash flooding are often not captured on the maps. In addition, the flood event may be more severe than the 100-year or 500-year flood zones. In this case, water would go beyond these anticipated areas. Further, development can also alter where water goes in terms of the amount of drainage capability and where water travels. Areas that have not flood historically should not be considered immune from such an event.

The flood hazard area information presented in this risk assessment reflects effective FIRMs for Imperial County and pending FIRMs for Riverside County, which were last updated in 2022.

El Niño–Southern Oscillation (ENSO Cycle) and Flooding

El Niño can be described as warmer than normal sea temperatures in the equatorial Pacific. Southern Oscillation is defined as a "seesaw of atmospheric pressure between the eastern equatorial Pacific and Indo–Australian areas." The two are closely linked and together called El Niño–Southern Oscillation (ENSO) events.[36] During this event, El Niño is the sea temperature component while Southern Oscillation is the atmospheric pressure component. The systems can impact weather patterns throughout the globe when in effect.

In the western U.S., El Niño is known to cause very wet winters. In general, the effect of El Niño on Southern California, and thus the Torres Martinez Reservation, is increased rainfall with accompanying floods and landslides. (Coastal erosion is also anticipated but not applicable to the Tribal area. Riverine erosion, however, may be an associated impact of increased flooding).[37]

Levee Failure

Worldwide interest in levee safety has risen significantly in recent years. Aging infrastructure, new hydrologic information, and population growth in floodplain areas near levees have resulted in an increased emphasis on safety, operation, and maintenance.

A levee is a man-made structure, usually an earthen embankment, intended to contain, control, or divert the flow of water to reduce risk to flooding. Levees are typically built parallel to a waterway, such as a river or canal, to reduce flood risk to the landward side. Floodwalls made of concrete or steel are often constructed on the levee crown to increase the height of levee without increasing the base. Figure 13 shows the typical components of a levee.[38]

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[36] http://drought.unl.edu/DroughtBasics/ENSOandForecasting.aspx.

[37] Creating an Earth System: El Nino. Retrieved March 30, 2015 http://www.ucmp.berkeley.edu/education/dynamic/session4/sess4_hydroatmo3.htm.

[38] What is a Levee?. (n.d.). FEMA. Retrieved October 5, 2017 from https://www.fema.gov/media-library-data/1463585105805-48106ac358b81c67287ea9021db17804/What_is_a_Levee_0512_508.pdf.

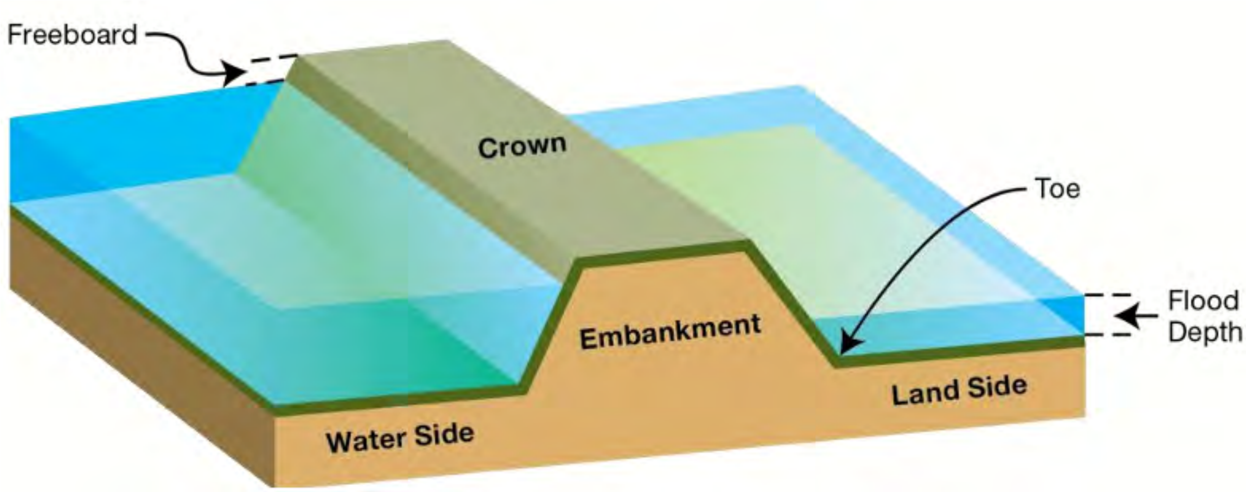

Figure 13. Typical Levee Components.

While levees are designed to reduce flood risk, they do not eliminate risk entirely. It is possible for a flood to exceed the capacity of a levee, no matter how well the structure is built. Levees are designed to control a certain amount of floodwater and can be overtopped or fail when flood events exceed that level. Levee failures can also result from one or more of the following:

- Prolonged periods of heavy rainfall and flooding;
- Failure of an upstream dam;
- Structural deficiencies resulting from improper construction or maintenance;
- Earthquakes and seismic activity;
- Erosion;
- Seepage; and
- Burrowing animals.

The USACE administers a Levee Safety Program to oversee certified levee construction and maintenance. Levees must be certified by USACE, FEMA, or other accepted state or federal agencies in order to be considered in FEMA flood mapping.

Erosion and Other, Secondary Hazards: The most problematic secondary hazards for flooding are fluvial erosion, riverbank erosion, and landslides affecting infrastructure and other assets located within floodplains. Without the space required along river corridors for natural physical adjustment, such changes in rivers after flood events can be more harmful than the actual flooding. The impacts from these secondary hazards are especially prevalent in the upper courses of rivers with steep gradients, where floodwaters may pass quickly and without much damage, but scour the banks, edging buildings, and structures closer to the river channel or cause them to fall in. Landslides can occur following flood events when high flows oversaturate soils on steep slopes, causing them to fail. These secondary hazards also affect infrastructure.

Roadways and bridges are impacted when floods undermine or wash out supporting structures. Dams may fail or be damaged, compounding the flood hazard for downstream communities. Failure of wastewater treatment plants from overflow or overtopping of hazardous material tanks and the dislodging of hazardous waste containers can occur during floods as well, releasing untreated wastewater or hazardous materials directly into storm sewers and rivers. Flooding can also impact public water supplies and the power grid in similar ways, through inundation and/or erosion.

LOCATION

The Torres Martinez Reservation is in the Salton Basin. In 1905, agricultural canals channeling water from the Colorado River were breached, flooding part of the Reservation and creating what is now the Salton Sea. Approximately 40-percent of the Reservation remains inundated by waters from Salton Sea, which continues to be fed by agricultural runoff. The Whitewater River flows north to south from the San Bernardino Mountains through Reservation lands into the northwestern tip of the Salton Sea. In addition, the Travertine Palms Wash, and the Wonderstone Wash drain water from the Santa Rosa Mountains (southeast) into the Salton Sea, running through portions of the Reservation. Since flooding is possible and often occurs outside of flood hazard areas (e.g., flash flooding), understanding stream location can help determine hazard location. For example, a more severe event, such as one greater than the 500-year flood, could easily exceed the FEMA flood hazard boundaries. While not major streams, each of these has the potential to flood. Further, the planning area is subject to flash flooding which could impact the entire Reservation.

Figure 14 shows the various FEMA flood hazard areas present on the Torres Martinez Reservation. Of the 37.54 square miles of Reservation land, there are 19.17 square miles of land in Zones A, AE, and AO (1.0 percent annual chance flood), including 0.07 square miles of land in floodways. There are 0.11 square miles of land in 0.2 percent annual chance flood areas (Zone X). In total, there are 19.28 square miles of floodplain areas on the Reservation, or of 51.4 percent of Reservation lands. Further, it should be noted that there are 9.95 square miles of land on the Reservation designated as Zone D, which represents areas of possible but undetermined flood hazard. Zone D areas make up 26.5 percent of the Reservation. There are also 1.93 square miles (5.1% of Reservation lands) protected by levees. Table 15 summarizes the area in each flood hazard zone. The totals included above include some portions of the Reservation inundated by the Salton Sea, as shown on the map below.

Table 15. FEMA Flood Hazard Areas on the Torres Martinez Reservation.

Flood Hazard Area	Area (square miles)	% of Reservation Lands
1.0-percent annual chance flood	19.17	51.1%
Zone A	8.47	22.6%

Flood Hazard Area	Area (square miles)	% of Reservation Lands
Zone AE	3.16	8.4%
Zone AE, Floodway	0.07	0.2%
Zone AO	7.47	19.9%
0.2-percent annual chance flood	0.11	0.3%
Zone D	9.95	26.5%
Levee-Protected Area	1.93	5.1%
TOTAL POTENTIAL FLOOD AREA	**31.16**	**83.0%**

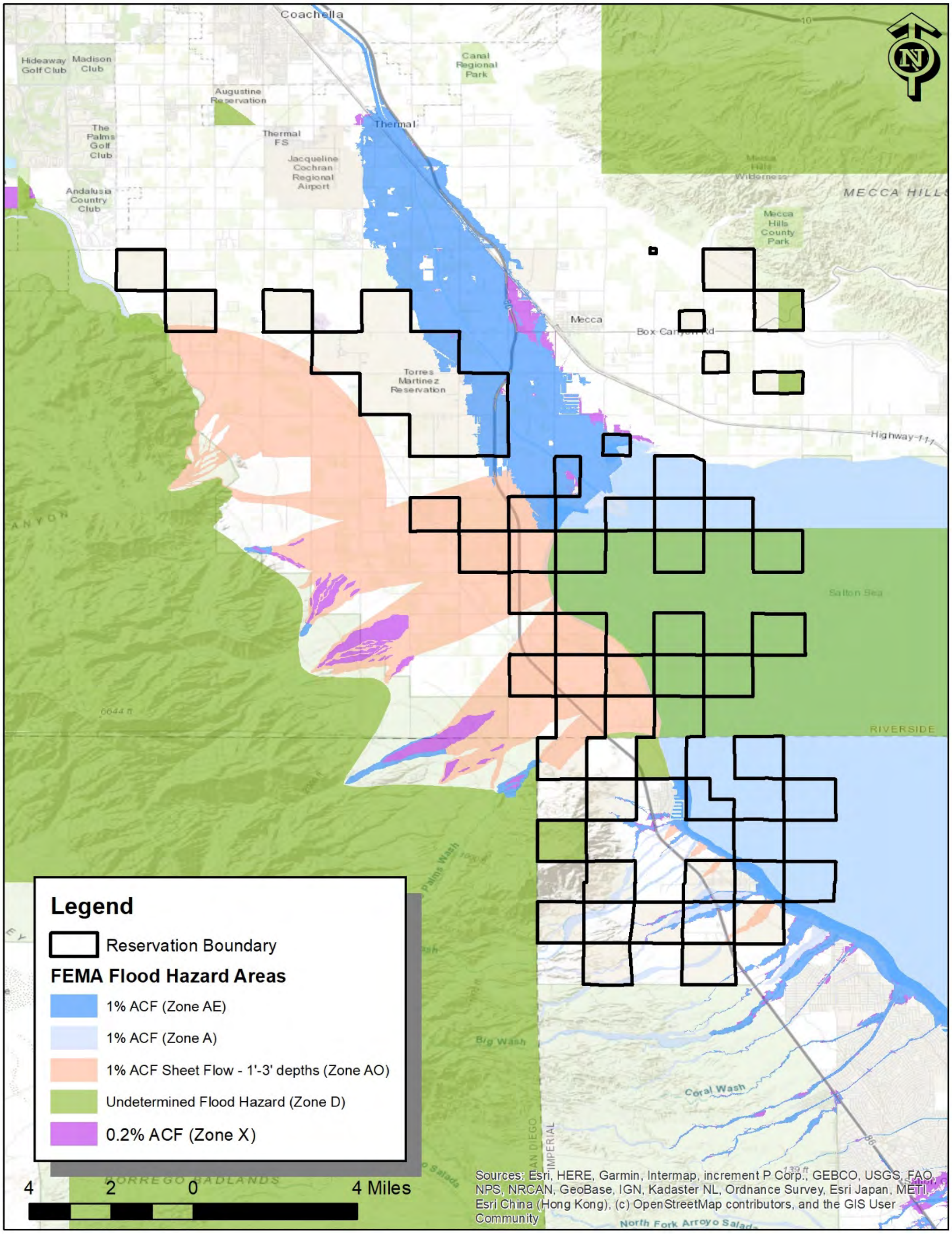

Figure 14. FEMA Flood Hazard Areas.

Two levees reduce flood risk within the Torres Martinez Reservation Figure 15. One levee exists directly northwest of the Torres Martinez Reservation and crosses 64th and 62nd Avenues (Dike Number 4, owned by the Coachella Valley Water District). Another levee exists along the Whitewater River, from the river's outlet into the Salton Sea to north of the Reservation (the Coachella Valley Stormwater Channel levee). This levee is not currently certified and is not accounted for on FEMA FIRMs; therefore, the area for which it could reduce flood risk (equivalent to the AE flood zone in Riverside County) was considered to be in the 1.0 percent annual chance flood for flood analysis purposes. According to the Coachella Valley Water District, parts of this levee may become re-certified through ongoing and proposed projects, but it is unlikely that the entire reach will become re-certified. Maps of areas likely to have reduced flood risk resulting from levee recertification projects are provided in Figure 15.

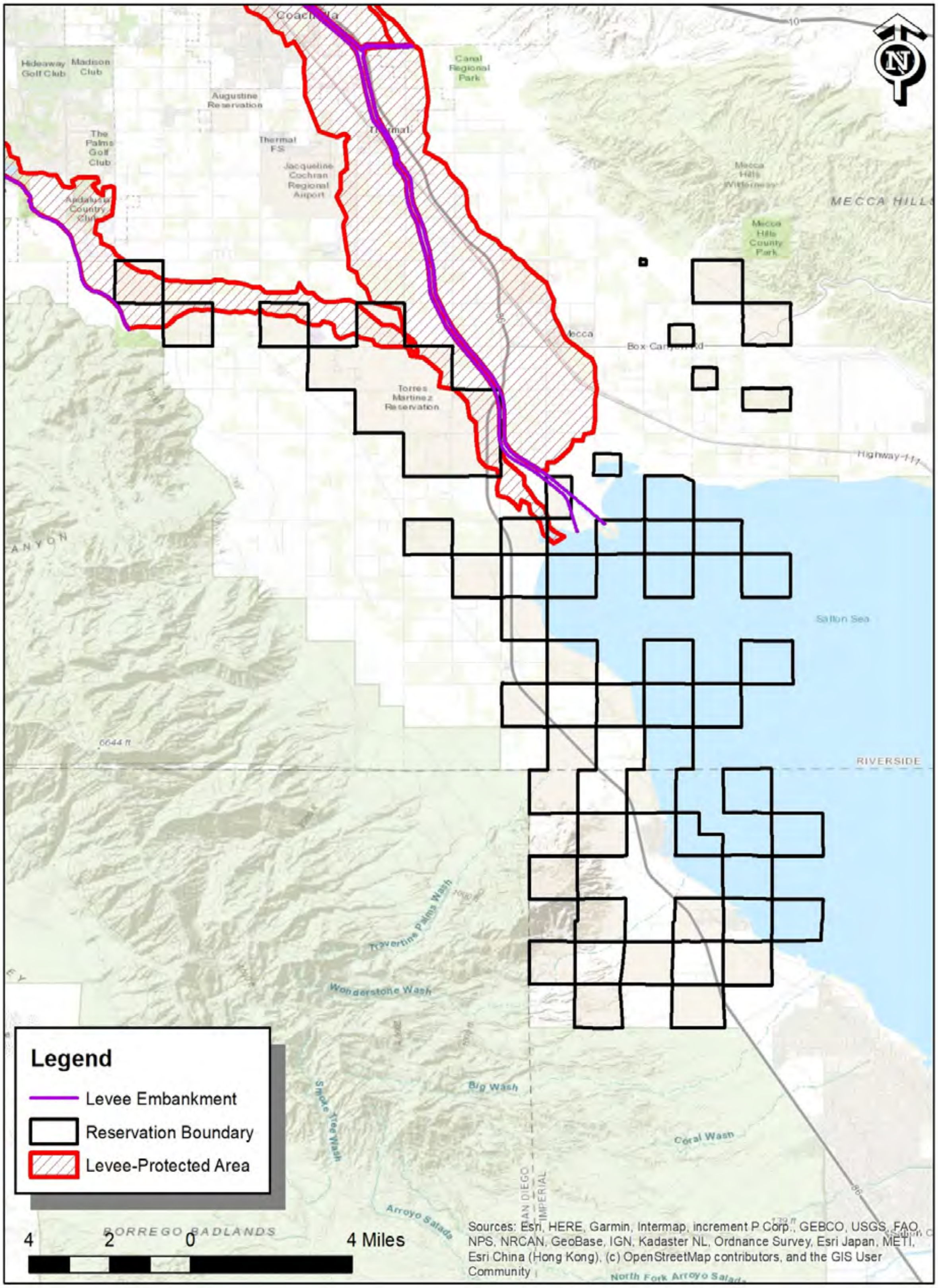

Figure 15. Torres Martinez Levee-Protected Areas.

PREVIOUS OCCURRENCES

There were 120 flood events reported over a 10-year period throughout Imperial and Riverside Counties, as reported by NCEI, from 2013 until 2023. Two of those events were reported in Thermal, the town most closely associated with the Torres Martinez Reservation. No deaths or injuries are associated with these events. It is likely that not all previous flood events have been reported. Detailed information on the NCEI-reported flood events reported in Thermal can be found in Table 16.

Table 16. Flood Occurrences Impacting Thermal, California (Riverside County).

Date	Event Type	Property Damage (2017 dollars)	Crop Damage (2017 dollars)	Details
9/7/2014	Flash Flood	$0	$0	Weakening Hurricane Norbert helped draw significant moisture into southwest California on the 7th. Early morning thunderstorms on the 8th drenched parts of the Coachella Valley. Rainfall rates were up to 2 inches per hour at times, producing widespread flash flooding, most notably in the Coachella Valley on September 8th. A complete storm survey was done in Riverside City and in the Coachella Valley.
7/17/2015	Flash Flood	$0	$0	Considerable moisture from Hurricane Dolores to the south, along with monsoon moisture from the southeast resulted in widespread showers and thunderstorms over most of the HSA for the 17th-19th. Rainfall ranged from one-half of an inch up to around 4 inches.

In Imperial County, 77 flood and flash flood events were reported between January 2016 and September 2024. Of those events, none was in the town of Thermal, none had recorded injuries, and one flash flood event in 2021 had two deaths recorded in Palo Verde (NOAA NCDC, 2024).

In Riverside County, 189 flood and flash flood events were reported between January 2016 and September 2024. Of those events, four had recorded injuries (ten injuries at Murrietta Airport in January 2017, one injury at South Temecula Ranch in January 2017, one injury associated with a flash flood at Mecca in September 2018, and four injuries associated with a flash flood at Murrietta in February 2019), and one had a recorded death associated with a flash flood at Mortmar in September 2018 (NOAA NCDC, 2024).

In addition to the events listed above, several other events were found through a search of local news sources, including:

- A flood event in September 2012 caused several mobile home parks and homes to flood in Mecca and Thermal. The Reservation's Desert Sun Mobile Home Park (Duroville) was heavily damaged and evacuated for a week; over 3 feet of standing water was reported in some locations. An elementary school in Mecca was also flooded. Thermal received 3.23 inches of rain in eight hours[39] (for comparison, the average annual rainfall for Thermal is 2.96 inches).

- In September 1976, the remnants of Hurricane Kathleen passed through the Imperial and Coachella valleys, causing heavy rainfall and flooding. The Torres Martinez Reservation is an area that received 3 to 5 inches of rain from the event.[40] While damages specific to the Reservation could not be found, it is assumed the Reservation was impacted, as most surrounding cities in Imperial and Riverside County reported major damages, included damages to crops, private property, and infrastructure. In total, the region reported over $800 million in damages (2017 dollars) and 12 deaths.[41] The storm was described by NASA and the Associated Press as a one-in-160-year event.[42] A Presidential Disaster declaration was made for both Imperial and Riverside Counties following the event.

Aside from flooding and flash flooding events, the Reservation has experienced several other water-related hazards, as described below:

August 27, 2013, Stormwater Evacuation Pond Breach

This incident occurred when a stormwater evacuation pond located at the corner of Fillmore Street and Avenue 62 breached and flooded nearby roadways. The Coachella Valley Water District closed the

[39] Rare storm floods Coachella Valley towns. (2012). Associated Press. Retrieved October 19, 2017, from http://www.sfgate.com/news/article/Rare-storm-floods-Coachella-Valley-towns-3858117.php#photo-3441689.
[40] Hurricane Kathleen – September 7-12, 1976. (n.d.). NOAA. Retrieved October 24, 2017, from http://www.wpc.ncep.noaa.gov/tropical/rain/kathleen1976.html.
[41] Raftery, M. (2015). Hurricane Kathleen Anniversary: A look back at the worst storm ever to hit our region. East County Magazine. Retrieved October 24, 2017, from https://www.eastcountymagazine.org/hurricane-kathleen-anniversary-look-back-worst-storm-ever-hit-our-region.
[42] Notable tropical cyclones in Southern California history. (2012). NASA. Retrieved October 24, 2017, from https://www.nasa.gov/topics/earth/features/earth20121017.html.

affected road areas and diverted water down Fillmore Street to a culvert located at Fillmore Street and Avenue 66. One Tribal member's driveway access was impacted during the event. Figure 16 and Figure 17 show the areas impacted by the event.

Figure 16. Tribal Member Flooded Driveway Access.

Figure 17. Flooding on Fillmore Street.

August 11, 2014, CVWD Canal/Roadway Undermining

Torres Tribal Emergency Management was informed that the canal was flowing at a high volume and speed, causing soil erosion that was undermining Avenue 68. The affected road area was barricaded, and the undermined area was filled in by Coachella Valley Water District two days later. Figure 18 and Figure 19 show the impacted area impacted before and after being repaired.

Figure 18. Avenue 68 Undermined by the Canal.

Figure 19. The Repaired Embankment.

August 20, 2023, Tropical Storm Hilary

According to NOAA, Hurricane Hilary (August 16-20, 2023), which appears to have originated from a tropical wave off the west coast of Africa, moved quickly westward across the Caribbean Sea and crossed Central America into the eastern Pacific basin late on August 12, 2023, strengthening to an offshore hurricane on August 17 before making landfall as a tropical storm in the Mexican state of Baja California on August 20, 2024. Hilary then lost strength and moved north toward San Diego, Los Angeles, and the Inland Empire.

Southern California experienced significant damage from flooding and debris flows. Some roads and bridges were washed out in Riverside, San Bernardino, and San Diego Counties, and a train derailment occurred around the Whitewater River Channel. Several parts of Interstate 10 were closed due to flooding, including a 30-mile stretch in Riverside County between Bob Hope Drive and Indian Canyon Drive that was inundated by water, mud, and debris. Generally minor wind damage was reported as strong winds brought down some trees and large branches, and media reports indicate that tens of thousands of southern California customers lost power during the event, many in Riverside and San Bernardino Counties. Gusty winds blew over a couple of semi-trucks on Interstate 8 in Imperial County.[43]

Tropical Storm Hilary impacted southern California and caused $126M in property damage throughout Riverside County with most damage in the Coachella Valley.[44] Tribal members describe high wind and flooding which impacted the community although major damage was not documented.

[43] https://www.latimes.com/environment/story/2024-02-22/hilary-was-not-a-tropical-storm-when-it-hit-california; and 2) https://www.nhc.noaa.gov/data/tcr/EP092023_Hilary.pdf.
[44] https://rivco.org/news/tropical-storm-hilary-damages-top-126-million-countywide-damage-still-being-assessed-coachella.

September 1-2, 2023, Monsoonal Activity

Local media reported that from September 1-2, 2023, nearly three inches of rain fell during monsoonal activity across the eastern Coachella Valley. The Riverside County Board of Supervisors formally declared a local emergency stemming from storm-related impacts at a landfill in eastern Riverside County, where there were initial concerns about pollutants streaming out of the space into communities. The County Department of Health sampled local ponds downstream and determined that no off-site migrations of contaminants had occurred. Reports indicated that the monsoonal activity caused widespread flooding in parts of Mecca, Oasis, and Thermal, including within the Torres-Martinez Desert Cahuilla Indian Reservation.[45]

No instances of levee failure were reported by the Tribe; no incidents were found after searching media sources.

EXTENT

Flood extent can be measured in terms of damage, gage height, or return period. USGS gage information was collected from two nearby gages in Mecca (about 1.5 miles from the Reservation) - one at the Whitewater River and one at the Salton Sea. A peak streamflow of 2,500 cubic feet/second was recorded in 1969 at the Whitewater River gage and a peak streamflow of 9,900 cubic feet/second was recorded in 1976 at the Salton Sea gage. For reference, the average peak flow from 1961 to 2022 was 95.4 cubic feet/second at the Whitewater gage and the peak streamflow the previous year was 21 cubic feet/second at the Salton Sea gage (data not available to average). The highest recorded gage height was 15.30 feet at the Whitewater River gage and 16.90 feet at the Salton Sea gage.[46] Stream gage values are presented in Table 17. Deaths and injury are possible, particularly to people driving through moving water.

Table 17. Stream Gage Values Near the Torres Martinez Reservation.

Gage Name	Peak Flow (cfs)	Year	Average Peak Flow (cfs) 1961-2022	Maximum Recorded Gage Height (ft)
Whitewater River near Mecca	2,500	1969	95	15.30
Salton Sea	9,900	1976	N/A	16.90

The extent of levee failure is difficult to determine given the lack of historic incidents. Extent could be measured by damages reported. Damaging events are possible.

PROBABILITY OF FUTURE EVENTS

Areas with designated FEMA special flood hazard areas are subject to an approximate annual probability of flooding of at least 1.0 percent. This results in varying degrees of probability across the Reservation.

[45] https://kesq.com/news/2023/09/11/board-declares-emergency-due-to-storm-damage-east-valley/.
[46] https://nwis.waterdata.usgs.gov/.

Flood events will remain a threat on the Reservation, as discussed further in the vulnerability assessment.

NCEI's Storm Events Database indicated 2 events occurred in Thermal between 2013 and 2023, and four other flood events were reported from local news sources. This results in a historic occurrence rate of one event every 1.8 years. However, this rate only considers floods reported in Thermal; it is likely floods occurred on other parts of the Reservation that were not reported by NCEI or heavily covered by the media. Based on reported historic occurrences and the proportion of the Reservation located in flood hazard areas, the flood hazard was assigned a probability of likely (10 to 90 percent annual chance). Although flooding does not occur annually, flood events, particularly flash flooding, can cause tremendous damage and displacement on the Reservation.

Given the lack of reported past levee failures, the probability assigned to this hazard is unlikely (less than 1 percent annual chance).

VULNERABILITY ASSESSMENT

Flooding can result in a variety of impacts, such as death and injury, property damage, crop damage, inability to access areas and road closures. In addition, business interruption may occur due to flooding. In the wake of a flood, flooded buildings can develop mold or wood rot, posing a health risk. In addition, effects on soil can limit the ability to resume agricultural activities once floodwaters recede. Those located within mapped flood hazard areas are considered at an elevated risk to flooding, however flooding can certainly occur outside of these areas. This is true for flash flooding which also poses a danger to people and property across the entire Reservation. Therefore, all current and future buildings, critical facilities, and populations are considered at risk to flooding.

The Tribe has recognized several factors that increase the Reservation's vulnerability to flooding. For example, the Reservation does not have sufficient stormwater management to mitigate flooding. In addition, garbage is often dumped into canals, which can cause water to backup if the canal becomes jammed. Further, erosion from water flowing down mountains is frequent and can result in sedimentation.

Assets potentially exposed to flooding are further analyzed below.

EXPOSURE

Flood Hazard

A GIS analysis was used to determine the number of Tribal assets at risk to the flood hazard, which indicated a total of 93 assets potentially at risk to flood on the Reservation. These assets are located in the 1.0 percent annual chance flood. Most of these assets are Tribal housing including 88 mobile homes in the Oasis Mobile Home Park, but other assets include greenhouses and a cell tower. The estimated replacement value of the buildings was $5.6 million in total.

Figure 20 shows flood vulnerability across the entire Reservation. Figure 21 shows flood vulnerability on areas of the Reservation where assets are clustered.

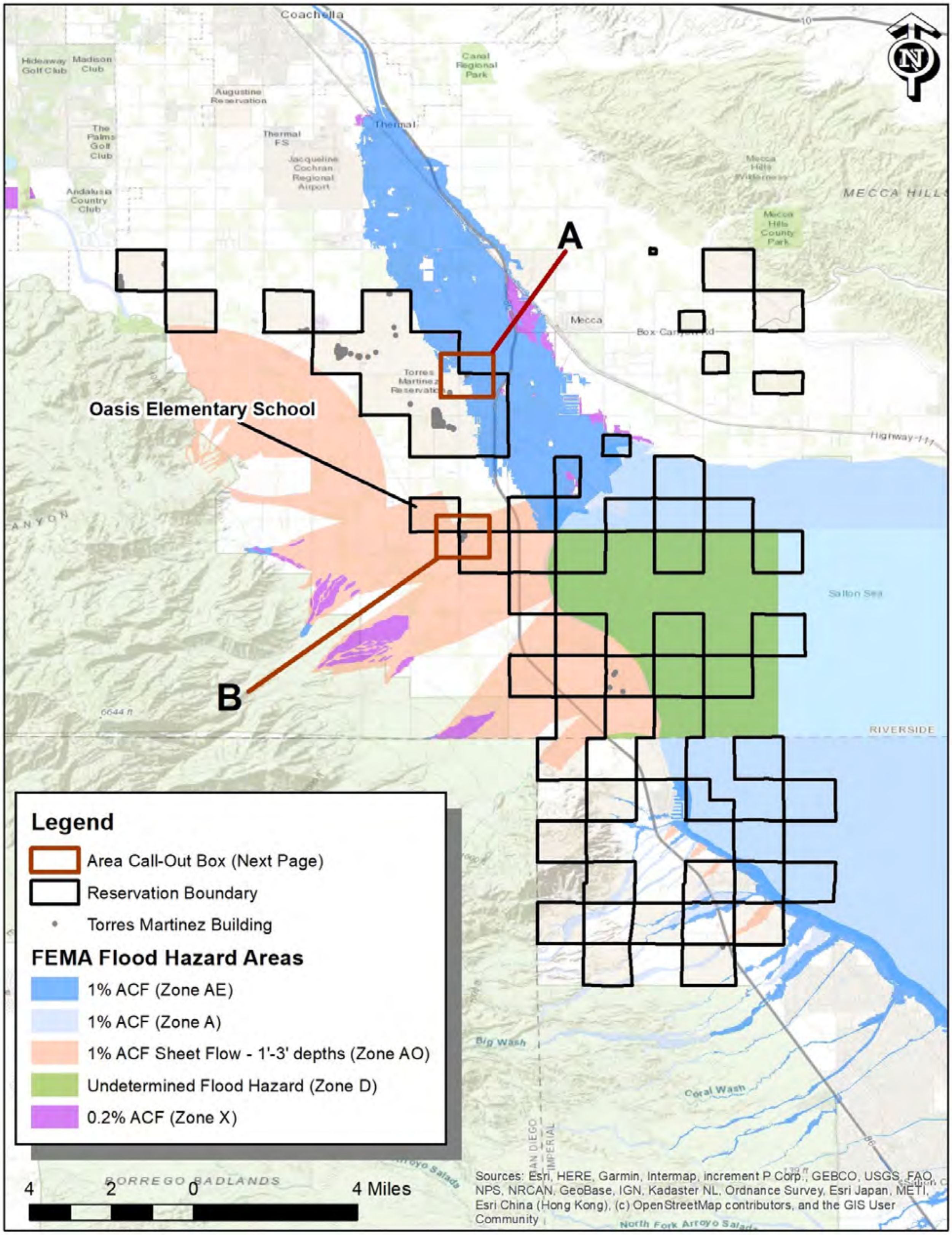

Figure 20. Torres Martinez Clustered Asset Areas in Annual Chance Flood (ACF) Hazard Areas.

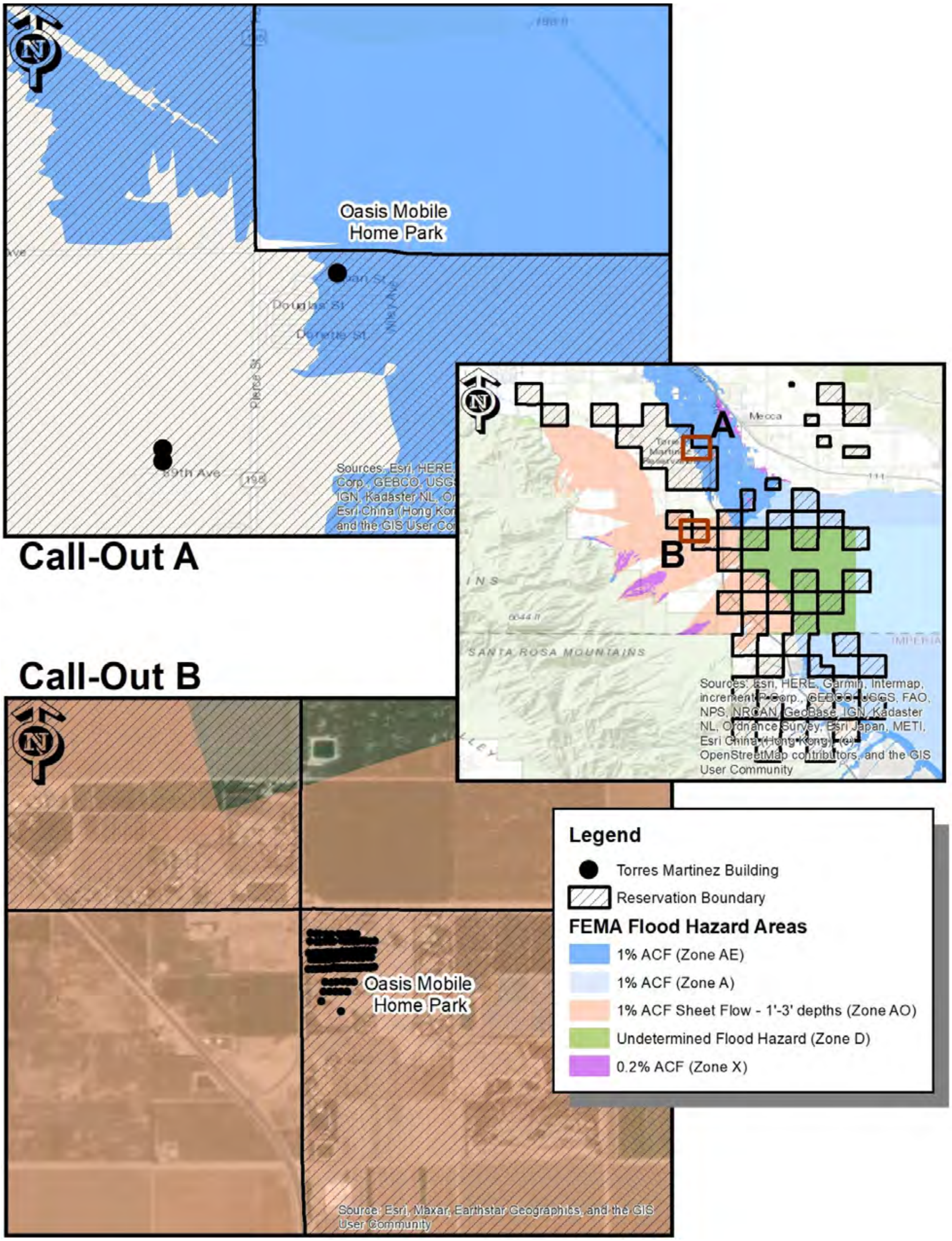

Figure 21. Call-Out Areas - Torres Martinez Clustered Asset Areas in Annual Chance Flood (ACF) Hazard Areas.

In addition to existing buildings, it is important to consider future development that may be at risk to flooding. A large mixed-use planned development at Travertine point, is proposed partially on Reservation lands, near the Imperial County/Riverside County boundary (Figure 22). A portion of the development within the Reservation's boundaries lies within the 1.0 percent annual chance flood. However, according to the Travertine Point land use plan, the floodplain area will be preserved as open space (Figure 23).

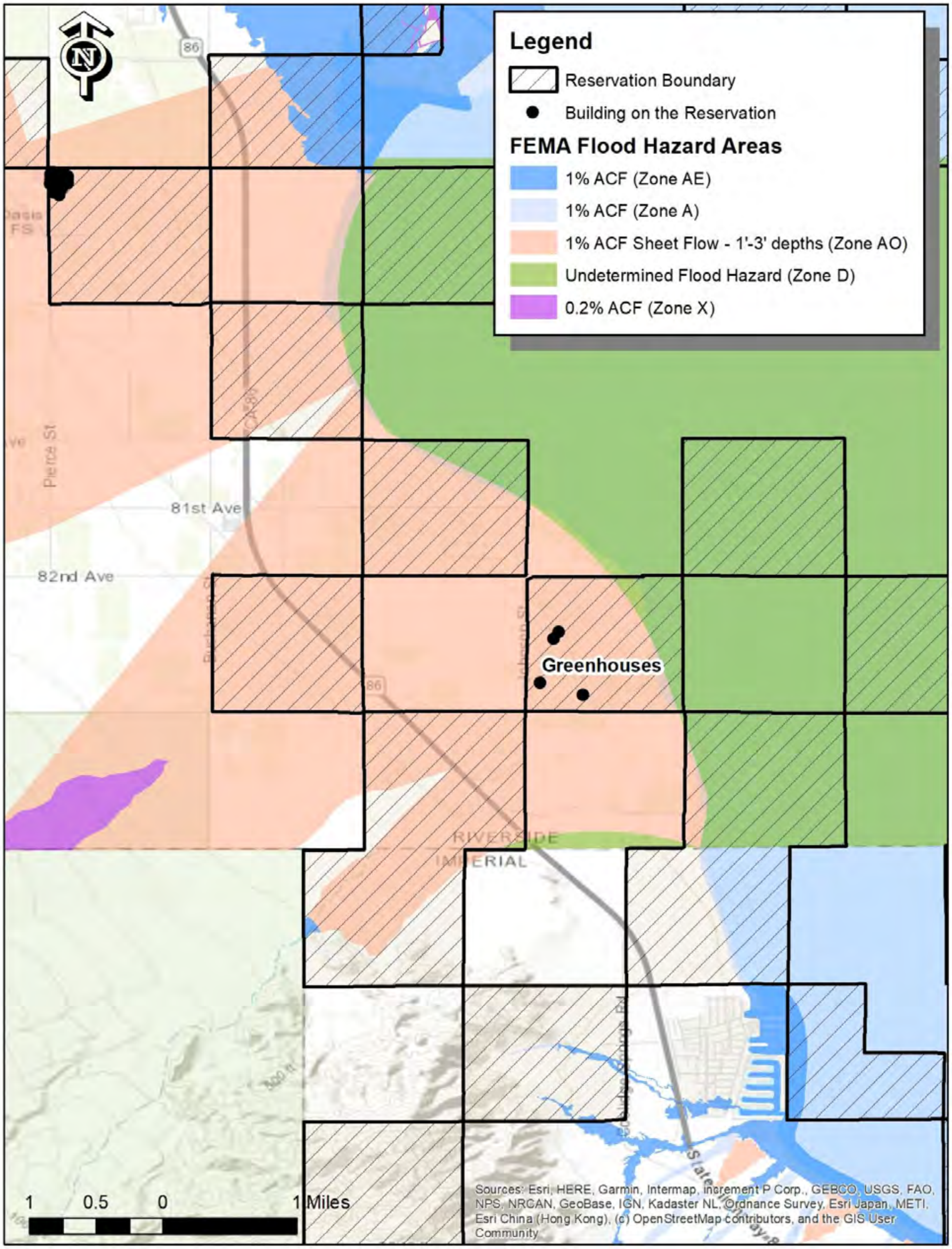

Figure 22. Travertine Point FEMA Flood Areas.

Figure 23. Travertine Point Land Use Plan.

Critical Facilities

FEMA has updated the flood map since the last HMP and there are now a cell tower and Tribal housing in the floodplain. Figure 24 shows the floodplain and all the critical facilities including the new health clinic, emergency equipment carport, and IT building.

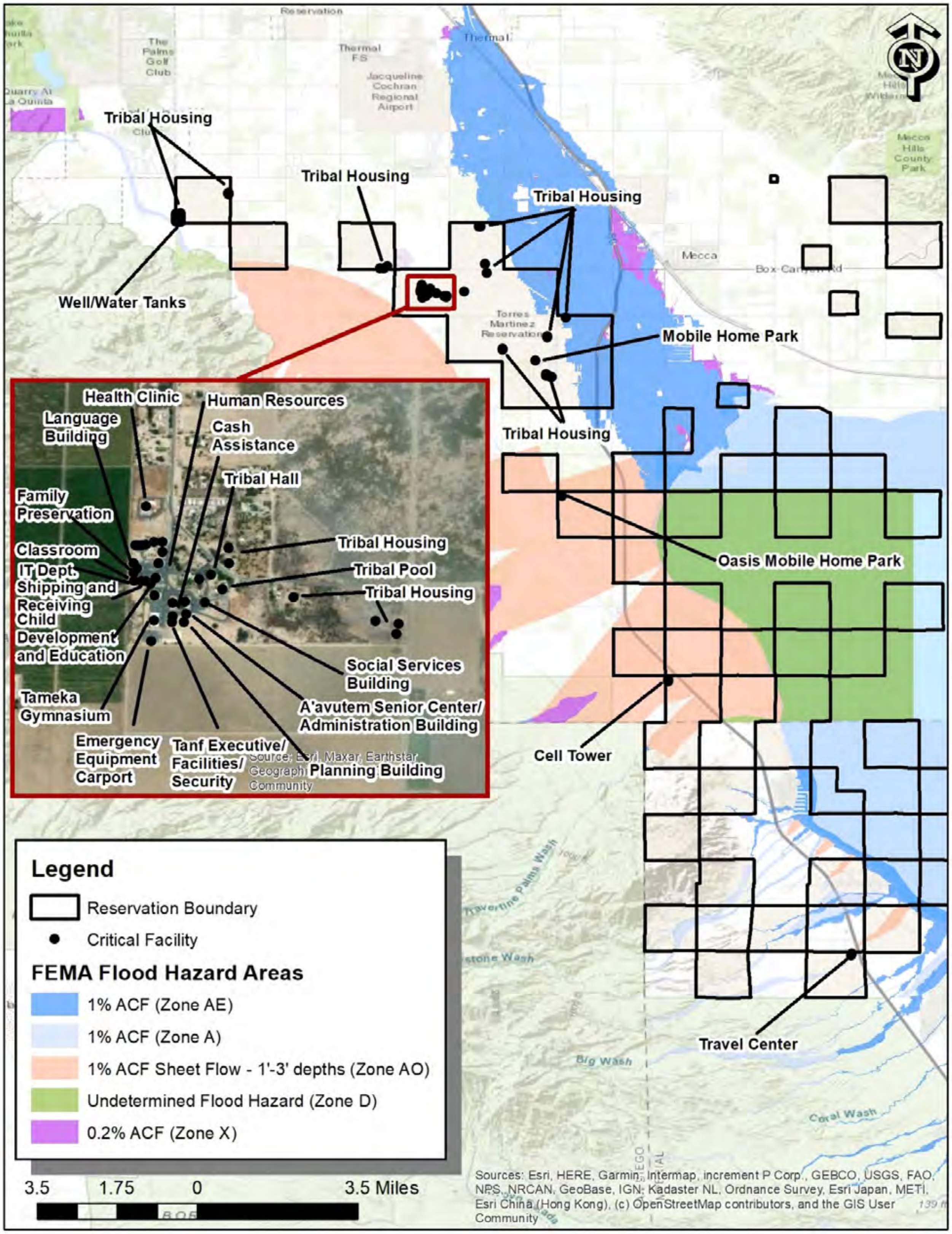

Figure 24. Torres Martinez Critical Facilities in Flood Hazard Areas.

Cultural Resources

There are some cultural resources located in the 1.0-percent annual chance flood including fish traps, the Oasis Community Park, and cultural landmark. Figure 25 shows Torres Martinez cultural resources potentially at risk to flooding.

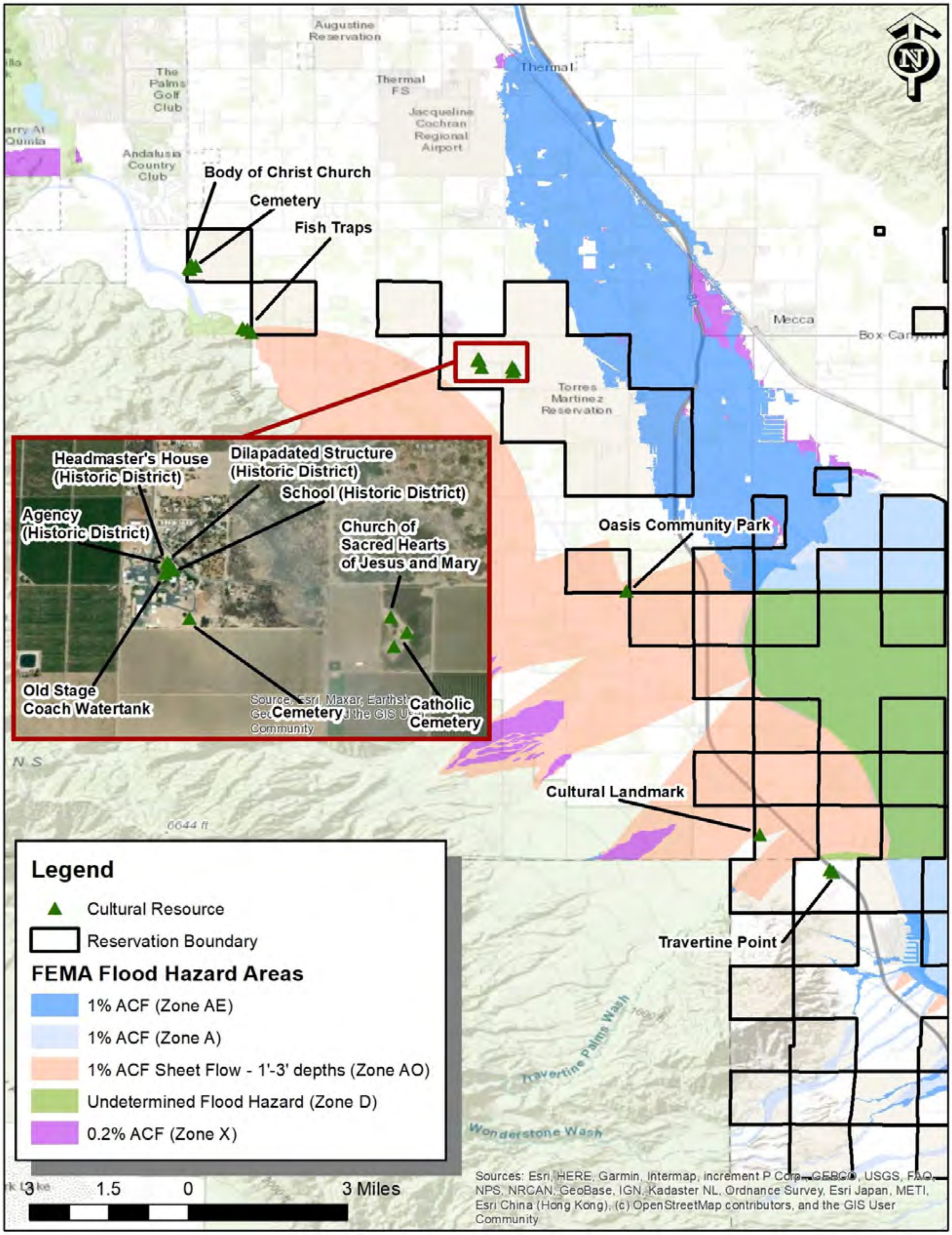

Figure 25. Torres Martinez Cultural Resources in Annual Chance Flood (ACF) Hazard Areas.

Levee Failure

All current and future buildings, critical facilities, cultural resources, and populations in levee risk reduction areas are considered at risk to failure. No dollar losses are reported as a result of levee failure on the Torres Martinez Reservation.

Levee reduced risk area data was provided by the Coachella Valley Water District and by the FEMA Map Service Center. A GIS analysis was completed to determine at risk buildings, critical facilities, and cultural resources located within the reduced risk areas.

Buildings, critical facilities, and cultural resources potentially at risk to levee failure are shown in Figure 26, at the end of this section.

Tribal Assets

There are 40 Tribal assets located within the levee-protected areas. These assets include a cemetery, the Body of Christ Church, Key Key Tum Park and ball field, Well/Water tanks, and 35 Tribal member homes. The replacement value of these assets is approximately $19.8M.

Critical Facilities

There are 36 critical facilities located within the levee-protected areas. These include the well/water tanks and 35 Tribal homes.

Cultural Resources

There are three cultural resources located within areas of flood risk reduction by the levee, including the Body of Christ Church (three buildings), Key Key Tum Park and ball field, and the Cemetery.

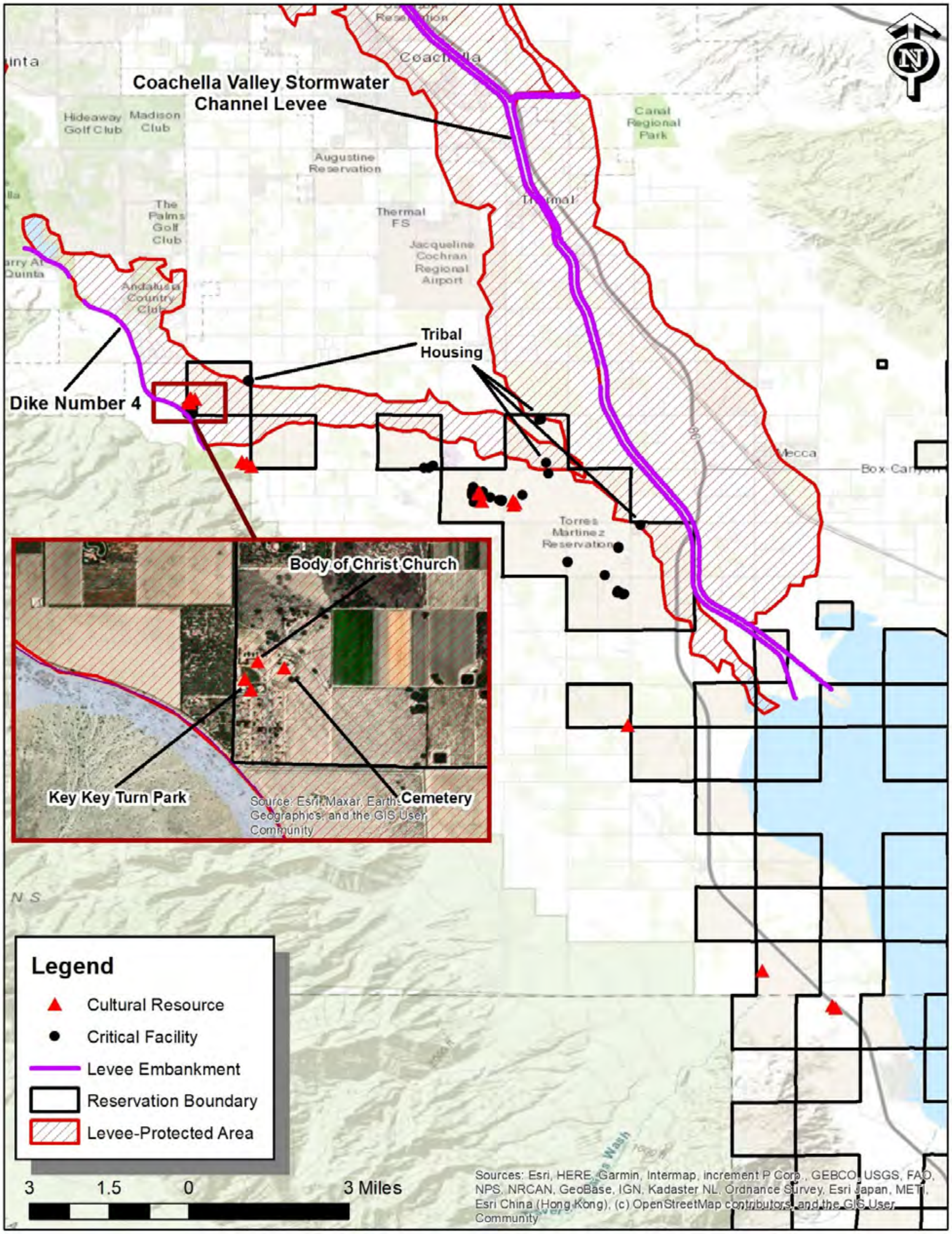

Figure 26. Torres Martinez Buildings, Critical Facilities, and Cultural Resources at Risk to Levee Failure.

Population

There are some cultural resources located in the 1.0-percent annual chance flood including fish traps, the Oasis Community Park, and cultural landmark. Figure 25 shows Torres Martinez cultural resources potentially at risk to flooding.

BUILT ENVIRONMENT IMPACTS

To identify built environment impacts to the Reservation, FEMA's risk assessment software, Hazus, was used. Detailed surveying data collected for the last HMP was used with updated building sites to determine asset characteristics and location. The economic loss results of the 100-year scenario are shown in Table 18. Many of the assets identified in the floodplain during the development of the previous plan are no longer in the updated FEMA floodplain. The assets that are still in the floodplain are only subjected to 1' of flood waters and since they are 2' above grade, the damage is modeled to be minimal. However, it should be noted that floods larger than the 100-year event have the potential to cause substantial damage to the more than $5M in assets (primarily homes) above the 100-year floodplain. The total 100-year loss is $5,197 of residential loss. The Reservation's Average Annual Loss (AAL) is calculated to be $52.

Table 18. Building Loss for the 100-Year Flood Scenario.

Loss Type	Residential ($)	Commercial ($)	Other Occupancy ($)	Total ($)
Building Loss	3,118	0.00	0.00	**3,118**
Content Loss	2,079	0.00	0.00	**2,079**
Total	**5,197**	**0.00**	**0.00**	**5,197**

Climate Change Impacts

Changes in temperature and precipitation are likely to impact the frequency and severity of flood events on the Reservation. Increased precipitation has the potential to increase the likelihood of flooding. According to data from CalAdapt, annual average precipitation on the Torres Martinez Reservation was 2.7 inches during a baseline period of 1961-1990. Projections indicate no change in precipitation under the lower emissions scenario. Under the higher emissions scenario, projections show no change in precipitation from 2020 – 2050 but do show an increase of 0.4 inches per year from 2070-2099.

In addition, the Reservation is projected to experience an increase in annual average temperature, which could lead to drier conditions and increased drought frequency and severity. Projected increases could rise from 88.9°F to upwards of 97°F by 2099 (detailed projections can be found in this section's equivalent under the *Extreme Heat* profile. Research suggests that under drought conditions, soils may develop hydrophobic characteristics that lead to decreased rainfall infiltration rates.[47] This in turn could increase runoff volumes and lead to flooding.

POPULATION IMPACTS

The Tribe should be aware that senior and low-income populations may be more vulnerable to hazard events due to a number of factors. Senior and low-income populations may be physically or financially unable to react and respond to a hazard event and require additional assistance. Access to information about the hazard event may be lacking, as well as access to transportation in the case of an evacuation. Areas in and around the Reservation where families are making less than $30K a year are shown in Figure 27. The darker brown areas have higher percentages of families who meet these criteria with many of the areas in the western and central parts of the Reservation. The population with ages 65+ in and around the Reservation is provided in Figure 28. Most of the areas with an older population are located outside the Reservation with one higher percentage location in the western center of the Reservation.

[47] Burch, G.J. et al. (1989). Soil hydrophobic effects on infiltration and catchment runoff. Hydrologic Processes. Vol 3 (3). Retrieved October 26, 2017 from http://onlinelibrary.wiley.com/doi/10.1002/hyp.3360030302/full.

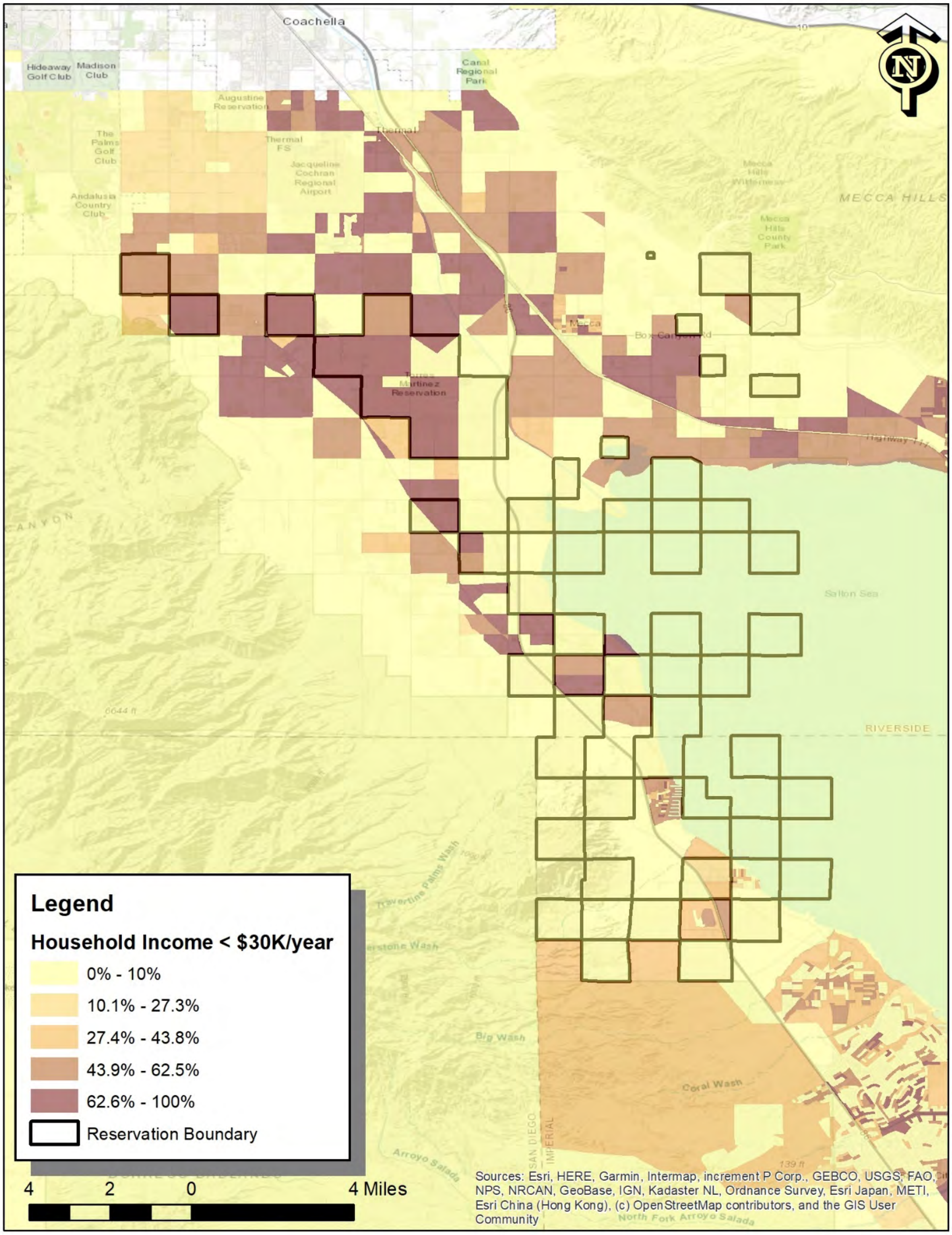

Figure 27. Families Making Less Than $30K a Year.

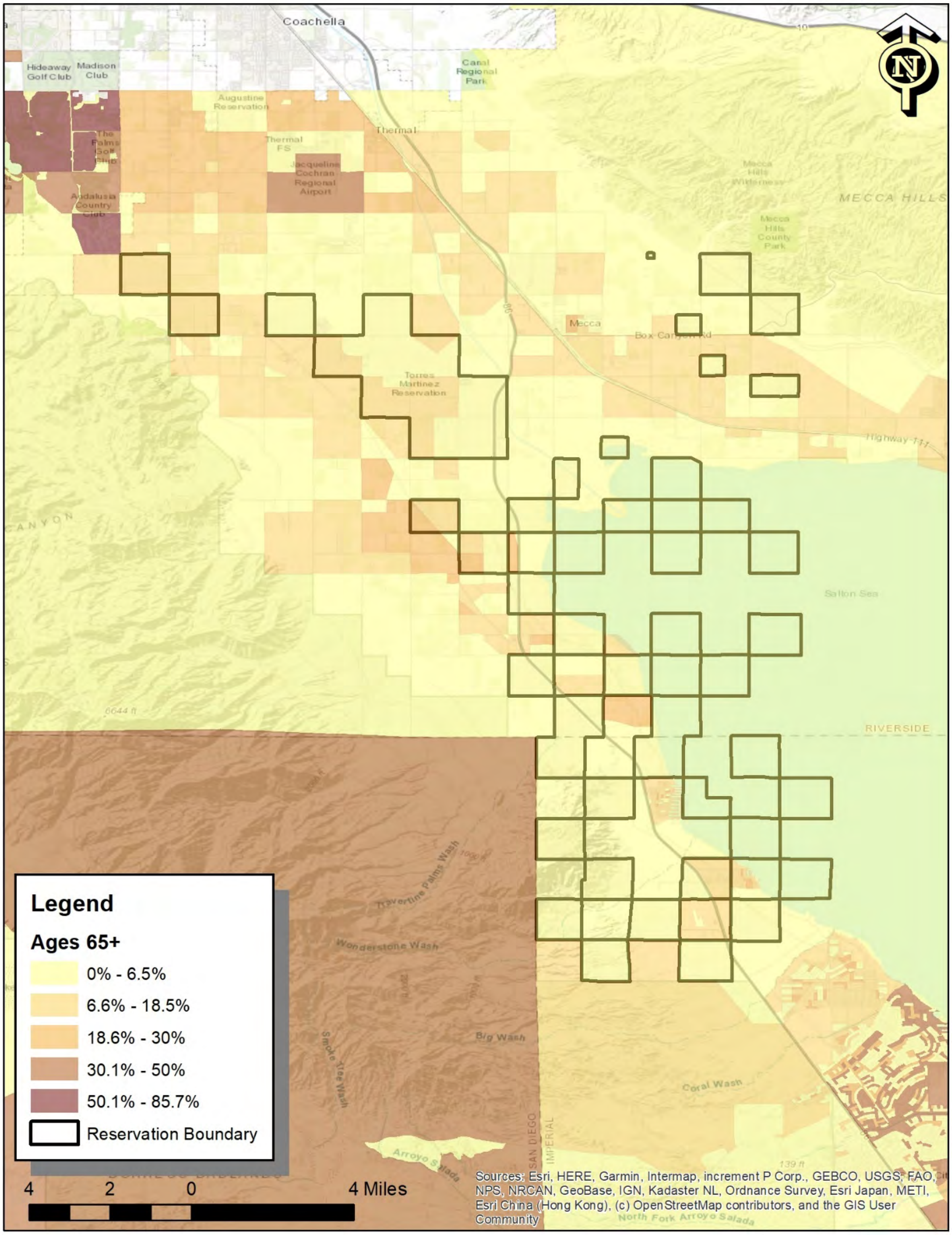

Figure 28. Population with Ages 65 or older.

Using the Hazus software, the 100-year flood scenario results showed that there could be more than 50 displaced households. Although there is not much residential damage, more than 70 residential homes would have floodwaters under and around them which could prohibit building access.

ENVIRONMENT IMPACTS

One of the major environmental impacts of a major flood would be the potential release of hazardous materials. Hazardous materials may be present in the dumping sites around the Reservation or may be transported through some of the major roadways (e.g. Highway 86) which cross the floodplain.

PROBLEM STATEMENTS FOR FLOOD

Problem statements summarize risk and vulnerability and are included following each hazard profile. The problem statements were developed to bridge the gap between identified hazard and development of the mitigation actions. Problem statements are included in each hazard profile section.

Table 19. Problem Statements Related to Flooding.

Assets	Problems Associated with Flood
People (including underserved communities and socially vulnerable populations)	• May encounter issues getting services to populations if roads are flooded. • Vulnerable populations in homes in floodplain and levee breach areas may have difficulty evacuating.
Structures (including facilities, lifelines, and critical infrastructure)	• Some of the water supply infrastructure is located in the levee-protected areas and could be impacted during a breach. • Homes may be impacted during a flood event. In larger flood events (>100-year), more than 70 homes could be impacted. • Potential train derailments could impact structures.
Systems (including networks and capabilities)	• Mapping of these hazards is limited and not easily available to the community. • Future development in hazard areas is difficult to restrict. • Some roads may be flooded causing delays in evacuation and response efforts.
Natural, historic, and cultural resources	• Hazardous materials found in the floodplain may be released into the groundwater and surface water. • Cultural sites may be impacted by a levee breach.
Activities that have value to the community	• Access to the cultural sites may be restricted if there are road closures. • Access to casino may be restricted if there are road closures.

4.2.2 GEOLOGICAL HAZARDS

4.2.2.1 EARTHQUAKE

An earthquake is the vibration of the Earth's surface that follows a release of energy in the Earth's crust.

DESCRIPTION

Earthquakes are scientifically defined as the sudden release of strain (or displacement of rock) in the earth's crust, resulting in waves of shaking that radiate outward from the earthquake source. They may result from crustal strain, volcanism, landslides or the collapse of caverns. Earthquakes can occur underwater or on land. Earthquakes can affect hundreds of thousands of square miles. Their intensity ranges from very minor (shaking not detected by humans without instruments) to very violent (catastrophic in nature). Damages follow this intensity ranging from minor to catastrophic. Earthquakes also occur without warning, resulting in deaths and injuries.

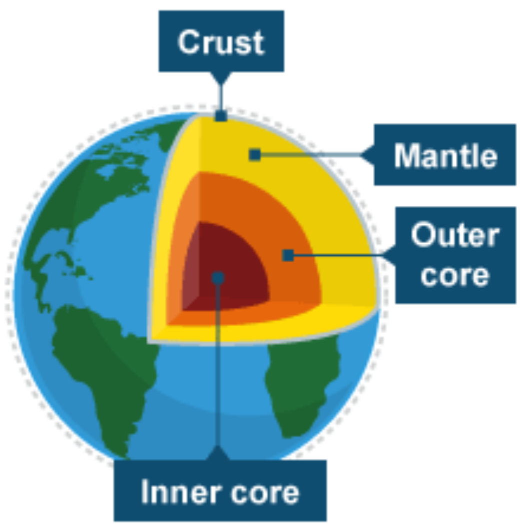

Figure 29. Earth's Sub Layers (Source: https://www.bbc.co.uk/bitesize/articles/zrcgr2p#zdb48hv).

To understand the nature of earthquakes, the composition of the earth must be explored. The earth is made up of four major layers and several sub layers (Figure 29): a solid inner core, a liquid outer core, a semi-molten mantle, and the rocky crust (the thin outermost layer of the earth). The upper portion of the mantle combined with the crust forms the lithosphere. This area is susceptible to fractures and is referred to as a shell. The lithosphere breaks up into large slabs, known as tectonic plates. This area is where earthquakes occur.

There are approximately twelve major plates and several dozen more minor plates on the earth's crust, as shown in Figure 30. Plates are regions of the crust that continually move over the mantle. Areas where these plates meet, grind past each other, dive under each other, or spread apart, are called plate boundaries. Most earthquakes are caused by the release of stresses accumulated due to the sudden displacement of rock along opposing plates in the Earth's crust. The areas bordering the Pacific Plate, also known as the "Pacific Ring of Fire", are at a particularly high risk since most of the largest earthquake events of the last century have occurred in the region.[48]

While earthquakes typically occur along plate boundaries, they can affect hundreds of thousands of square miles, causing damage to property (measured in the tens of billions of dollars), resulting in loss of life and injury to hundreds of thousands of persons, and disrupting the social and economic functioning of the affected area. The point where an earthquake starts is termed the focus or hypocenter and may be many miles to several hundred miles deep within the earth. The point at the surface directly above the focus is called the earthquake's epicenter. Earthquakes are measured in terms of their magnitude and intensity.

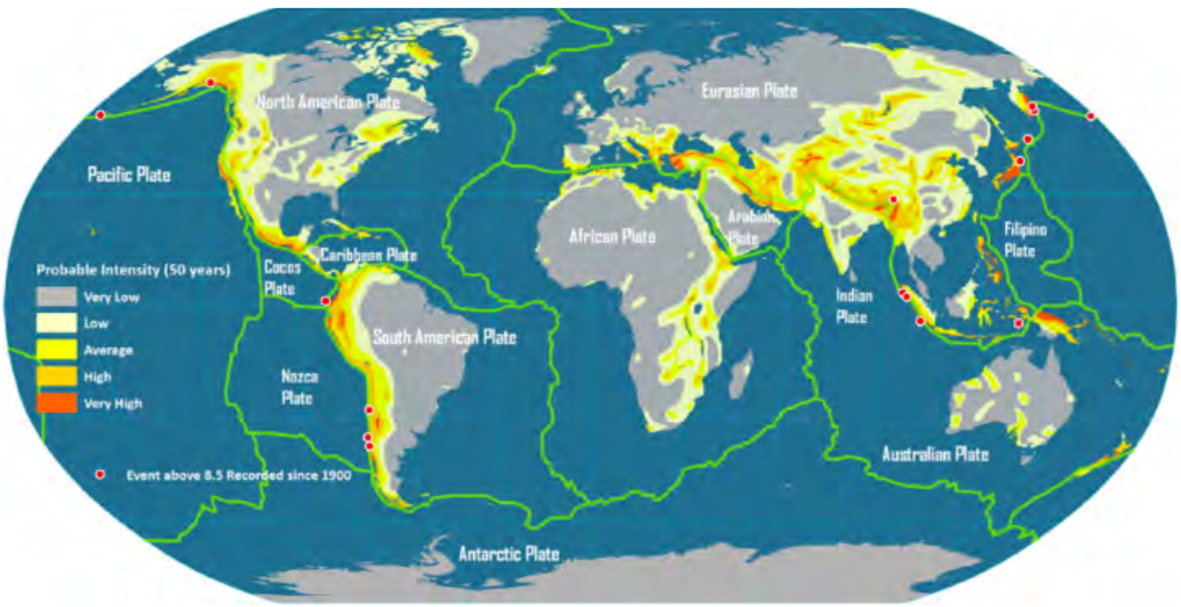

Figure 30. Global Plate Tectonics and Seismic Activity.[49]

Most property damage and earthquake-related deaths are caused by the failure and collapse of structures due to ground shaking. The level of damage depends upon the amplitude and duration of the shaking, which are directly related to the earthquake size, distance from the fault, site, and regional geology. Other damaging earthquake effects include landslides, the down-slope movement of soil and rock (mountain regions and along hillsides), and liquefaction, in which ground soil loses the ability to resist shear and flows much like quicksand. In the case of liquefaction, anything relying on the substrata for support can shift, tilt, rupture, or collapse.

48 http://www.bbc.co.uk/bitesize/ks3/geography/physical_processes/plate_tectonics/revision/2/.
49 Rodrigue, J.P. Global Plate Tectonics and Seismic Activity. (2017). Hofstra University. Retrieved from https://people.hofstra.edu/geotrans/eng/ch9en/conc9en/plate_tectonics.html.

The greatest earthquake threat in the United States is along tectonic plate boundaries and seismic fault lines located in the central and western states; however, the Eastern United State does face moderate risk to less frequent, less intense earthquake events. Figure 31 shows relative seismic risk for the United States.

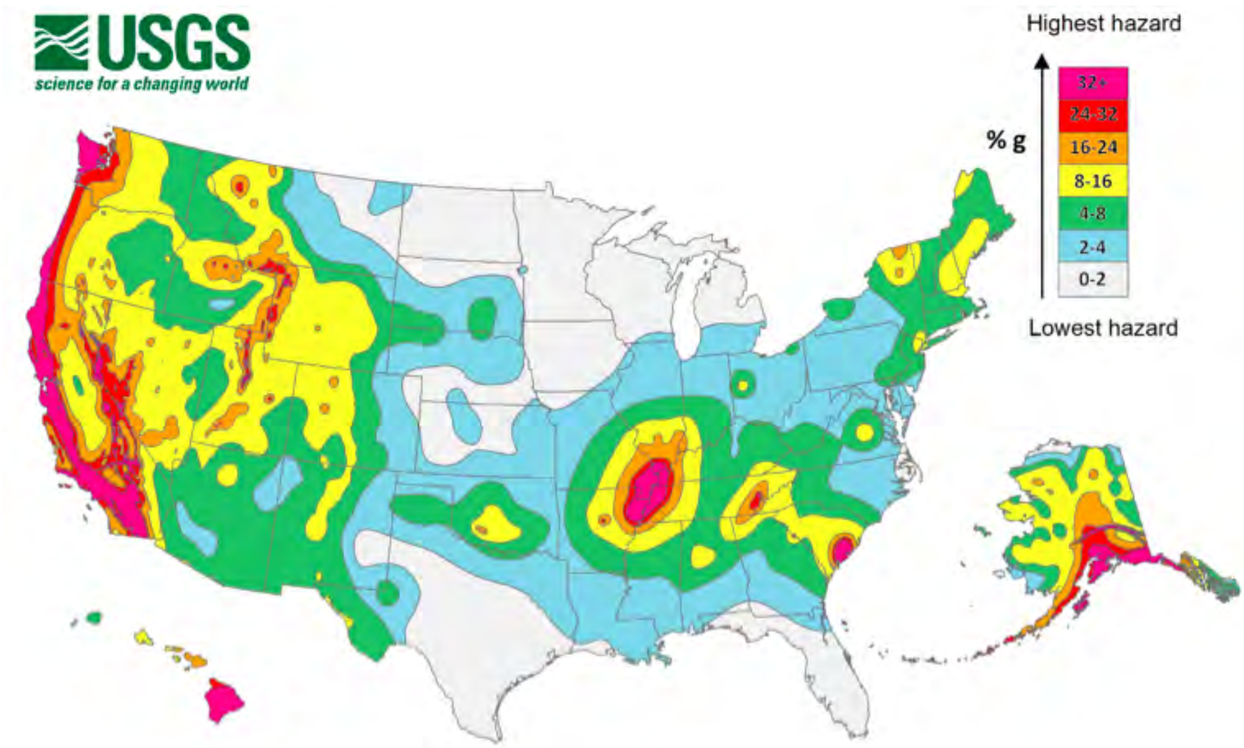

Figure 31. United States Earthquake Hazard Map.

Earthquake magnitude is measured using the Richter Scale, an open-ended logarithmic scale that describes the energy release of an earthquake through a measure of shock wave amplitude (Table 8). Each unit increase in magnitude on the Richter Scale corresponds to a 10-fold increase in wave amplitude, or a 32-fold increase in energy. Beginning in 2002, the United States Geological Survey (USGS) began using Moment Magnitude as the preferred measure of magnitude for all USGS earthquakes greater than magnitude 3.5. This was primarily due to the fact the Richter Scale has an upper bound, so large earthquakes were difficult to measure. Moment Magnitude also has a scale, but no instrument is used to measure it. Instead, factors such as the distance the earthquake travels, the area of the fault, and land that was displaced (also known as “slip”) are used to measure moment magnitude. Table 21 shows the Moment Magnitude Scale.

Table 20. Richter Scale (Source: FEMA).

RICHTER MAGNITUDES	EARTHQUAKE EFFECTS
<3.5	Generally, not felt, but recorded.
3.5 - 5.4	Often felt, but rarely causes damage.
5.4 - 6.0	At most slight damage to well-designed buildings. Can cause major damage to poorly constructed buildings over small regions.
6.1 - 6.9	Can be destructive in areas up to about 100 kilometers across where people live.
7.0 - 7.9	Major earthquake. Can cause serious damage over larger areas.
8 or >	Great earthquake. Can cause serious damage in areas several hundred kilometers across.

Table 21. Moment Magnitude Scale (Source: FEMA).

SCALE VALUES	EARTHQUAKE EFFECTS
<3.5	Very weak; unlikely to be felt
3.5 - 5.4	Generally felt; rarely causes damage
5.4 - 6.0	Will not cause damage to well-designed buildings; will damage poorly designed ones
6.1 - 6.9	Considered a “major earthquake” that causes a lot of damage
7.0 - 7.9	Large and destructive earthquake that can destroy large cities
8 or >	Large and destructive earthquake that can destroy large cities

Earthquake intensity is most commonly measured using the Modified Mercalli Intensity (MMI) Scale based on direct and indirect measurements of seismic effects. The scale levels are typically described using roman numerals, ranging from “I” corresponding to imperceptible (instrumental) events to “XII” for catastrophic (total destruction). A detailed description of the Modified Mercalli Intensity Scale of earthquake intensity and its correspondence to the Richter Scale is given in Table 22. Table 23 compares the Richter scale magnitudes and MMI magnitudes for several well-known historic earthquakes in the U.S.

Table 22. Modified Mercalli Intensity Scale for Earthquakes.[50]

SCALE	INTENSITY	DESCRIPTION OF EFFECTS	CORRESPONDING RICHTER MAGNITUDE
I	INSTRUMENTAL	Detected only on seismographs.	
II	FEEBLE	Some people feel it.	< 4.2
III	SLIGHT	Felt by people resting; like a truck rumbling by.	
IV	MODERATE	Felt by people walking.	
V	SLIGHTLY STRONG	Sleepers awake; church bells ring.	< 4.8
VI	STRONG	Trees sway; suspended objects swing, objects fall off shelves.	< 5.4
VII	VERY STRONG	Mild alarm; walls crack; plaster falls.	< 6.1
VIII	DESTRUCTIVE	Moving cars uncontrollable; masonry fractures, poorly constructed buildings damaged.	
IX	RUINOUS	Some houses collapse; ground cracks; pipes break open.	< 6.9
X	DISASTROUS	Ground cracks profusely; many buildings destroyed; liquefaction and landslides widespread.	< 7.3
XI	VERY DISASTROUS	Most buildings and bridges collapse; roads, railways, pipes, and cables destroyed; general triggering of other hazards.	< 8.1
XII	CATASTROPHIC	Total destruction; trees fall; ground rises and falls in waves.	> 8.1

Table 23. Richter v. Moment Magnitude Values.

Earthquake	Richter Scale	Moment Magnitude
New Madrid, MO 1812	8.7	8.1
San Francisco, CA 1906	8.3	7.7

[50] Magnitude/Intensity Comparison. USGS. Retrieved from http://earthquake.usgs.gov/learn/topics/mag_vs_int.php on March 3, 2015.

Earthquake	Richter Scale	Moment Magnitude
Prince William, AK 1964	8.4	9.2
Northridge, CA 1994	6.4	6.7

LIQUEFACTION

Liquefaction is the phenomenon that occurs when the strength and stiffness of a soil is reduced by earthquake shaking or other rapid loading.[51] Essentially, the soil temperature acts like a fluid, similar to wet sand near the beach, resulting in ground failure. According to the San Diego County Hazard Mitigation Plan, liquefaction causes two types of ground failure: lateral spread and loss of bearing strength. Lateral spread develops on gentle slopes and entails the sidelong movement of large masses of soil as an underlying layer liquefies. Loss of bearing strength results when the soil supporting structures liquefies and causes structures to collapse.[52]

Liquefaction has occurred in the Imperial Valley in response to large earthquakes (Magnitude 6 or greater) originating in that area.[53] Liquefaction was recorded during the 1979 and 1981 Imperial Valley earthquakes. Liquefaction is also a risk in parts of the Coachella Valley.[54] Liquefaction risk is greater where the water table is high.

LOCATION

An earthquake event would likely impact the entire planning area. There are earthquake faults and earthquake risk areas that also help define location including several active faults in Southern California which are known to have caused earthquakes over 6.0M in recent times. Active faults near the Reservation include the San Andreas Fault and the San Jacinto Fault. The San Andreas Fault runs northwest-to-southeast immediately east of the Reservation. The San Andreas Fault is classified as one with a record of historic displacement (in the last 200 years).[55] The San Jacinto Fault lies about 40 miles southwest of the Torres Martinez Reservation. The San Jacinto Fault is categorized as having Holocene fault displacement (during the past 11,700 years). These faults are shown in Figure 32.

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[51] What is soil liquefaction? (n.d.). University of Washington. Retrieved October 9, 2017 from http://www.ce.washington.edu/~liquefaction/html/what/what1.html.

[52] Earthquake Basics: Liquefaction: Earthquake Engineering Research Institute. (n.d.). Retrieved October 9, 2017 from https://eeri.org/wp-content/uploads/store/Free%20PDF%20Downloads/LIQ1.pdf.

[53] Youd, L.T., and Bennet, M.J. (1983). Liquefaction sites, Imperial Valley, California. Journal of Geotechnical Engineering. Volume 109, Issue 3. Retrieved October 9, 2017 from https://doi.org/10.1061/(ASCE)0733-9410(1983)109:3(440).

[54] Stahl, J. Liquefaction a real hazard in the Coachella Valley. (2016). CBS. Retrieved October http://www.kesq.com/home/liquefaction-a-real-hazard-in-the-coachella-valley/62493225.

[55] Fault Activity Map of California. (2015). California Geological Survey. Retrieved October 9, 3017 from http://maps.conservation.ca.gov/cgs/fam/.

The Reservation is located within the Salton Trough, one of the most seismically active areas in the United States. Smaller to moderate earthquakes have occurred in the area than other segments of the San Andreas Fault. In the last 100 years, the area has experienced eleven earthquakes of magnitude 6.0 or greater on the Richter scale.[56]

[56] Imperial County Multi-Jurisdictional Hazard Mitigation Plan. (2013).

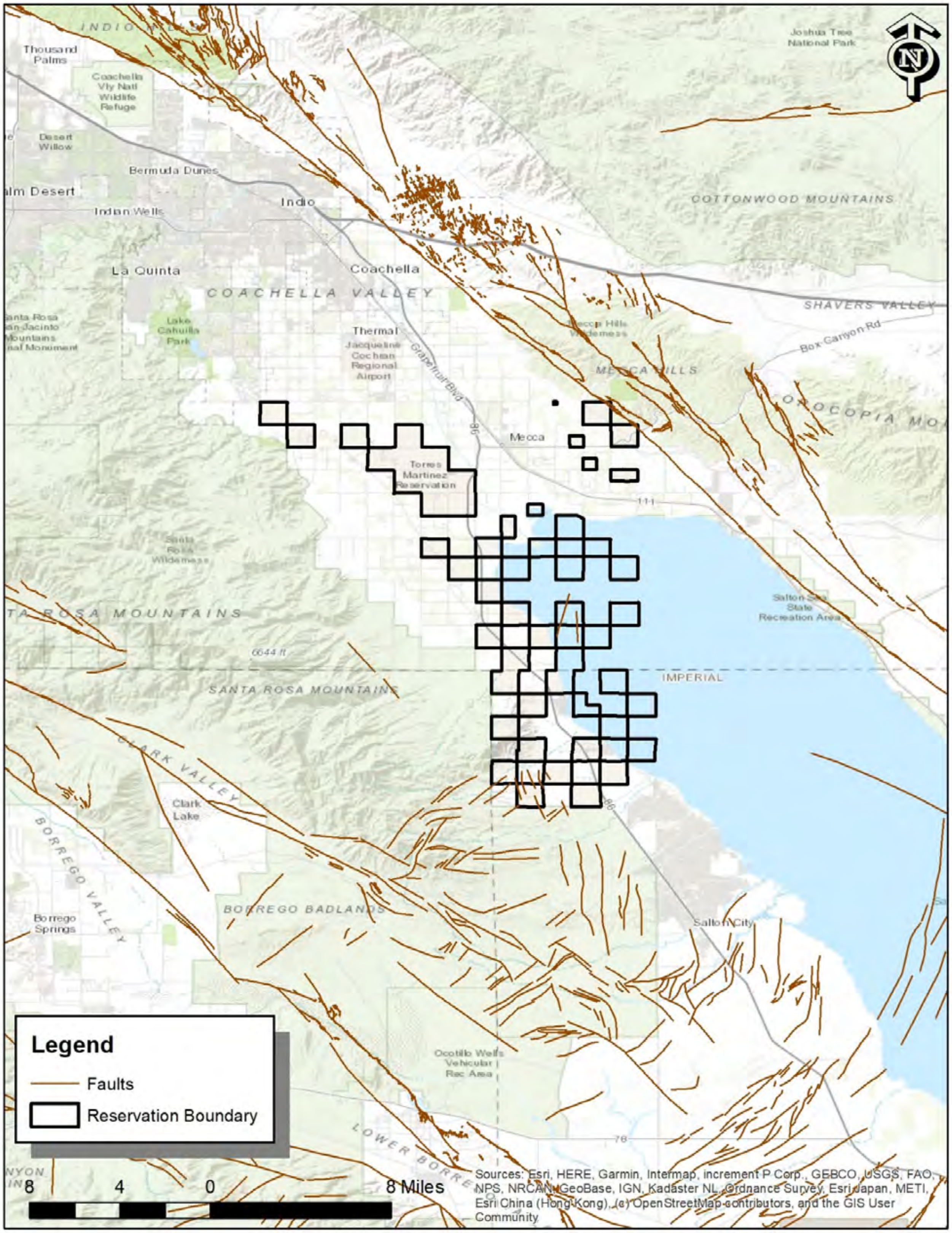

Figure 32. Fault Lines Near the Torres Martinez Reservation.

In addition to fault lines, risk areas help define earthquake location and can emphasize the Reservation-wide risk. Figure 33 shows the potential for ground shaking from an earthquake (as peak ground acceleration, or PGA), and it indicates that the Torres Martinez Reservation is within high hazard areas. PGA is further described in the Extent section of this hazard's profile.

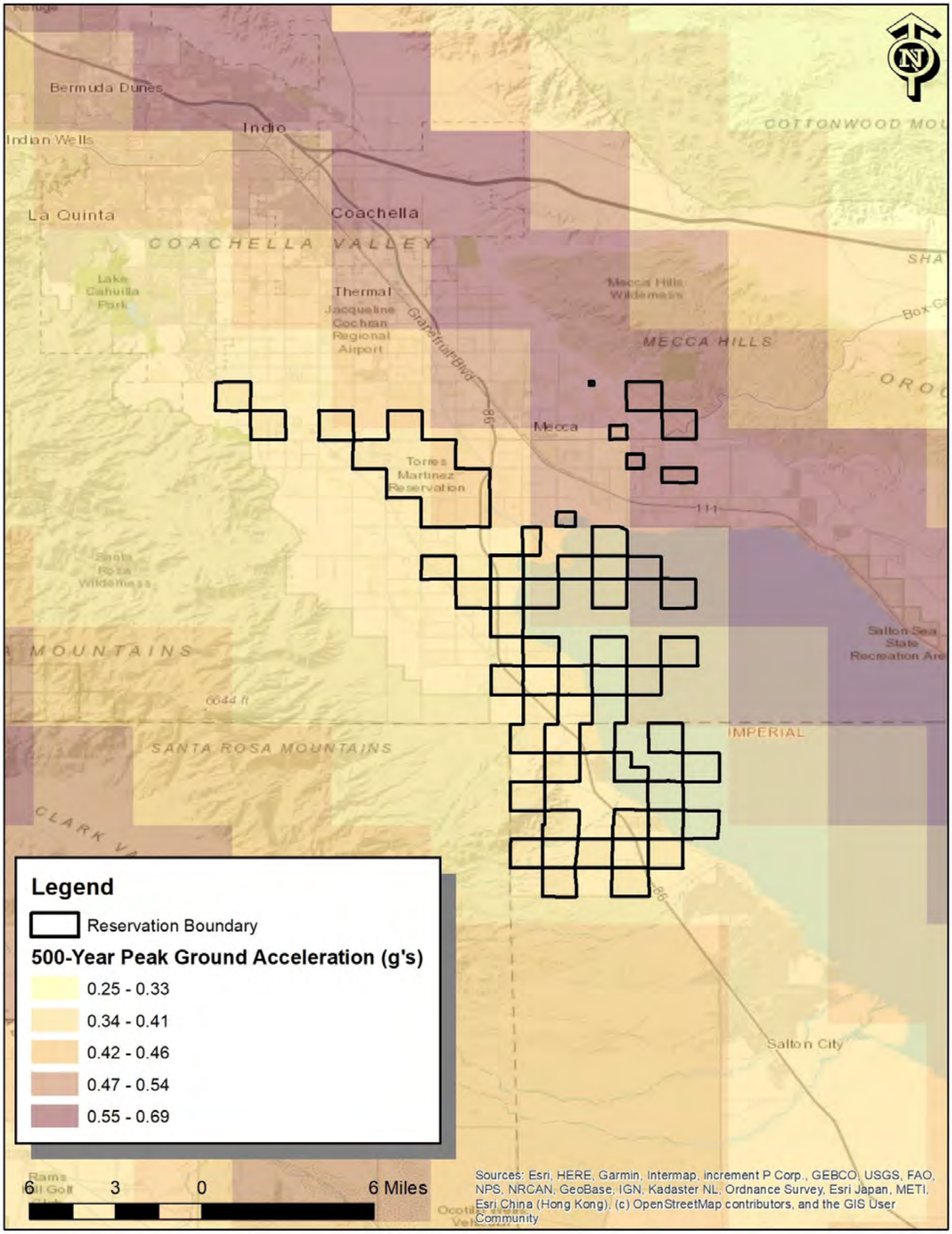

Figure 33. Peak Ground Acceleration (PGA) at the Torres Martinez Reservation.

LIQUEFACTION

Liquefaction tends to occur in areas with loose, sandy soils and a shallow groundwater table, which are typically located in alluvial river valleys and floodplains.[57] Riverside County created a GIS layer that shows liquefaction risk throughout the county.[58] According to the metadata, liquefaction risk areas were broken into five categories (Very Low, Low, Moderate, High, and Very High), based on the sediment type and the depth of the groundwater table.

Liquefaction risk areas for the portion of the Torres Martinez Reservation in Riverside County are shown in Figure 34. A majority of the Reservation land and development resides in Riverside County. Liquefaction risk area GIS data was not available for Imperial County. However, due to the presence of risk areas in Riverside County, and the shallow water table near the Salton Sea, it is likely that the portion of the Reservation located in Imperial County also faces some level of liquefaction risk.

[57] SANDAG GIS liquefaction metadata.
[58] Riverside County Spatial Data: http://data-countyofriverside.opendata.arcgis.com/datasets/8b4d6c0ed6154902b03be41faebdf588_3.

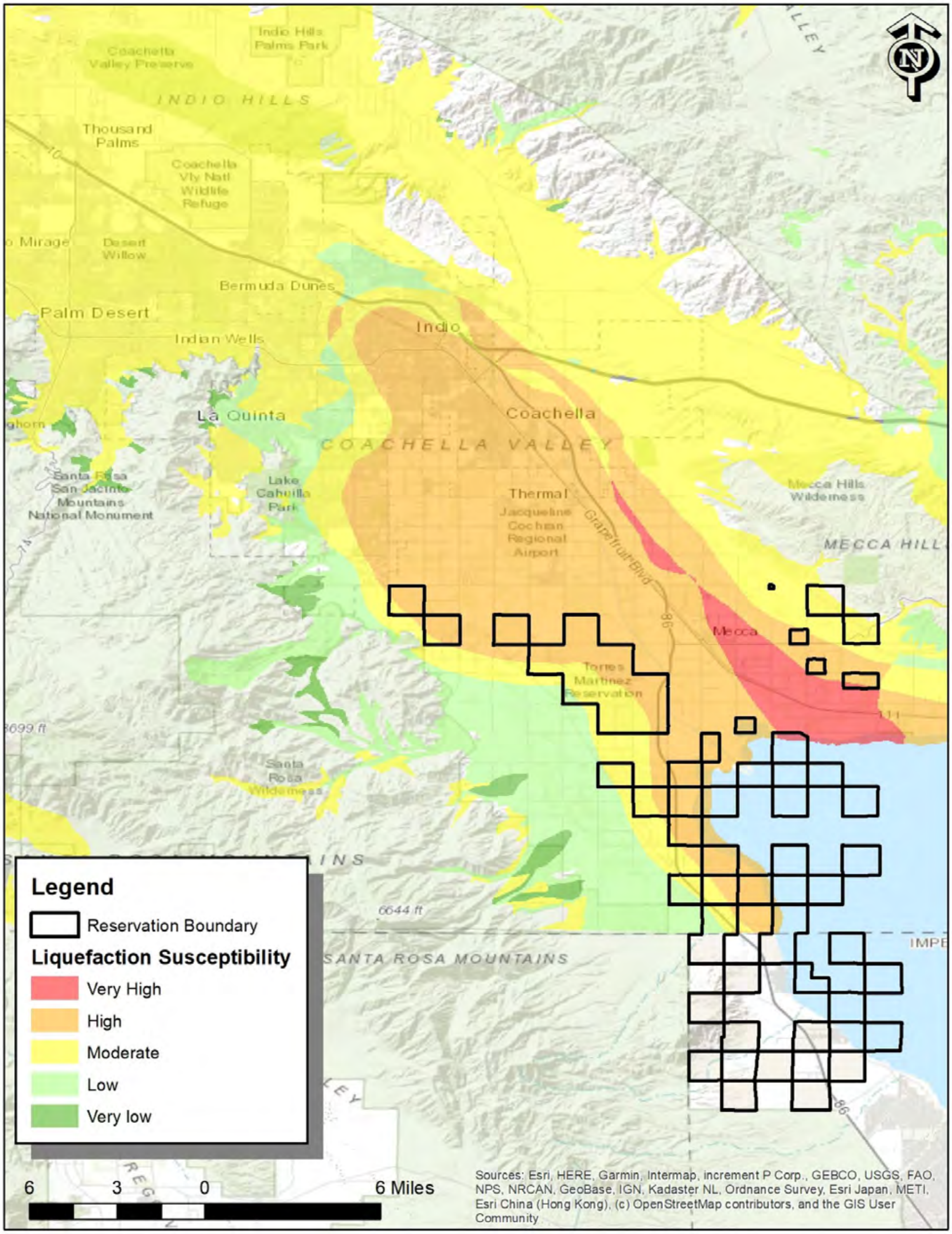

Figure 34. Liquefaction Risk Areas on the Torres Martinez Reservation (Riverside County Only).

PREVIOUS OCCURRENCES

Given limited information about events on the Reservation and the knowledge that earthquakes can impact vast areas, information was gathered from a variety of sources including anecdotal information from Tribal members and the public, county and state hazard mitigation plans, news articles, and federal sources. Most earthquakes and their aftershocks are referenced between 1800 and 2016 in the two counties. It should be noted that, unless indicated, the inclusion of the following earthquake events does not necessarily mean they resulted in damage on the Reservation. Figure 35 shows the epicenter location of several notable earthquakes that have occurred near the Reservation, represented by yellow and red stars (red reflects an earthquake with significant strong motion).[59] Reported earthquakes that occurred near the planning area of a significant magnitude are listed below by source (earthquakes above an M5.0, and/or earthquakes with a recognized impact on the planning area).

[59] Earthquakes with Strong Motion Records in CESMD. (n.d.). USGS Strong Motion Center. Retrieved October 18, 2017, from http://strongmotioncenter.org/cgi-bin/CESMD/iqrEventMap.pl.

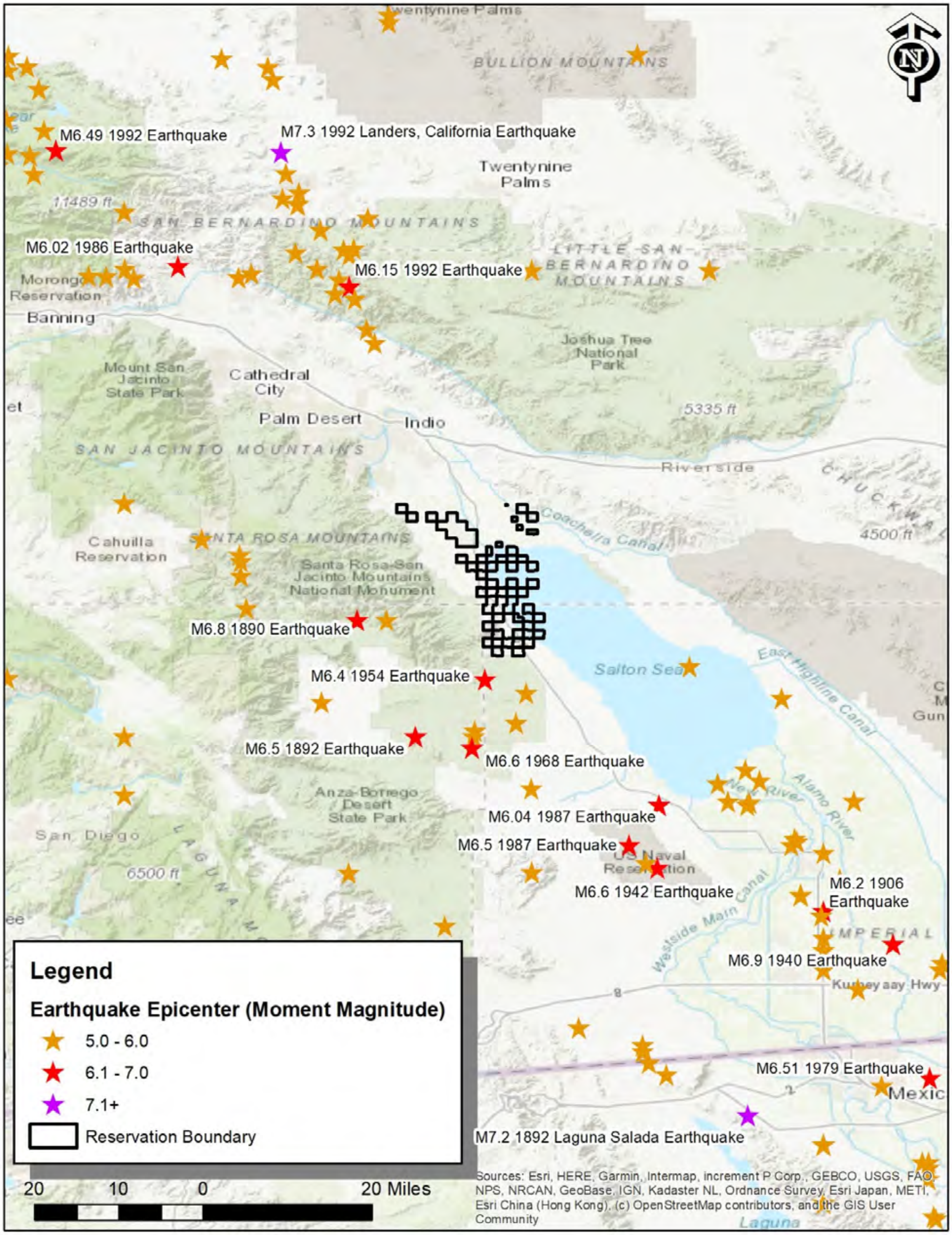

Figure 35. Earthquake Epicenter Locations.

Imperial County Multi-Jurisdiction Hazard Mitigation Plan (January 2021)

November 1852 (M6.5)

- An earthquake occurred at the Northern Salton Trough.

November 15, 1875 (M6.2)

- An earthquake struck in the Imperial Valley to the Colorado River.

May 18, 1940 (M7.1)

- Nine people were killed by the May 1940 Imperial Valley earthquake. At Imperial, 80 percent of the buildings were damaged to some degree. In the business district of Brawley, all structures were damaged, and about 50 percent had to be condemned. The shock caused 40 miles of surface faulting on the Imperial Fault, part of the San Andreas system in southern California. About 48 aftershocks occurred through the end of 1940.
- According to NOAA's Significant Earthquake Database, damages from this event totaled over $671 million (2017 dollars).[60]

April 25, 1957 (M5.8)

- An earthquake occurred at the south end of Salton Sea, causing slight damage in El Centro, Brawley and Westmorland. Intensity VII.

April 9, 1968 (M6.5)

- The Borrego Mountain earthquake resulted in ground cracking, minor building damage, and power disruption in parts of the Imperial Valley. Damage sustained as far west as Los Angeles, as far east as Yuma, Arizona, and as far south as Calexico. Several aftershocks were associated with this event.

October 15, 1979 (M6.6)

- An earthquake epicentered on the Imperial Fault, approximately 12 miles south of the Mexican border and 12 miles east of Mexicali. It was widely felt throughout Southern California. Approximately 100 persons were reported injured; two were hospitalized. The six story County Services Building, the largest building ever built in Imperial County, suffered the most notable damage resulting in its subsequent demolition and total loss. Sixty percent of the commercial buildings in Imperial were subsequently condemned. Over 1,800 mobile homes in the area were damaged or destroyed. Damage also occurred to water mains and railroad tracks.

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[60] NOAA Significant Earthquake Database. https://www.ngdc.noaa.gov/nndc/struts/results?bt_0=-2150&st_0=2017&type_17=EXACT&query_17=150&op_12=eq&v_12=USA&type_12=Or&query_14=CA&type_3=Like&query_3=&st_1=&bt_2=&st_2=&bt_1=&bt_4=0&st_4=9.9&bt_5=0&st_5=12&bt_6=0&st_6=700&bt_7=&st_7=&bt_8=&st_8=&bt_9=&st_9=&bt_10=&st_10=&type_11=Exact&query_11=&type_16=Exact&query_16=&bt_18=&st_18=&ge_19=&le_19=&type_20=Like&query_20=&display_look=1&t=101650&s=1&submit_all=Search+Database.

- According to NOAA's Significant Earthquake Database, damages from this event totaled just under $131 million (2017 dollars).

July 13, 1986 (M5.3)

- This earthquake epicentered 28 miles southwest of Oceanside in the Pacific Ocean. The quake was felt as far away as Yuma, Arizona. No injuries or deaths were reported.
- According to NOAA's Significant Earthquake Database, damages from this event totaled approximately $1.8 million (2017 dollars). Damages occurred in San Diego and Newport Beach.

November 24, 1987 (M6.0 and M6.3)

- Two strong earthquakes caused widespread damage, but few injuries. Calexico was hardest hit. Highway 86 closed due to bridge damage.
- According to NOAA's Significant Earthquake Database, damages from this event totaled approximately $7.5 million (2017 dollars). Two deaths and no injuries were reported.

September 2, 2005 (M5.1)

- The most recent significant earthquake activity occurred on September 2, 2005 with a M5.1 originated at the Salton Sea approximately 16 miles north of El Centro (Imperial County). The earthquake was part of a swarm of temblors that hit the region over four days, named the Obsidian Butte Earthquake Swarm. No injuries or damages were reported.
- Between 2005 and 2012, seven earthquakes affecting Imperial County were documented with a magnitude of 5.0 or more, including the April 4, 2010, El Mayor-Cucapah Earthquake with a magnitude of 7.2 in Northern Baja California, Sierra Cucapah Mountains.
- The Bombay Beach Swarm that occurred in September 2016 is significant because these events are the largest to date. Starting on September 26, 2016, the swarm included more than 290 events in just three days in the magnitude range M0.7 to M4.3, 17 events with a magnitude greater than M3, and 97 events with magnitudes greater than M2. This is the same area where two previous swarms occurred in 2009 and 2001. Prior to 2001, no swarms had been recorded with an M4.0 or greater intensity (with records going back to 1933).

<u>County of Riverside Operational Area Multi-Jurisdictional Local Hazard Mitigation Plan (April 2023)</u>

December 25, 1899 (M6.5)

- An earthquake struck approximately 10 miles southeast of San Jacinto, but was felt as far east as Seligman, Arizona. Most damage occurred in San Jacinto, Hemet, and on the Soboba Indian Reservation.[61]
- Twelve earthquakes occurring from 2012 through 2022 that were "5.0 and above and may have impacted Riverside County", including the following:

2012 earthquake in Brawley/ Imperial County (5.4)

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[61] Southern California Earthquake Data Center: http://scedc.caltech.edu/significant/sanjacinto1899.html.

2016 earthquake in Borrego Springs / San Diego County (5.2).

Southern California Earthquake Data Center[62]

April 21, 1918 (M6.8)

- The San Jacinto earthquake caused damage mostly to the towns of San Jacinto and Hemet, but was felt as far east as Seligman, Arizona.

March 25, 1937 (M6.0)

- Called the Terwilliger Valley earthquake, this event occurred approximately 19 miles southeast of the Terwilliger Valley and caused little damage, as the area was remotely populated at the time.

December 4, 1948 (M6.0)

- The Desert Hot Springs earthquake caused damage in regions far from its epicenter, including damage in Los Angeles, San Diego, and Palm City. Palm Springs was hardest hit. The Morongo Indian Reservation was badly damaged.

March 19, 1954 (M6.4)

- San Jacinto Fault earthquake caused minor building damage throughout southern California.

April 8, 1968 (M6.5)

- The Borrego Mountain earthquake occurred along the Coyote Creek fault, approximately 15 miles southwest of the Reservation. It caused damage across southern California, including downed power lines in San Diego County, cracked plaster in Los Angeles, and collapsed roofs in the Imperial Valley. Although no damage was reported specifically for the Torres Martinez Reservation, it is likely damages occurred due to its close proximity to the quake's epicenter.

July 8, 1986 (M6.1)

- The 1986 North Palm Springs earthquake was responsible for at least 29 injuries and the destruction or damage of 51 homes in the Palm Springs-Morongo Valley area. It also triggered landslides in the area. Damage caused by this quake was estimated at over $4 million. Ground cracking was observed along the Banning, Mission Creek, and Garnet Hill faults, but these cracks were due to shaking, not surface rupture.

April 22, 1992 (M6.1)

- The Joshua Tree Earthquake caused damage in Joshua Tree, Desert Hot Springs, Palm Springs, and Twentynine Palms. It was felt as far away as San Diego, Los Vegas, and Phoenix, Arizona.
- According to NOAA's Significant Earthquake Database, 32 injuries resulted from this event.

[62] Southern California Earthquake Data Center: http://scedc.caltech.edu/significant/index.html.

***NOAA's Significant Earthquake Database*[63]**

Earthquakes in this database meet at least one of the following criteria:

- Moderate damage (approximately $1 million or more),
- 10 or more deaths,
- Magnitude 7.5 or greater,
- Modified Mercalli Intensity X or greater, or the
- Earthquake generated a tsunami.

The Torres Martinez Reservation coordinates were used as a location indicator. One earthquake that was not reported by the Riverside or Imperial County hazard mitigation plans was reported as occurring near the planning area[64]:

June 28, 1992 (M7.6, MMI 9)

- This event, called the Landers or Yucca Valley earthquake, occurred approximately 40 miles from the Reservation. The event resulted in 3 deaths, 400 injuries, and $92 million in damages ($186,370,000 in 2017 dollars).

***US Geological Survey*[65]**

According to the USGS, earthquakes happen infrequently, or about every 200-300 years on the southmost part of the San Andreas fault (from Palm Springs to the Salton Sea). The most recent earthquake occurred about 300 years ago, during the time of Spanish exploration. While there was no record of the event, radiocarbon dating provided the age of the most recent earthquake, as well as six others that occurred since approximately 800 AD.

***Los Angeles Times*[66]**

- A 7.2 magnitude earthquake occurred in the Mexicali region of northern Mexico on April 4, 2010 (dubbed the Easter Sunday quake[67] or the El Mayor-Cucapah quake). Shaking and liquefaction primarily impacted the southern Imperial Valley (near Calexico), but peak ground acceleration

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[63] National Geophysical Data Center / World Data Service (NGDC/WDS): Significant Earthquake Database. National Geophysical Data Center, NOAA. doi:10.7289/V5TD9V7K [July 5, 2017].

[64] Details from NOAA's Significant Earthquake Database for events also reported by county hazard mitigation plans are included with the event description under the county subsection.

[65] Back to the Future on the San Andreas Fault. (n.d.). USGS. Retrieved from https://earthquake.usgs.gov/learn/topics/safz-paleo/.

[66] Lin, R., II. (2016, October 1). Risk of big earthquake on San Andreas fault rises after quake swarm at Salton Sea. Los Angeles Times. Retrieved July 5, 2017, from http://www.latimes.com/local/lanow/la-me-ln-earthquake-swarm-20160930-snap-story.html.

[67] Becerra, H. (2010). Easter Sunday earthquake shifted Earth's crust nearly 3 feet near Calexico. Los Angeles Times. Retrieved October 12, 2017 from http://articles.latimes.com/2010/jun/24/local/la-me-624-mexicali-earthquake-20100624.

between 18-34 (%g) was recorded at a station in Salton City (about 3.5 miles south of the Reservation).[68] A presidential disaster was declared for Imperial County.

- The Los Angeles Times reported a swarm of 200 earthquakes (with three measuring above magnitude 4.0) occurring on September 26, 2016. The temblors were recorded under the Salton Sea, near Bombay Beach. It was only the third time such a swarm has been recorded since sensors were installed in 1932. According to the article, the probability for an earthquake of magnitude 7.0 or greater was heightened significantly in the week after the swarm was reported. Similar swarms occurred at the Salton Sea in 2005 and 2009.
- A 3.6 magnitude earthquake occurring on March 14, 2017 was reported by the Los Angeles Times. The quake occurred 11 miles west of the Salton Sea, southwest of Salton City. An elementary school was evacuated until the building could be checked for damages.[69]

Stakeholder Input

Stakeholders including members of the Tribe and the public were asked about previous earthquakes in the area. While no specific events were provided, all attendees acknowledged experiencing an earthquake. Many of these events were minor in nature, characterized by light shaking.

During the 2024 Torres Stakeholder Interviews, the topic of implementing protective measures and design improvements was raised by personnel responsible for ensuring that water infrastructure, such as pipelines and storage tanks, can withstand natural hazards such as floods, earthquakes, and storms.

LIQUEFACTION

No events of liquefaction were found to have occurred on the Torres Martinez Reservation based on extensive research of previous events. Recorded liquefaction occurrences closest to the planning area include liquefaction caused by the 1979 and 1981 Imperial Valley earthquakes,[70] as well as the 2010 El Mayor-Cucapah earthquake in Mexicali. Further, the Riverside County liquefaction map indicates areas of concern on the Torres Martinez Reservation.

EXTENT

One way to measure the extent of an earthquake is peak ground acceleration (PGA). USGS peak ground acceleration (PGA) measures the intensity of an earthquake. It is the probability that ground motion will reach a certain level during an earthquake (the fastest measured change in speed, for a particle at ground level that is moving horizontally due to an earthquake). PGA is expressed as g (the acceleration of gravity, equivalent to g-force), where a higher level means higher shaking. It is frequently stated as “x

[68] McCrink, T. et al. (2011). Liquefaction and other ground failures in Imperial County, California, from the April 4, 2010, El-Mayor-Cucapah Earthquake. USGS. Retrieved October 12, 2017, from https://pubs.usgs.gov/of/2011/1071/of2011-1071_pamphlet.pdf.

[69] Rocha, V. and Serna, J. (2017). 3.6 quake near Salton Sea triggers elementary school evacuation. Los Angeles Times. Retrieved October 3, 2017 from http://www.latimes.com/local/lanow/la-me-ln-earthquake-salton-sea-evacuation-20170314-story.html.

[70] Stahl, J. Liquefaction a real hazard in the Coachella Valley. (2014). Gulf-California Broadcast Company Palm Springs. Retrieved from http://www.kesq.com/home/liquefaction-a-real-hazard-in-the-coachella-valley/62493225.

percent probability of exceedance in C years," For data stating PGA (%g) as "10 percent probability of exceedance in 50 years," a map would indicate that there is a 10 percent probability of reaching that level of shaking (%g) in 50 years. It is meant to show the upper bounds of possible shaking.
In addition, spectral acceleration (SA) is presented and measured as %g. According to the USGS, SA can be described as "approximately what is experienced by a building, as modeled by a particle mass on a massless vertical rod having the same natural period of vibration as the building.[71]" It is the maximum acceleration in an earthquake on an object and approximates building motion during an earthquake. Further, PGA estimates ground motion versus object motion. SA is best used for taller buildings, while PGA is best used for shorter buildings (less than 7 stories). Figure 36[72] shows a comparative diagram.

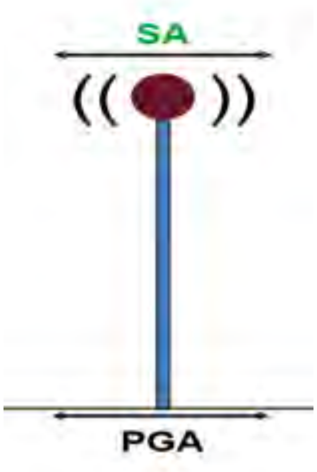

Figure 36. SA and PGA Comparison.

The USGS 2014 Unified Hazard Tool was consulted.[73] PGA was estimated for the Torres Martinez Reservation. PGA was considered rather than SA because the Reservation does not have buildings greater than 7 stories. Given an input of 2% probability in 50 years, the Reservation had a PGA value between 60 and 120 (potential damage is heavy/perceived shaking is violent) (Figure 37). Given an input of 10% probability in 50 years, the Reservation had a PGA value of 40 to 60 (potential damage is moderate to heavy/perceived shaking is severe) (Figure 38).

[71] http://earthquake.usgs.gov/hazards/about/technical.php#sa.
[72] http://kula.geol.wwu.edu/rjmitch/pga_maps.pdf.
[73] Unified Hazard Tool. (2014). USGS. Retrieved from https://earthquake.usgs.gov/hazards/interactive/.

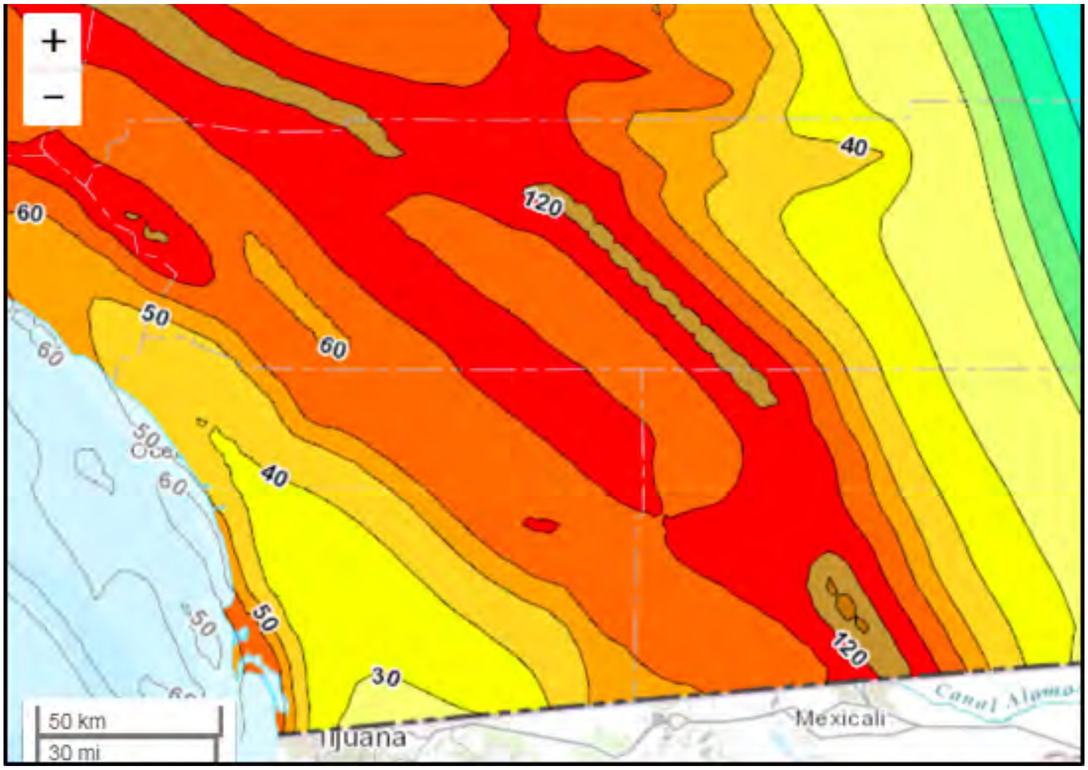

Figure 37. PGA on the Torres Martinez Reservation (2% Probability).

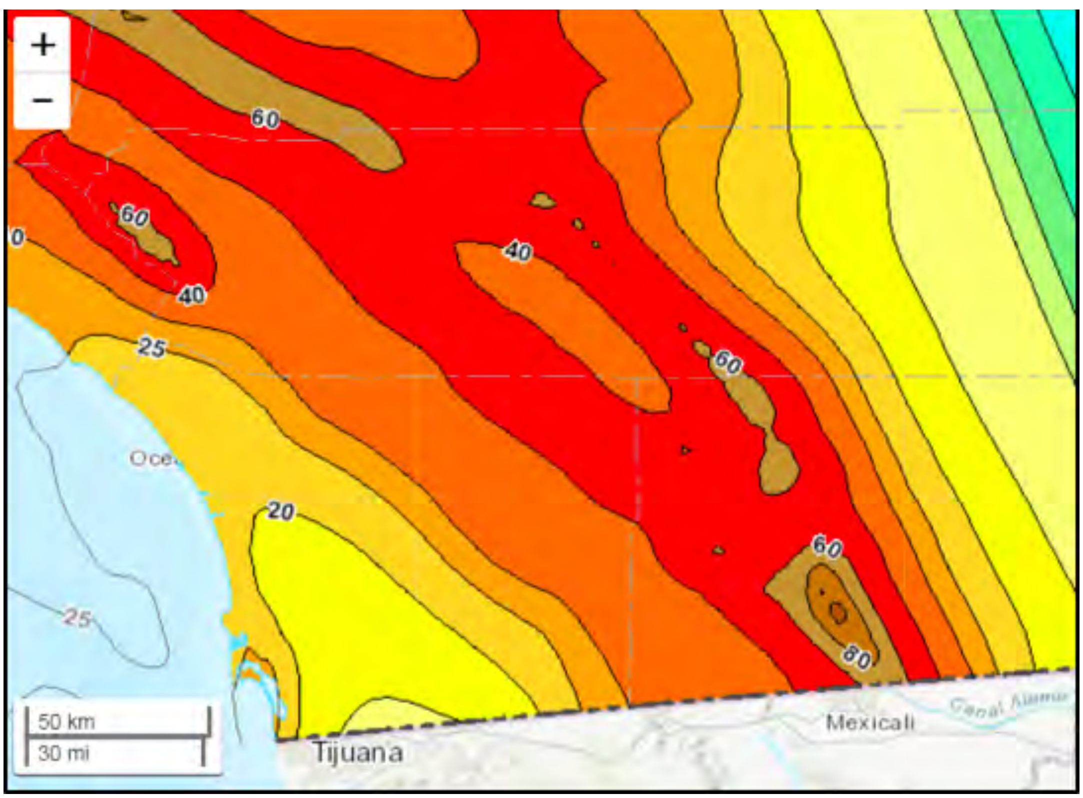

Figure 38. PGA on the Torres Martinez Reservation (10% Probability).

LIQUEFACTION

One way to determine liquefaction extent is by estimating the amount of land potentially at risk to soil failure. Effectively all the Reservation lands in Riverside County (where liquefaction hazard maps are available) are identified as having potential liquefaction risk shown in Figure 34.

PROBABILITY OF FUTURE EVENTS

The Torres Martinez Reservation lies between two seismically active fault zones – San Jacinto and San Andreas - which are capable of producing large, damaging earthquakes. The San Andreas Fault produced the state's two largest earthquakes in history and is often referred to as the "sleeping giant" for the next big earthquake that may occur. The paleoseismic data on different parts of the San Andreas Fault Zone determine that some segments appear to be past the average, or "overdue" for a significant earthquake. However, the data can't be used to make predictions: scientists do not understand earthquakes well enough to know exactly where the next earthquake will occur, what the magnitude will be, or exactly when it will happen.[74]

The Riverside County Planning Department has modeled the probability of certain earthquake scenarios.[75] The department's results predicted a 22 percent chance that a 7.1 magnitude earthquake will occur on the Coachella segment of the San Andreas fault in 30 years. The Coachella segment of the San Andreas fault runs approximately from the San Gorgonio Pass, near Desert Hot Springs, to the Salton Sea. Given that location, it is likely the Torres Martinez Reservation would be impacted by such an event. According to the same research, a 6.9 magnitude earthquake has a 43 percent chance of occurring in 30 years along the San Jacinto Valley segment of the San Jacinto Fault. The San Jacinto Valley is approximately 45 miles northwest of the Reservation. Further, the segment to the south of the San Jacinto Valley segment, the Anza segment, was modeled to have a 17 percent chance of a magnitude 7.2 earthquake occurring in the next 30 years. Each of these scenarios is likely to impact the Reservation. The locations of these fault segments are shown Figure 39.

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[74] Back to the Future on the San Andreas Fault (n.d.). USGS. Retrieved October 9, 2017 from https://earthquake.usgs.gov/learn/topics/safz-paleo/.

[75] County of Riverside Environmental Impact Report No. 521, Section 4.12 Geology and Soils (Public Review Draft). (2014). Riverside County Planning. Retrieved from http://planning.rctlma.org/Portals/0/genplan/general_plan_2014/EnvironmentalImpactReport/04-12_GeologyAndSoils_2014-04-07.pdf.

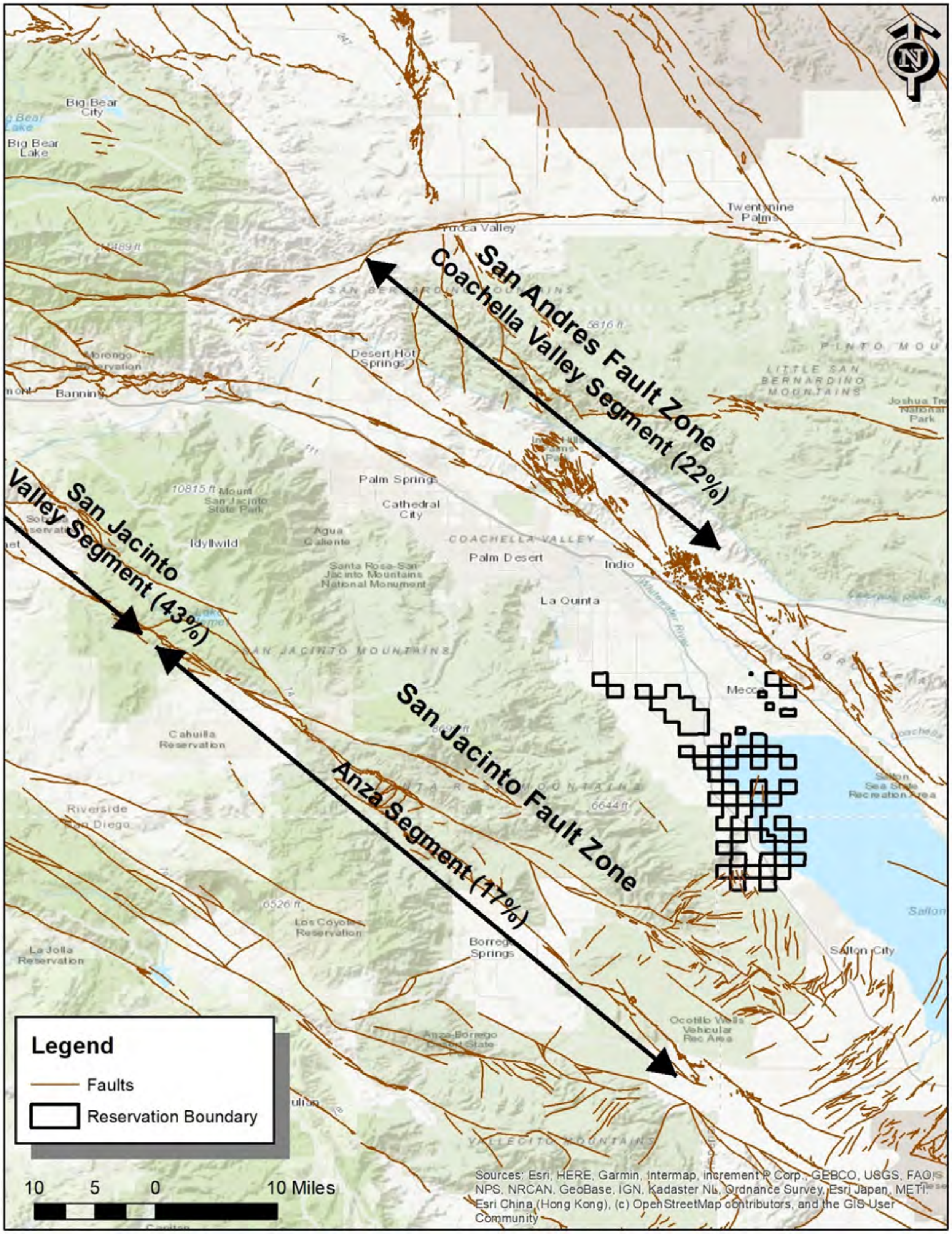

Figure 39. Fault Segments Close to the Torres Martinez Reservation.

Earthquakes are a significant risk to the Torres Martinez Reservation. The probability of future earthquake events impacting the Torres Martinez Reservation was determined using historic occurrence information. Seventeen significant (above a 5.0 magnitude) events have been reported over a 216-year reporting period near the Reservation, resulting in a significant earthquake every 13 years, on average. However, in that period many more earthquakes have occurred in the greater region. In addition, many smaller earthquakes (lower than 5.0 magnitude) have been reported near or on the Reservation. Given the number of historic events, active faults near the Reservation, and the predictions for significant earthquake events reported by Riverside County, the probability assigned to the Reservation for a significant earthquake event is likely (10 to 90 percent annual chance).

VULNERABILITY ASSESSMENT

EXPOSURE

It can be assumed that all existing and future buildings, cultural resources, and populations are at risk to the earthquake hazard. There are several factors that impact vulnerability to earthquake on the Torres Martinez Reservation, including proximity to fault lines, underlying soils, height of the water table, and type of building construction.

An earthquake could result in deaths, injuries, property damage, environmental damage and disruption of normal services and business activities. The effects could be aggravated by collateral emergencies such as fires, flooding, hazardous material spills, utility disruptions, and transportation emergencies. Aftershocks to major earthquakes could also be large enough to cause damage.

BUILT ENVIRONMENT IMPACTS

All buildings, including critical facilities, are at risk to earthquakes, but certain structures may be at a higher risk. Any structures not built to the California Uniform Building Code are at higher risk for damage or collapse. In addition, certain building types, such as unreinforced masonry and concrete, are at a higher risk of damage. Softer soils may collapse or slide during an earthquake. Liquefaction risk areas, as demonstrated in Figure 34, present a higher risk to buildings. Nearly all the developed property of the Torres Martinez Reservation resides in a high or moderate liquefaction risk area.

Hazus 6.1 was used to estimate the potential of complete structural damage due to an earthquake. A baseline of dollar exposure for all buildings and their contents on the Torres Martinez Reservation was reviewed, as detailed in the table below .

These dollar values reflect a combination of estimates and on-the-ground conditions, as detailed in the Tribal Asset Database. This information provides a baseline of how much property, in terms a dollar value, is at risk. Exposure for the identified buildings where most Reservation residents reside is approximately $142 million.

Table 24. Hazus-MH 6.1 Dollar Exposure for the Torres Martinez Reservation.

Occupancy Type	Building Exposure	Content Exposure	Total Exposure
Commercial	$23,497,180	$29,691,279	**$53,188,459**
Educational	$405,330	$405,330	**$810,660**
Government	$13,571,282	$13,571,282	**$27,142,564**
Religious	$3,974,923	$3,974,923	**$7,949,846**
Residential	$35,185,328	$17,592,664	**$52,777,992**
TOTAL	**$76,634,043**	**$65,235,478**	**$141,869,521**

A Level 2 Hazus "USGS ShakeMap Event" analysis was performed. Two scenarios were modeled. An event on the San Andreas fault, near Coachella, with a 7.4 Moment Magnitude, and an event on the San Jacinto Fault, near San Jacinto Valley, with a 7.5 Moment Magnitude (Table 4.8). The results presented reflect the percent chance of physical damage to a structure. The total economic loss for the San Andreas event is $13,017,537 and for the San Jacinto event it is $31,088,101.

Table 25. Hazus Earthquake Event Damages Per Percent Chance.

San Andreas Fault (Coachella 7.2)		
Percent Chance	**Physical Damage – None (# of Buildings)**	**Physical Damage – Complete (# of Buildings)**
0 – 25%	39	423
25 – 50%	339	0
50 – 75%	19	0
75 – 100%	26	0
Total	**423**	**423**
San Jacinto Fault (San Jacinto Valley 7.5)		
Percent Chance	**Physical Damage – None (# of Buildings)**	**Physical Damage – Complete (# of Buildings)**
0 – 25%	381	423
25 – 50%	1	0
50 – 75%	41	0
75 – 100%	0	0
TOTAL	**423**	**423**

The results indicate the probability of complete destruction for all buildings is low (0-25 percent) and a majority of buildings would not be damaged. However, some physical damage is likely, which can be seen in the San Andreas scenario. All buildings in this scenario are expected to sustain some damage.

THIRA Scenario

Per the Tribe's Threat Hazard Identification and Risk Assessment (THIRA) document, a magnitude 6.5 earthquake on the southern San Andres Fault occurring at the end of summer could result in an estimated 545 deaths on the Reservation (Tribal and non-Tribal members). Under this same scenario, the Reservation's Red Earth Casino and administrative buildings would have major structural damages.

Probabilistic Scenario

A probabilistic scenario was also run for the Reservation consisting of a 1,000-year event. The results are provided in Table 26. The total economic loss for that event would be $58,719,983. This would result in an AAL of $58,720.

Table 26. Hazus Earthquake Results for 1,000-year Earthquake Scenario.

Percent Chance	Physical Damage – None (# of Buildings)	Physical Damage – Complete (# of Buildings)
0 – 25%	423	42
25 – 50%	0	18
50 – 75%	0	359
75 – 100%	0	4
Total	**423**	**423**

LIQUEFACTION

Losses to liquefaction were analyzed using GIS analysis. Analysis was only performed for parts of the Reservation located in Riverside County, as no liquefaction data was available for Imperial County.

Buildings

The analysis revealed that 438 buildings including those considered critical facilities and/or cultural resources, are potentially at risk to liquefaction (located in high or moderate liquefaction susceptibility areas). Combined, these buildings and their contents are valued at approximately $142 million. The number of buildings and associated value potentially at risk to liquefaction are presented in Table 27.

Table 27. Torres Martinez Buildings and Value Potentially at Risk to Liquefaction.

	Number of Buildings	**%**	**Approximate Replacement Value**	**%**	**Approximate Content Value**	**%**	**Approximate Total Value**	**%**
Moderate Susceptibility	370	84%	$33,746,503	44%	$19,539,859	30%	$53,286,362	38%
High Susceptibility	68	15%	$37,068,424	48%	$39,876,502	61%	$76,944,926	54%
Total	**438**	**99%**	**$70,814,927**	**92%**	**$59,416,361**	**91%**	**$130,231,288**	**92%**

Critical Facilities

Ninety-two existing and two proposed critical facilities are at risk to liquefaction (in "high" or "moderate" susceptibility areas). Table 28 lists the critical facilities and their susceptibility to liquefaction. This includes Tribal housing (68 structures), Classrooms (2 structures), and 22 additional critical facilities. Liquefaction susceptibility data for the Travel Center and Red Earth Casino (Imperial County) was not available.

Table 28. Torres Martinez Critical Facilities at Risk to Liquefaction.

	Name	Susceptibility to Liquefaction
1	A'avutem Senior Center/Administration	High
2	Cash Assistance	High
3	Classrooms (2)	High
4	Cell Tower	Low
5	Child Development and Education Department / Library Center	High
6	Family Preservation / Family Perseverance	High
7	Gas station / Market	Moderate
8	Guard Station	High
9	New Health Clinic	High
10	Human Resources	High
11	IT Department	High
12	Language Building	High
13	Mobile Home Park	Moderate
14	Oasis Mobile Home Park	Moderate
15	Planning Building	High
16	Procurement / Compliance / Finance / Grants	High
17	Shipping and Receiving	High
18	Social Services Building	High
19	Tameka Gymnasium	High
20	TANF Executive / Facilities / Security	High
21	Tribal Hall	High
22	Tribal Housing (68 total dwellings)	High – 27 dwellings; Moderate – 41 dwellings
23	Tribal Pool	High
24	Well / Water Tanks	Moderate
25	Proposed Emergency Equipment Carport	High
26	Proposed IT Building	High

Cultural Resources

Sixteen cultural resources are potentially at risk to liquefaction. At risk cultural resources are identified below in

Table 29.

Table 29. Torres Martinez Cultural Sites at Risk to Liquefaction.

	Name	Susceptibility to Liquefaction
1	Agency (Historic District)	High
2	Catholic cemetery	High
3	Catholic cemetery	High
4	Cemetery	Moderate
5	Cemetery	High
6	Church of Sacred Hearts of Jesus and Mary	High
7	Cultural Landmark	Low
8	Dilapidated Structure (Historic District)	High
9	Fish Traps (4 sites total)	Moderate (2 of 4 sites); Low (2 of 4 sites)
10	Headmaster's House (Historic District)	High
11	Oasis Community Park	Moderate
12	Old Stagecoach Water Tank	High
13	Petroglyphs at the fish traps	Moderate
14	School (Historic District)	High
15	The Body of Christ Church (3 buildings)	Moderate
16	Travertine Point (2 sites)	N/A

Figure 40 shows liquefaction vulnerability across the entire Reservation. Figure 41 shows liquefaction vulnerability on areas of the Reservation where assets are clustered, including critical facilities, and cultural resources, and other buildings. Figure 42 and Figure 43 show critical facilities and cultural resources potentially at risk to liquefaction.

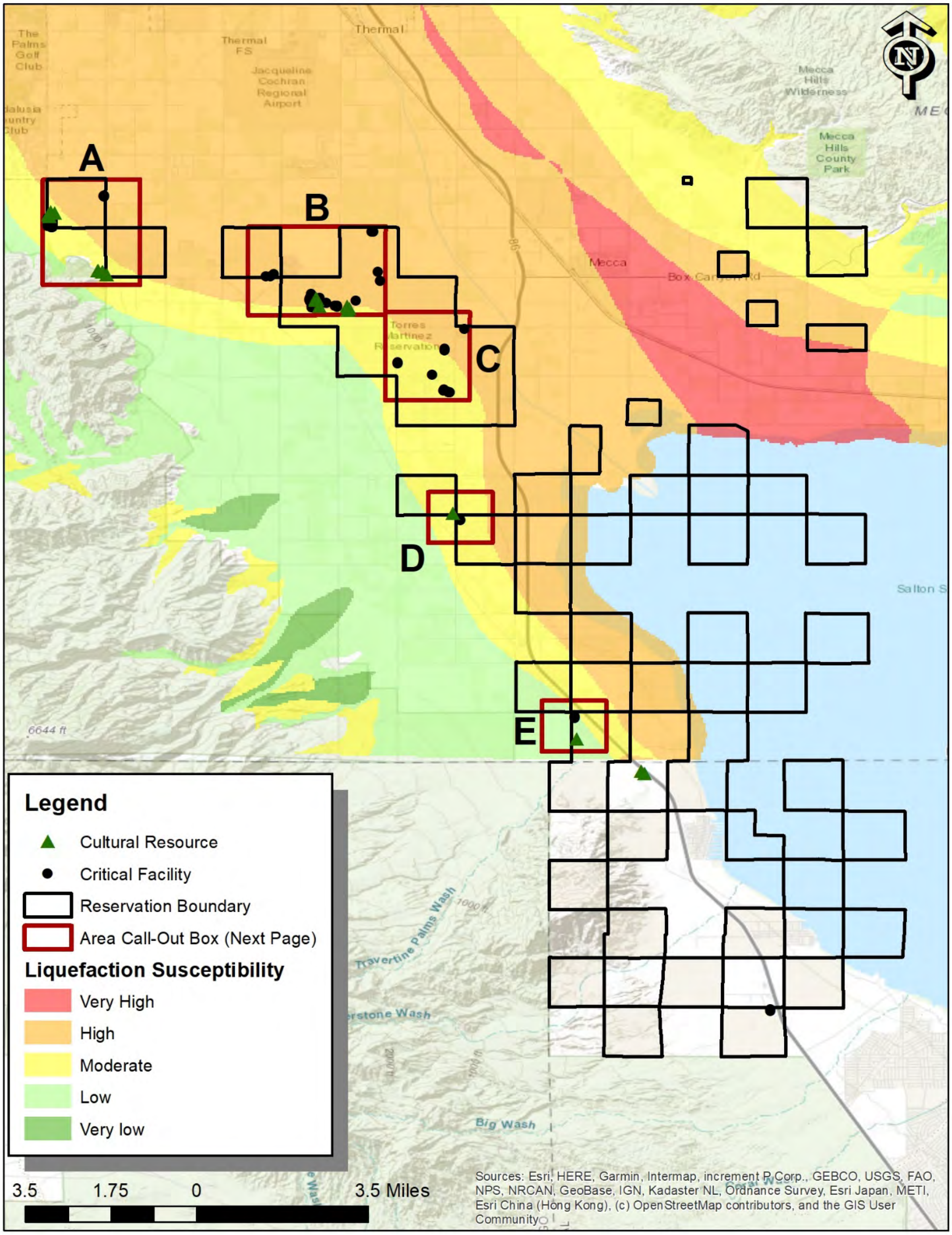

Figure 40. Torres Martinez Buildings Clustered Asset Areas at Risk to Liquefaction (Riverside County).

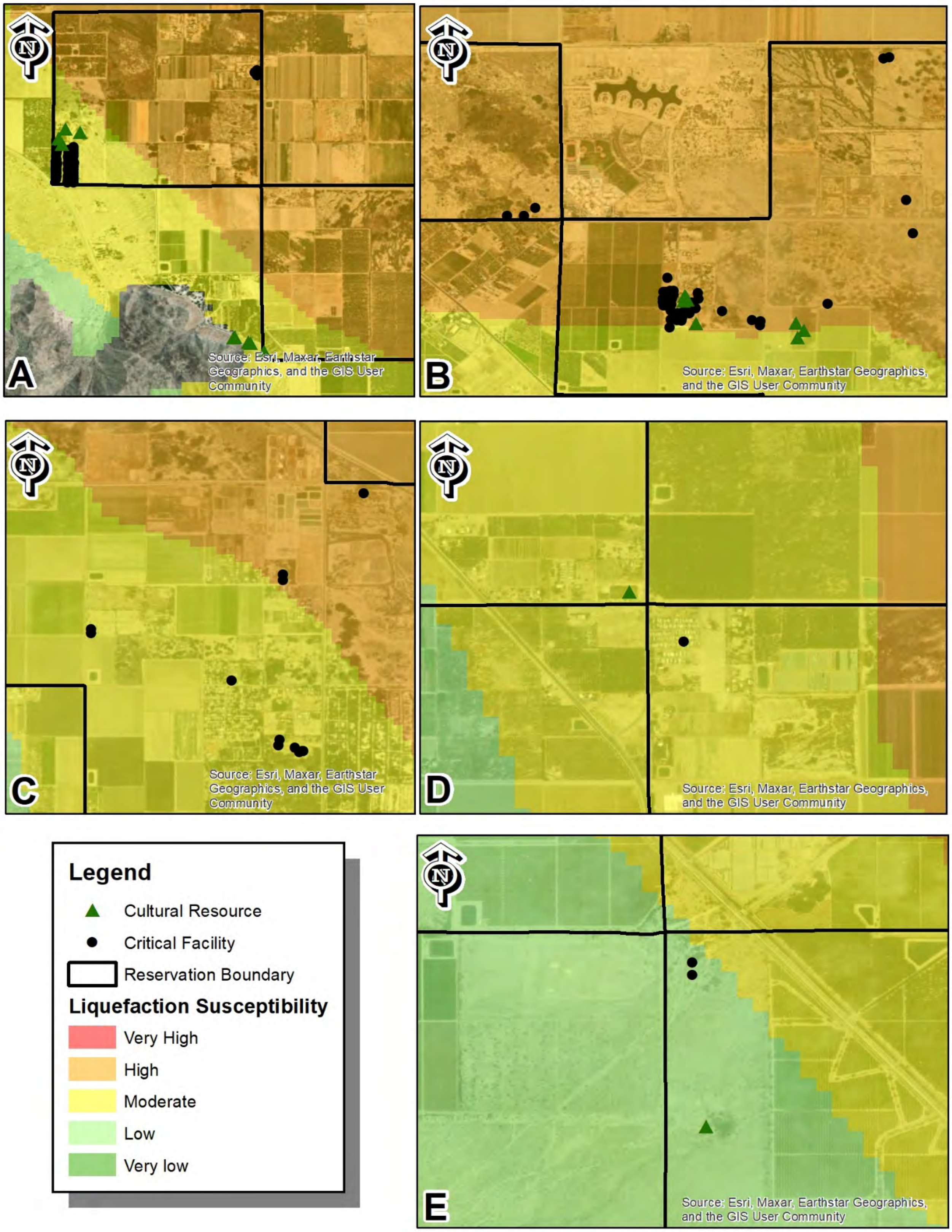

Figure 41. Torres Martinez Clustered Assets Potentially At Risk to Liquefaction.

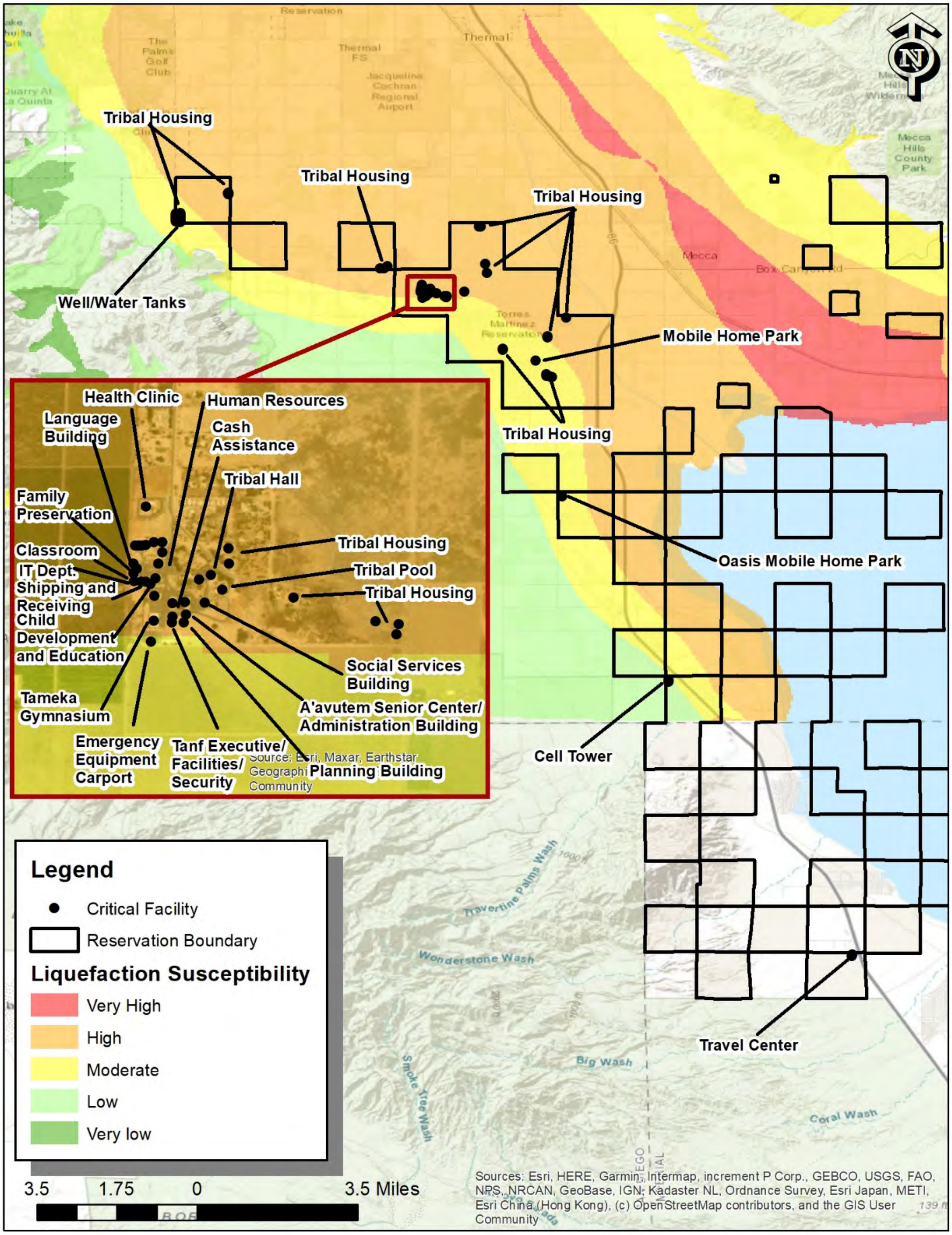

Figure 42. Torres Martinez Critical Facilities Potentially At Risk to Liquefaction.

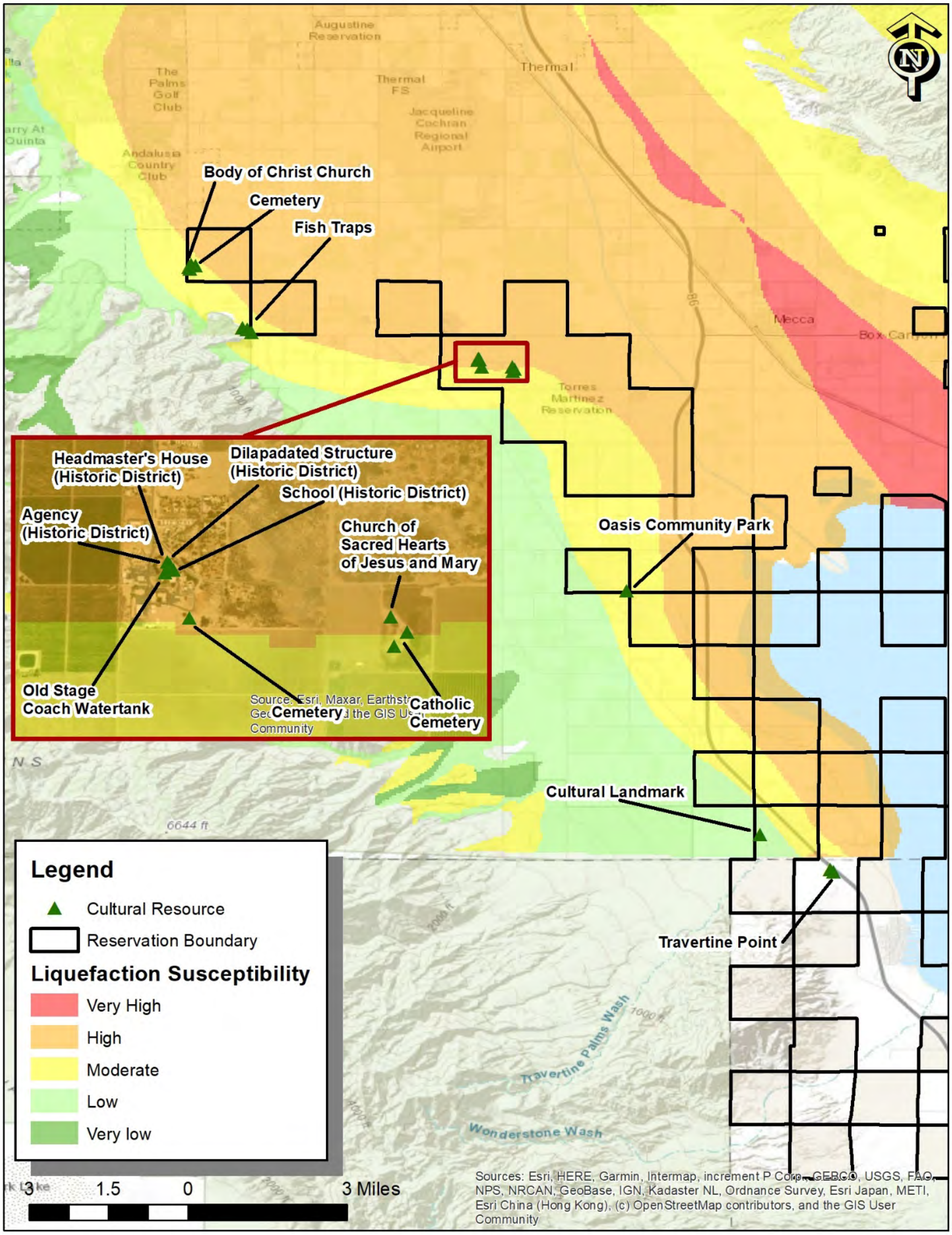

Figure 43. Torres Martinez Cultural Resources Potentially at Risk to Liquefaction.

POPULATION IMPACTS

Populations considered most vulnerable to earthquake impacts are identified based on a number of factors including their physical and financial ability to react or respond during a hazard and the location and construction quality of their housing. The flood vulnerability assessment provides maps of the senior and low-income populations on the Reservation. It should be noted that there may be overlap within the two categories, so that the total number of persons exposed may be lower than what is shown in the table. However, the Reservation should be aware of the potential needs of residents within these population segments in the event of a hazard occurrence.

Hazus was used to model injuries and fatalities for the 1500- and 2500-year events. For the 1500- year event, there are up to 10 minor injuries not requiring medical attention with up to 3 injuries requiring medical attention. For the 2500-year event there are up to 15 minor injuries not requiring medical attention with up to 5 injuries requiring medical attention.

ENVIRONMENT IMPACTS

The environment may be impacted by cascading impacts from the earthquake, such as a HAZMAT spill caused by road/rail damage, landslide, or dam breach. This could result in a hazardous material release.

PROBLEM STATEMENTS FOR EARTHQUAKES

Table 30. Problem Statements for Earthquakes.

Assets	Problems Associated with Earthquakes
People (including underserved communities and socially vulnerable populations)	• Vulnerable populations in unreinforced masonry and mobile homes/tiny homes may need response. • Elderly population falls during event.
Structures (including facilities, lifelines, and critical infrastructure)	• Unreinforced masonry and utility lifelines impacted. • Older bridges and utilities may need to be inspected after event. • Indoor sprinkler system can cause flood damage after small quakes.
Systems (including networks and capabilities)	• EMS services may be disrupted if road network is disturbed.
Natural, historic, and cultural resources	• Historical buildings constructed out of unreinforced masonry are susceptible and may be impacted.
Activities that have value to the community	• None apparent or projected.

4.2.2.1 SUBSIDENCE

DESCRIPTION

Subsidence is the settling or sinking of the ground surface with little or no horizontal movement. Cracks and separations (known as fissures) are common with subsidence. Subsidence can be localized to affect a small area but can also occur over a whole region. Ground subsidence can occur naturally as the earth's plates move, or by man-made forces, such as the extraction of oil or groundwater. Documented subsidence has occurred in Riverside County (the Southern Coachella Valley) due to falling and rising groundwater tables. The withdrawal of groundwater has been the primary cause of subsidence in Riverside County.[76]

Alluvial sediments and soil deposited by winds are most susceptible to subsidence in the future. Ground subsidence can happen over time, or rapidly as the result of an earthquake. Subsidence can damage buildings and infrastructure and can also change aquifer storage capacities or surface drainage pathways. Therefore, areas susceptible to subsidence may be more vulnerable to earthquakes.

LOCATION

According to the United States Geological Survey (USGS), the main cause of subsidence in California is groundwater pumping (https://www.usgs.gov/centers/land-subsidence-in-california). The USGS has mapped areas of documented subsidence and areas susceptible to subsidence. Figure 44 shows documented subsidence occurring in the planning area.

[76] County of Riverside Environmental Impact Report No. 521. (2014, March). Section 4.12 Geology and Soils. Retrieved July 5, 2017 from http://planning.rctlma.org/Portals/0/genplan/general_plan_2014/EnvironmentalImpactReport/04-12_GeologyAndSoils_2014-04-07.pdf.

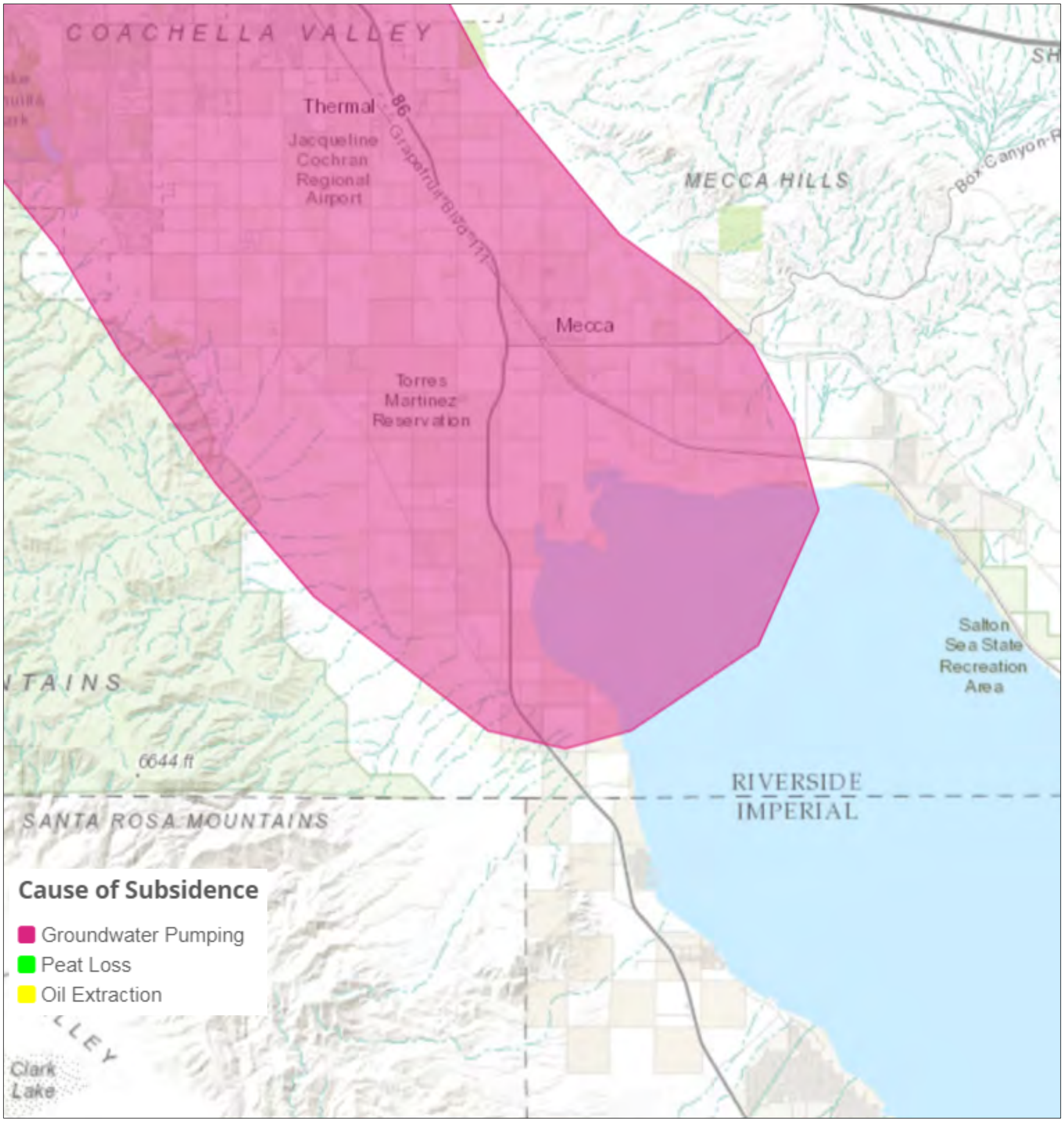

Figure 44. Ground Subsidence Areas in Riverside County.[77]

Tribal members have also noted issues associated with three flowing artesian wells occurring on the Reservation. An artesian well taps into a confined aquifer, or an aquifer that is confined by an impervious layer of rock or sediments. Water in a confined aquifer is under pressure; therefore, when water in a confined aquifer is tapped, pressure causes the water to rise without using a pump. A flowing artesian well occurs when the pressure in the confined aquifer is great enough to cause the water to rise

[77] U.S. Geological Survey. Areas of Land Subsidence in California. Retrieved from https://ca.water.usgs.gov/land_subsidence/california-subsidence-areas.html.

above the surface of the land. These events can be continuous or intermittent.[78] Flowing artesian wells can result in sinkholes, a form of land subsidence. At least one of the affected wells has resulted in a sinkhole on Tribal lands, as demonstrated by Figure 45, which shows a sinkhole near a flowing artesian well on Jackson Street.

Figure 45. Ground Sinking at an Artesian Well on the Torres Martinez Reservation (Jackson Street, Thermal).

PREVIOUS OCCURRENCES

Groundwater has been a major source of agricultural, recreational, municipal, and domestic supply in the Coachella Valley of California since the early 1920s. Pumping of groundwater resulted in groundwater-level declines as large as 50 feet (ft) or 15 meters (m) by the late 1940s. Because of concerns that the declines could cause land subsidence, the Coachella Valley Water District (CVWD) and the USGS have cooperatively investigated subsidence in the Coachella Valley since 1996.

Importation of Colorado River water to the southern Coachella Valley began in 1949, resulting in a reduction in groundwater pumping and a recovery of groundwater levels during the 1950s through the 1970s. Since the late 1970s, the demand for water in the valley increased to the point that groundwater levels again declined in response to increased pumping and, consequently, increased the potential for land subsidence caused by aquifer-system compaction. Several management actions to increase recharge or to reduce reliance on groundwater have been implemented since as early as 1973 to address overdraft in the Coachella Valley.

The USGS Publication, *Detection and measurement of land subsidence and uplift using Global Positioning System surveys and interferometric synthetic aperture radar, Coachella Valley, California, 2010–17,* describes the use of Global Positioning System (GPS) surveying and interferometric synthetic aperture

[78] British Columbia. (n.d.) Flowing Artesian Wells. Retrieved June 30, 2017 from http://www.env.gov.bc.ca/wsd/plan_protect_sustain/groundwater/flowing_artesian_wells.pdf.

radar (InSAR) methods to determine the location, extent, and magnitude of the vertical land-surface changes in the Coachella Valley during 2010–17, updating 1993–2010 information presented in previous USGS reports.[79]

EXTENT

Variables that contribute to the extent of potential subsidence activity in any area include soil properties, topographic position and slope, and historical incidence. Predicting subsidence is difficult, even under ideal conditions. As a result, estimations of the potential severity of subsidence are informed by previous occurrences as well as an examination of local geology.

The USGS recognizes four major impacts caused by land subsidence:

- Changes in elevation and slope of streams, canals, and drains
- Damage to bridges, roads, railroads, storm drains, sanitary sewers, canals, and levees
- Damage to private and public buildings
- Failure of well casings from forces generated by compaction of fine-grained materials in aquifer systems

PROBABILITY OF FUTURE EVENTS

The lack of a long-term record of historical occurrences and comprehensive, readily available scientific studies make it difficult to predict the probability of future occurrence, only that it is likely.

VULNERABILITY ASSESSMENT

The risk and potential impacts of land subsidence depend on the type of subsidence that occurs (regional or localized, gradual or sudden) and the location in which the subsidence occurs. Potential damage and loss due to sinkholes or land subsidence is nearly impossible to assess because the nature of the damage is site- and event-specific.

EXPOSURE

Although some subsidence has been mapped (shown in Figure 44), the entire Reservation should be considered potentially exposed.

BUILT ENVIRONMENT IMPACTS

If the ground fails, the built environment could be impacted through damaged structures, utilities, and other infrastructure.

POPULATION IMPACTS

Homes and businesses impacted would affect the residents and employees.

[79] https://www.usgs.gov/publications/detection-and-measurement-land-subsidence-and-uplift-using-global-positioning-system).

ENVIRONMENTAL IMPACTS

The ground could collapse resulting in tree and agriculture damage and loss.

PROBLEM STATEMENTS FOR SUBSIDENCE

Table 31. Problem Statements for Ground Subsidence.

Assets	Problems Associated with Ground Subsidence
People (including underserved communities and socially vulnerable populations)	• Vulnerable populations residing in or adjacent to susceptible areas could be impacted.
Structures (including facilities, lifelines, and critical infrastructure)	• Structures in subsidence susceptible areas could be impacted. • Bridges and utilities could be impacted.
Systems (including networks and capabilities)	• None apparent or projected.
Natural, historic, and cultural resources	• Public areas in susceptible zones could be impacted by ground failure.
Activities that have value to the community	• If an activity venue was in a susceptible zone could be impacted by a ground failure.

4.2.3 METEOROLOGICAL HAZARDS

4.2.3.1 DUST STORM AND WIND EROSION

DESCRIPTION

Wind erosion occurs when winds erode, carry, and displace soil particles, transporting them through the air. Soil erosion is a natural process that transports soil particles through a transport mechanism, such as flowing water or wind. Therefore, the “dust” in a dust storm is typically sandy or loamy soils and other particulate solids found in soil, such as fertilizers and pesticides used in agriculture. Loose soil texture and steep slopes primarily result in high potential for wind erosion. Wind erosion is most severe in arid regions, where sandy or loamy sediments are unvegetated and exposed to severe wind conditions.[80] As detailed in the Extreme Storm Section of this plan, the Torres Martinez Reservation experiences strong/high wind occurrences, thunderstorm wind occurrences, and events caused by the Santa Ana Winds, all of which can contribute to wind erosion. Drought conditions and/or poor agricultural practices that loosen topsoil can contribute to and/or exacerbate wind erosion.

[80] Riverside County Multi-Jurisdictional Local Hazard Mitigation Plan. (2012).

Dust particles in the air can create major health problems. Atmospheric dust causes respiratory discomfort and may carry pathogens or chemicals that cause eye infections and skin disorders in humans and animals. As the Salton Sea continues to shrink, and the newly exposed sediment dries, wind erosion and particles of soil in the air are expected to increase (see *Vulnerability* section, below, for health impacts to the Reservation). Besides contributing to health problems, excessive and fast-moving particulate matter in the air can damage machinery, HVAC systems, and electronic equipment. Water ditches can fill with sediment, impacting water quality. In addition, wind erosion can be economically damaging for agriculture when occurring on croplands, as the fertile topsoil is removed.[81]

In extreme cases, wind events can result in dust storms. Dust storms occur when strong winds drive dust particles into the air. Strong dust storms, also called Haboobs, are caused when strong winds flowing downward and outward from thunderstorms pick up fine particles of dirt and sand. This phenomenon can create an image of what appears to be a huge wall of dust. Dust storms can severely reduce visibility, making them a hazard for motorists and air traffic.[82] Buildings, fences, roads, crops, trees and shrubs can all be damaged by abrasive blowing soil.

Another form of dust storm, which also causes wind erosion, are dust devils. Dust devils are small, rotating columns of air that pick-up dust and debris. Dust devils typically develop in dry regions under hot, calm, clear conditions when intense surface heating (such as that occurring on an asphalt parking lot) quickly causes a difference in vertical air temperatures.[83] The hot air rises, creating a vertical column of warm air. Displaced cooler air circulates around the column of warm air, picking up dust. Dust devils are not as strong as tornadoes but can cause damage to crops and property. The typical dust devil is approximately 10 to 100 feet wide and 650 feet tall. Such occurrences are common on the Torres Martinez Reservation. Figure 46 shows a dust devil that occurred near the Reservation.

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[81] Kern County Multi-Jurisdictional Hazard Mitigation Plan, (2005). Retrieved June 28, 2017, from http://hazardmitigation.calema.ca.gov/docs/lhmp/Kern_County_LHMP.pdf.
[82] What is a Haboob? (2013, September 27). The Weather Channel. Retrieved June 28, 2017, from https://weather.com/science/news/what-haboob-20130927.
[83] American Meteorological Society. (2016, May 6). Retrieved June 28, 2017 from http://glossary.ametsoc.org/wiki/Dust_devil.

Figure 46. Dust Devil on the Torres Martinez Reservation.

LOCATION

It is assumed that the entire Reservation is uniformly exposed to dust storms and wind erosion. Thus, dust storms and wind erosion can occur anywhere on the Reservation. It should be noted that places on the Reservation with loose soils (such as those with no or minimal vegetation and/or sandy composition) may be at higher risk for wind erosion.

A wind erosion susceptibility map obtained from Riverside County Planning[84] is displayed in Figure 47 below. According to the map, most of the Torres Martinez Reservation located in Riverside County has high susceptibility to wind erosion. This information was not available for Imperial County.

[84] County of Riverside Environmental Impact Report No. 521, Section 4.12 Geology and Soils (Public Review Draft). (2014). Riverside County Planning. Retrieved from

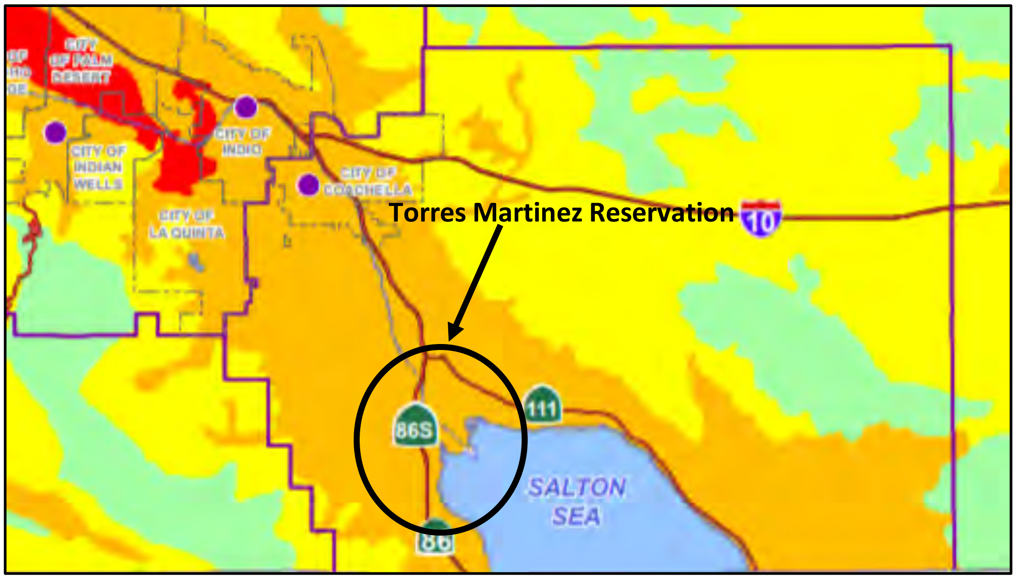

Figure 47. Wind Erosion Susceptibility Areas.

PREVIOUS OCCURRENCES

In late August of 2023, Tropical Storm Hillary impacted Southern California with flooding and mud slides. The mudslides then dried out and became airborne impacting human health including asthma, symptoms of heart and lung disease, and respiratory infections. One way to monitor air quality is to measure the amount of inhalable particles with a diameter of 10 micrometers or smaller (PM10). After the tropical storm came through, the Federal PM10 standard was exceeded three times (it had only been exceeded six times the previous five years).[85]

The National Centers for Environmental Information (NCEI) database was reviewed to collect records of dust storms and dust devils. This source does not specifically include wind erosion events or rates, and no additional information on wind erosion was located through research and interviews. According to data from the NCEI Storm Events Database, there have been 52 reported dust storms in Imperial and Riverside Counties since 1993, including one dust devil that occurred in Durmid, CA (approximately 10 miles from the Torres Martinez Reservation, on the eastern shore of the Salton Sea). Of those reported events, 35 occurred in forecast zones overlaying Reservation lands, which resulted in five injuries, and almost $477,000 (2017 dollars) in damages. It should be noted that figures reported for damages may include damages resulting from wind gusts (e.g., a roof coming off a building), not necessarily the sand and dirt particles in the wind gusts or wind erosion impacts. When available, details are included for those events that resulted in injuries or damages. NCEI-reported events are presented in Table 32. While

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http://planning.rctlma.org/Portals/0/genplan/general_plan_2014/EnvironmentalImpactReport/04-12_GeologyAndSoils_2014-04-07.pdf.

[85] https://www.desertsun.com/story/news/environment/2023/11/24/coachella-valleys-unhealthy-air-likely-connected-to-tropical-storm-hilary/71672450007/

no specific events were reported on Reservation lands in the NCEI database, dust devils are known to be a common occurrence which typically do not result in damage based on anecdotal information from the Tribe.

Table 32. Historic Dust Storm Occurrences.

Forecast Zone	Beginning Date	Deaths/ Injuries	Property Damage (2024 Dollars)	Crop Damage (2024 Dollars)	Narrative
C Riverside (Zone)	9/9/1998	0/4	$0	$0	--
Coachella Valley (Zone)	4/21/1999	0/0	$392,149	$0	Prolonged and sustained winds between 30 and 40 mph with gusts to 54 mph across the Apple, Yucca, and Coachella Valleys occurred over this two-day period. Blowing dust and sand caused visibilities near zero, forced road closures, damaged automobile windshields, and raised air pollution readings to exceptionally high levels. A roof was partially torn off a house in Palm Springs. Just to the west, along Highway 111, a semi tractor-trailer was overturned. Farther north, a tree and several power poles along the Oro Grande Wash between Hesperia and Victorville were toppled.
Coachella Valley (Zone)	8/11/2000	0/0	$0	$0	--
C Riverside (Zone)	8/17/2001	0/0	$0	$0	--
C Riverside (Zone)	9/30/2001	0/0	$20,535	$0	--
C Riverside (Zone)	2/17/2002	0/0	$0	$0	--
Coachella Valley (Zone)	3/13/2002	0/0	$79,750	$0	--
Coachella Valley (Zone)	3/16/2002	0/0	$0	$0	--
C Riverside (Zone)	5/7/2002	0/0	$0	$0	--

C Riverside (Zone)	5/20/2002	0/0	$0	$0	--
Coachella Valley (Zone)	2/2/2003	0/0	$29,035	$0	High winds blew trees down in the communities of Redlands, Jurupa, and Riverside. Blowing sand and dust disrupted traffic and outdoor activities in the Coachella Valley.
Coachella Valley (Zone)	11/22/2003	0/0	$67,749	$0	Trees, power lines, and signs were knocked down.
Lower Colorado River Valley (Zone)	2/18/2004	0/0	$0	$0	--
Imperial County Except the Lower Colorado River Valley (Zone)	10/5/2007	0/0	$0	$0	--
Imperial County Except the Lower Colorado River Valley (Zone)	6/4/2008	0/0	$0	$0	--
Imperial County Except the Lower Colorado River Valley (Zone)	8/8/2008	0/0	$0	$0	--
Imperial County Except the Lower Colorado River Valley (Zone)	8/8/2008	0/0	$0	$0	--
Coachella Valley (Zone)	3/22/2009	0/0	$0	$0	--
Imperial County Except the Lower Colorado River Valley (Zone)	9/5/2009	0/0	$0	$0	--
Imperial County Except the Lower Colorado River Valley (Zone)	10/4/2010	0/0	$0	$0	--

Imperial County Except the Lower Colorado River Valley (Zone)	7/3/2011	0/0	$0	$0	--
Coachella Valley (Zone)	2/13/2012	0/0	$0	$0	--
Imperial County Except the Lower Colorado River Valley (Zone)	8/13/2012	0/0	$0	$0	--
Coachella Valley (Zone)	9/9/2012	0/0	$0	$0	--
Coachella Valley (Zone)	4/14/2013	0/0	$14,403	$0	Very windy conditions existed along the Interstate 10 corridor in the Coachella Valley on the evening of the 14th, with blowing dust bringing visibility down to under one-eighth of a mile. KESQ news reported a sand storm impacting the Coachella Music Festival with winds gusting up to 40 mph at the Coachella mesonet. California Highway Patrol reported a large quantity of sand in the roadway near Vamer Road and Monterey Avenue the following morning. The Desert Sun newspaper reported police closed Gene Autry Trail between Interstate 10 and Via Escuela and Indian Canyon Road from Palm Springs Train Road to Tramway Road

					due to blowing sand and reduced visibility of less than one-quarter mile. These major roads remained closed until the 16th due to blowing sand and downed trees.
Imperial County Except the Lower Colorado River Valley (Zone)	8/22/2013	0/0	$0	$0	--
Imperial County Except the Lower Colorado River Valley (Zone)	8/24/2013	0/0	$0	$0	--
Imperial County Except the Lower Colorado River Valley (Zone)	8/31/2013	0/0	$0	$0	--
Imperial County Except the Lower Colorado River Valley (Zone)	9/7/2013	0/0	$0	$0	--
Coachella Valley (Zone)	3/26/2014	0/0	$0	$0	--
Imperial County Except the Lower Colorado River Valley (Zone)	8/21/2014	0/0	$0	$0	--
Coachella Valley (Zone)	8/21/2014	0/0	$6,789	$0	A spotter reports a dust storm producing quarter mile visibility in Cathedral City, with winds estimated at 15-20 mph. A haboob in Palm Springs felled a tree onto a pickup truck containing a man who was injured and taken to the hospital. Peak wind speeds at the nearby

					Palm Springs ASOS were 40 mph at that time. The dust storm then proceeded down the Coachella Valley, reaching the Thermal Airport, whose ASOS reported one-quarter mile visibility in dust and 40 knot wind gusts.
Coachella Valley (Zone)	12/11/2015	0/0	$0	$0	--
Coachella Valley (Zone)	3/6/2016	0/0	$0	$0	--
Imperial County Except the Lower Colorado River Valley (Zone)	8/19/2016	0/0	$0	$0	--
Imperial County West (Zone)	9/7/2017	0/0	$0	$0	--
Coachella Valley (Zone)	7/9/2018	0/0	$0	$0	A line of thunderstorms from Arizona pushed into Southern California early on July 9th. The thunderstorm collapsed and produced a gust front, which brought strong winds into the Coachella Valley. These winds kicked up a significant amount of dust, reducing visibility to as low as 3/4 of a mile. The intense winds knocked over a power pole, and resulted in a house fire.
Coachella Valley (Zone)	2/13/2021	0/0	$0	$0	A potent mid-level shortwave trough

					passed through Southern California and produced strong onshore flow (west to northwest winds) followed by gusty Santa Ana winds.
Coachella Valley (Zone)	3/15/2021	0/0	$0	$0	
Coachella Valley (Zone)	8/31/2021	0/0	$30,000	$0	On August 31 a significant dust storm moved through the Coachella Valley and into the Borrego Deserts.
Coachella Valley (Zone)	4/16/2022	0/0	$0	$0	
Salton Sea (Zone)	10/6/2022	0/0	$0	$0	A well-organized outflow boundary surged well ahead of the thunderstorm complex, resulting in dense blowing dust, which traversed westward across the Imperial Valley and into the Salton Sea area.
Coachella Valley (Zone)	10/7/2022	0/0	$0	$0	Widespread reports of strong winds and severely reduced visibility were received across the deserts, mountains and inland valleys.
Coachella Valley (Zone)	7/31/2023	0/0	$0	$0	

Coachella Valley (Zone)	9/1/2023	3/0	$0	$0	Visibility estimated as low as 100 feet locally along Interstate 10 north of Palm Springs. Three people died in a car crash on Sunday afternoon in Palm Springs on North Gene Autry Trail

EXTENT

The extent, or severity, of dust storms and wind erosion can be measured in several different ways. Dust storms can be measured in terms of wind speed; however, the wind speed was not reported in NCEI for the events listed in the table above. Dust storms can also be measured in terms of damages incurred. The greatest damage caused by a single dust storm in the analyzed forecast zones was over $392,149 (2024 dollars) in 1999.

Dust devils can be measured on the Enhanced Fujita scale (AMS) (see the Tornado profile). It is not common for dust devils to exceed an EF0 or an EF1 on the Enhanced Fujita scale. The magnitude associated with the dust devil reported in Riverside County was not reported in NCEI.

The severity of wind erosion can be measured in terms of the amount of soil moved or displaced in a given period of time. NCEI does not report wind erosion events or rates, and no additional sources indicated a specific rate of occurrences for the planning area. According to the map above, the Reservation is in an area of high erosion susceptibility, which is the second-highest category (with “very high” areas having the most severe wind erosion rates).

PROBABILITY OF FUTURE EVENTS

Based on a search of the NOAA / NCEI Storm Events Database, 44 dust storm events were recorded for Imperial and Riverside Counties (including the Coachella Valley Zone and Imperial Valley Zone) between January 2016 and September 2024, a calculated average of 5.5 events per year. However, it is known that weaker dust devils and dust storms are a common occurrence in the planning area, particularly when there are Santa Ana Wind influences; stronger dust storms are less common. In addition, wind erosion and the amount of dust in the air is expected to increase on the Reservation as the Salton Sea continues to recede and expose more soils to wind. Therefore, the probability of a dust storm is “highly likely” (greater than 90 percent annual chance).

Wind erosion and dust storms are exacerbated by hot temperatures and drought conditions, which can cause vegetation to die and soils to loosen. In addition, warmer temperatures can result in increased evaporation, which could cause the already shrinking Salton Sea to shrink further, exposing more soils.

On the Reservation, extreme heat events are expected to increase, as are average maximum temperatures. As temperatures rise and the frequency/intensity of droughts increase, the potential for wind erosion, dust storms, and dust devils will also increase.

VULNERABILITY ASSESSMENT

EXPOSURE

All current and future buildings, populations, and critical facilities are at risk to this hazard. Similar to the drought hazard, dust impacts are more likely to have non-structural, societal implications. Dust storms and dust devils can create dangerous road and driving conditions, damage crops, impact public health (asthma and other respiratory illnesses), and damage car windshields and other property.

BUILT ENVIRONMENT IMPACTS

Strong dust storms and dust devils could result in tornado-like damages to structures, including critical facilities, particularly to roof shingles and surfaces vulnerable to abrasive sand and dirt particles. Cultural sites also have the potential to be damaged. Major damages to structures are unlikely but could be caused from downed trees or powerlines falling on cars and structures.

Dust storms can inundate or bury equipment, can damage surfaces and coatings on infrastructure, houses, and other buildings, especially when the dust is laden with pollutants such as salts, sulfur, and heavy metals.

A 2022 study analyzing the impact of extreme dust storms on the national photovoltaic energy supply in Spain noted that clouds, aerosols, water vapor, and ozone can absorb, reflect, and deflect part of the sunlight, reducing the intensity of the radiation reaching photovoltaic (PV) modules, with the result being that PV performance is likely to worsen during dust and sand storms.[86]

Annualizing the losses from dust storm damage overtime results in an approximate value of $23,719 annually. However, this value is for Riverside County, the Coachella Valley, and the Imperial Valley zones, which is inclusive of the Torres Martinez Reservation and several areas beyond it. Further, the potential losses associated with public health such as missed work and reduced productivity are also unknown given limited data. It is difficult to determine an exact value for the Reservation without detailed historic data. Annualizing losses directly associated with the Reservation would likely result in a negligible value.

POPULATION IMPACTS

The Torres Martinez Reservation is especially vulnerable to wind erosion from the shrinking Salton Sea. The Salton Sea receded during the 2013-2016 drought and is expected to recede further in coming years. The Salton Sea's main source of inflow is water apportioned from the Colorado River that is used for agriculture. That agricultural runoff then flows into the Salton Sea. Agreements between local, state,

[86] source: https://www.sciencedirect.com/science/article/pii/S2213138824000031).

and federal agencies have resulted in conservation measures that will reduce the amount of agricultural runoff, and therefore the amount of water flowing into the Salton Sea.[87] The reduced inflow, combined with evaporation from the region's hot, dry climate, could result in the shoreline receding by several miles, leaving 21,120 acres of sediment exposed.[88]

Agricultural runoff has resulted in high amounts of pesticides and fertilizers in the lake, including arsenic, lead, selenium, chromium, and dichloro-diphenyl-trichloroethane (DDT). As the lake evaporates and sediment is exposed, these chemicals could bind to fine particles of sediment. When those particles are eroded by the wind and breathed by people, they could cause a major health hazard. Health care professionals warn that the increased dust from the newly exposed lakebed could exacerbate already elevated rates of asthma and respiratory infections for communities adjacent to the Salton Sea.

ENVIRONMENT IMPACTS

Dust storms impact air quality by increasing the contaminant loads of breathable suspended particles in the air during the storms. In addition, the deposition of dust on the landscape can cause drying of leaves that hinders the growth of plants and can damage crops. The suspended dust particles in water can obstruct penetration of sunlight and affect the life cycles of aquatic/marine species.

According to the World Meteorological Organization (WMO), sand and dust storms originate from natural sources like deserts and dry lake beds, and human activities exacerbate the problem through construction, agriculture, and poor land management practices that strip vegetation and expose soil to wind erosion. Climate change amplifies the occurrence of sand and dust storms by altering weather patterns and reducing vegetation cover. Dust particles also significantly impact weather due to feedback processes related to atmospheric dynamics, cloud formation, and precipitation.

The WMO's Sand and Dust Storm Warning Advisory and Assessment System was established in 2007 to strengthen operational forecasting and warning services for regions of the world in a globally coordinated manner. The system is a collaborative international partnership of research, operational, and user communities facilitating the transfer of technology to serve society by reducing the impacts on the environment, health, and economies.[89]

Wind erosion can impact cropland by removing the fertile layer of topsoil. However, eroded soils and particulates suspended in the air, or "atmospheric dust" also pose a health threat that contributes to asthma, respiratory irritation, and eye and skin infections or irritation. Problems associated with poor air quality caused by dust are a documented health issue in the region. In 2015, Imperial County had more

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[87] California Department of Fish and Wildlife. Background Information on the Salton Sea. (n.d.). Retrieved June 29, 2017, from https://www.wildlife.ca.gov/Regions/6/Salton-Sea-Program/Background.

[88] Polakovic, G. (n.d.). A Shrinking Sea Mean Toxic Dust. Retrieved June 15, 2017, from http://www.sci.sdsu.edu/salton/ShrinkingSeaNToxicDust.html.

[89] https://wmo.int/topics/sand-and-dust-storms).

than double the state's rate of asthma-related hospitalizations and emergency room visits for children ages 5 to 17.[90]

PROBLEM STATEMENTS FOR DUST AND WIND EROSION

Table 33. Problem Statements for Dust and Wind Erosion.

Assets	Problems Associated with Dust and Wind Erosion
People (including underserved communities and socially vulnerable populations)	• Populations with asthma are particularly vulnerable to dust storms and those exposed could develop respiratory infections.
Structures (including facilities, lifelines, and critical infrastructure)	• Structures including critical facilities may be adversely impacted by dust storms and erosion. • Bridges and utilities could be impacted.
Systems (including networks and capabilities)	• Transportation may be temporarily suspended due to conditions.
Natural, historic, and cultural resources	• Public areas, historic, and cultural assets may be adversely impacted by dust storms and wind erosion damaging them.
Activities that have value to the community	• If an activity venue was occurring during a dust storm, it would need to be postponed or cancelled.

4.2.3.2 EXTREME COLD

DESCRIPTION

The term "extreme cold" can have varying definitions in hazard identification. Generally, extreme cold events refer to a prolonged period (days) with extremely cold temperatures. Further, what is considered an extreme cold event will vary greatly by region. Sustained temperatures below freezing in Southern California's generally warm and mild weather regions can cause life loss and health risks to vulnerable populations. Although freeze events are infrequent, they can pose a health risk, especially in instances where temperatures dip into the teens and single digits.

Freezing temperatures can severely affect California agriculture. Freezing temperatures occurring during winter and spring growing seasons can cause extensive crop damage. Secondary impacts of freeze disasters can include major economic impacts on farmers, farm workers, packers, and shippers of agricultural products. Freezes can also cause significant increases in food prices to the consumer due to shortages. [91]

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[90] Agha, M. (2017, March 24). 12,000 Imperial County children already have asthma. Will Salton Sea make it worse? The Sacramento Bee. Retrieved June 29, 2017, from 12,000 Imperial County children already have asthma. Will Salton Sea make it worse? Read more here: http://www.sacbee.com/news/politics-government/capitol-alert/article140673403.html#storylink=cpy.

[91] http://www.caloes.ca.gov/HazardMitigationSite/Documents/007-SHMP%202013%20Chapter%206.pdf.

When freezing temperatures occur in the region, farmers burn hay and light smudge pots to help preserve crops. This practice puts smoke in the air creating air quality issues and impacting community members with respiratory issues.

LOCATION

Nearly the entire continental United States is susceptible to extreme cold and freeze events. Some freeze events may be large enough to affect several states, while others might affect limited, localized areas. The degree of exposure typically depends on the normal expected severity of local winter weather. Given the atmospheric nature of the hazard, the entire Reservation has uniform exposure to extreme cold and freeze events.

PREVIOUS OCCURRENCES

In order to understand extremes, average temperatures were researched. In addition, previous occurrences from NCEI were reviewed. Average low temperatures at the Torres Martinez Reservation range from the upper 30s in the winter months to the mid-70s in the summer months. In general, Southern California, including the Torres Martinez Reservation, is accustomed to mild winters and temperatures below freezing are rare. Record lows have brought below freezing temperatures to the area, ranging from the teens in the winter months to the mid-50s in the summer months. Figure 48 shows average monthly maximum and record temperatures for a monitoring station in Thermal, CA.

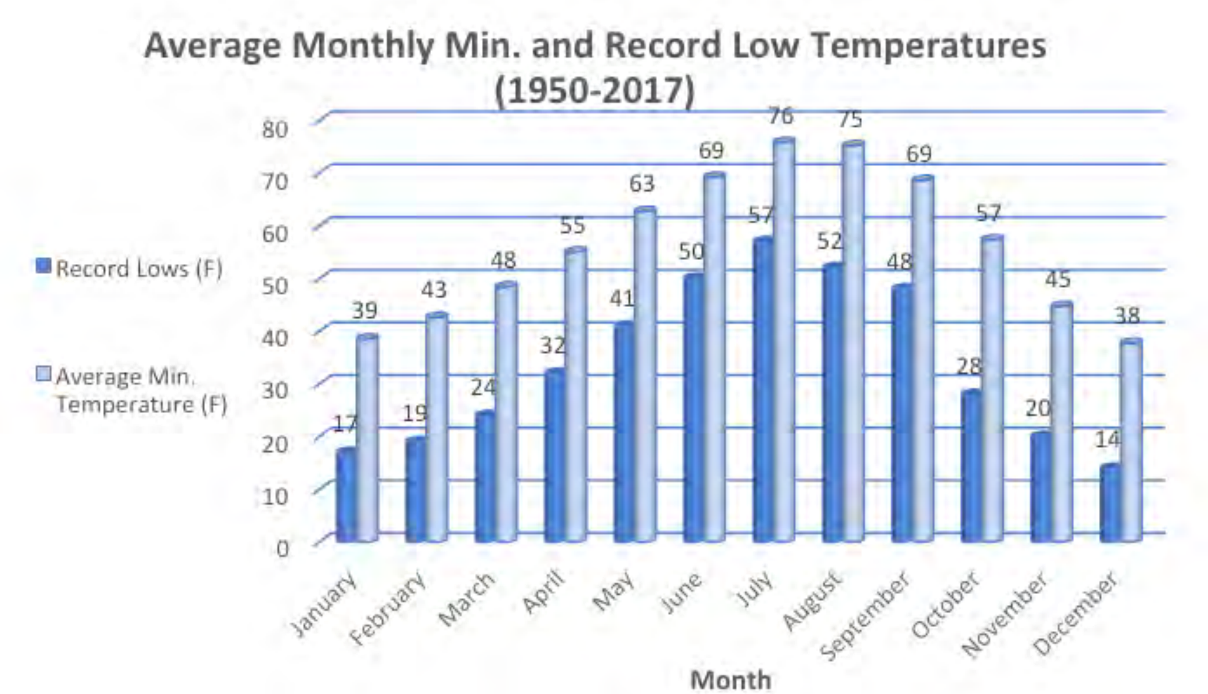

Figure 48. Average Minimum Temperatures at the Desert Resorts Regional Airport Monitoring Station in Thermal, CA.

The NCEI Storm Events Database (https://www.ncdc.noaa.gov/stormevents/) reports extreme cold and freeze events by National Weather Service (NWS) Forecast Zone. Therefore, extreme cold and freeze event data solely for The Torres Martinez Reservation is not available. However, due to the regional nature of extreme cold/freeze events, it can be assumed that if the overlying zone was impacted, the planning area was likely impacted.

There have been eight recorded extreme cold or freeze events in forecast zones falling within Riverside or Imperial Counties. Five of these events were reported in forecast zones that overlie lands in the Torres Martinez Reservation. These five events resulted in no deaths or injuries but did result in over $7.4 million in property damages and almost $120.8 million (2024 dollars) in crop damages. Details for these events are presented in Table 34. It should be noted that damages reported represent costs imposed on the entire forecast zone, not just the planning area.

Table 34. Historic Extreme Cold and Freeze Occurrences.

Location	Begin Date	Event Type	Crop damage (2024)	Narrative
Coachella Valley (Zone)	1/28/2002	Extreme Cold/ Wind Chill	$1,279,732	Record cold temperatures following the cold Pacific Storm lingered over Southwest California for several days. Water pipes froze and burst, vegetable and ornamental crops were badly damaged, and homeless shelters filled to capacity.
Coachella Valley (Zone)	1/14/2007	Frost/ Freeze	$118,408,904	Numerous long-standing records were broken as temperatures dipped into the single digits to teens in the deserts. Except for right along the immediate coastline, the freeze lasted for up to a week or longer. Local farmers were hit the hardest by the freeze. Crop damage was estimated at $86 million in Riverside County. All affected counties were eventually declared Disaster Areas. Plumbing pipes froze and burst in many valley, mountain, and desert locations. At the onset of the freeze, snow was reported in the valleys of San Bernardino, Riverside, and San Diego Counties at elevations as low as 500 ft. Gusty winds at times made it feel much colder. During the freeze, the air temperature dropped to 18 degrees at Thermal and 19 degrees at Hemet and Moreno Valley.
Imperial County Except the Lower Colorado River	1/14/2007	Frost/ Freeze		--

Location	Begin Date	Event Type	Crop damage (2024)	Narrative
Valley (Zone)				
Imperial County Except the Lower Colorado River Valley (Zone)	1/12/2013	Frost/ Freeze	$360,078	A deep and very cold area of low pressure developed across the desert southwest during the middle of January 2013, which led to widespread freezing and sub-freezing temperatures across the lower deserts of southeastern California. Freezing temperatures developed on the morning of January 12 and continued for 2 more days. The intense cold led to the issuance of a Freeze Warning on Friday evening, January 11th that ran through the morning hours on Monday January 14th. The freezing temperatures resulted in significant damage across the deserts, in the form of burst outdoor pipe, crop damage and dead frost sensitive plants and trees, such as ficus and lantana.
Imperial County Except the Lower Colorado River Valley (Zone)	1/1/2015	Frost/ Freeze		A deep and cold upper level low pressure system and associated cold front moved across far southeast California through the New Year's holiday period and ushered in freezing temperatures to Imperial county early in January 2015. Freezing or sub-freezing low temperatures affected the Imperial valley beginning on January 1st and the cold temperatures persisted through the 3rd of the month. The cold temperatures prompted the issuance of multiple Freeze Warnings for Imperial county and they resulted in damage to both crops as well as ornamental and decorative vegetation.

The National Weather Service publication, “A History of Significant Weather Events in Southern California (Updated March 2024)” lists weather events that occurred in or near the forecast area of the National Weather Service in San Diego, which includes Orange and San Diego Counties, southwestern San Bernardino County, and western Riverside County. Included under the heading “Extreme Cold”, is October 31, 2019, when the low temperature in San Diego fell to 44 degrees, a daily record low and the second lowest all-time for October. It was also the first daily record minimum to be set since September

1997, a period of over 22 years. The listing does not include a description of adverse impacts such as crop damage.[92]

EXTENT

The extent of extreme cold or freeze events can be measured in terms of the most extreme cold temperature. The lowest temperature reported from the Western Regional Climate Center was 14 degrees (occurring in December 1990), but lower temperatures are possible.

Extent can also be measured in terms of loss of human and animal life or economic costs incurred due to cold temperatures. The greatest amount of damage associated with any one event was $118,408,904 (2024 dollars) which occurred in the Coachella Valley Zone during a 2007 freeze/frost event. Most of the damages associated with this event were crop losses associated with temperatures as low as 18 degrees in Thermal.

The extent (severity or magnitude) of extreme cold temperatures is generally measured through the Wind Chill Temperature Index. Wind Chill Temperature is the temperature that people and animals feel when they are outside, and it is based on the rate of heat loss from exposed skin by the effects of wind and cold. As the wind increases, the body loses heat at a faster rate, causing the skin's temperature to drop. The NWS issues a Wind Chill Advisory if the Wind Chill Index is forecast to dip to –15°F to – 24°F for at least 3 hours, based on sustained winds (not gusts). The NWS issues a Wind Chill Warning if the Wind Chill Index is forecast to fall to –25°F or colder for at least 3 hours. On November 1, 2001, the NWS implemented a Wind Chill Temperature Index designed to more accurately calculate how cold air feels on human skin.

PROBABILITY OF FUTURE EVENTS

The NCEI Storm Events Database reported five extreme cold/freeze events in the planning area's forecast zones since 1996. This indicates that one extreme cold/freeze event can be expected every four years based on historical data. Therefore, the annual probability assigned is "likely" (between 10 and 90 percent annual probability). Climate change impacts, as discussed below, are anticipated to make colder events less frequent in the area.

Extreme cold and freeze events are likely to become less frequent in California as temperatures increase.[93] While projections for extreme cold events are not available via CalAdapt, a tool provided by the California Energy Commission for obtaining localized climate change projections, the tool did provide projected changes in average minimum temperature for the Reservation. According to CalAdapt, average minimum temperature will rise from its baseline of 56°F to upwards of 65.5°F by 2099 under a high emissions scenario (representative concentration pathway (RCP) 8.5). Figure 49 shows the

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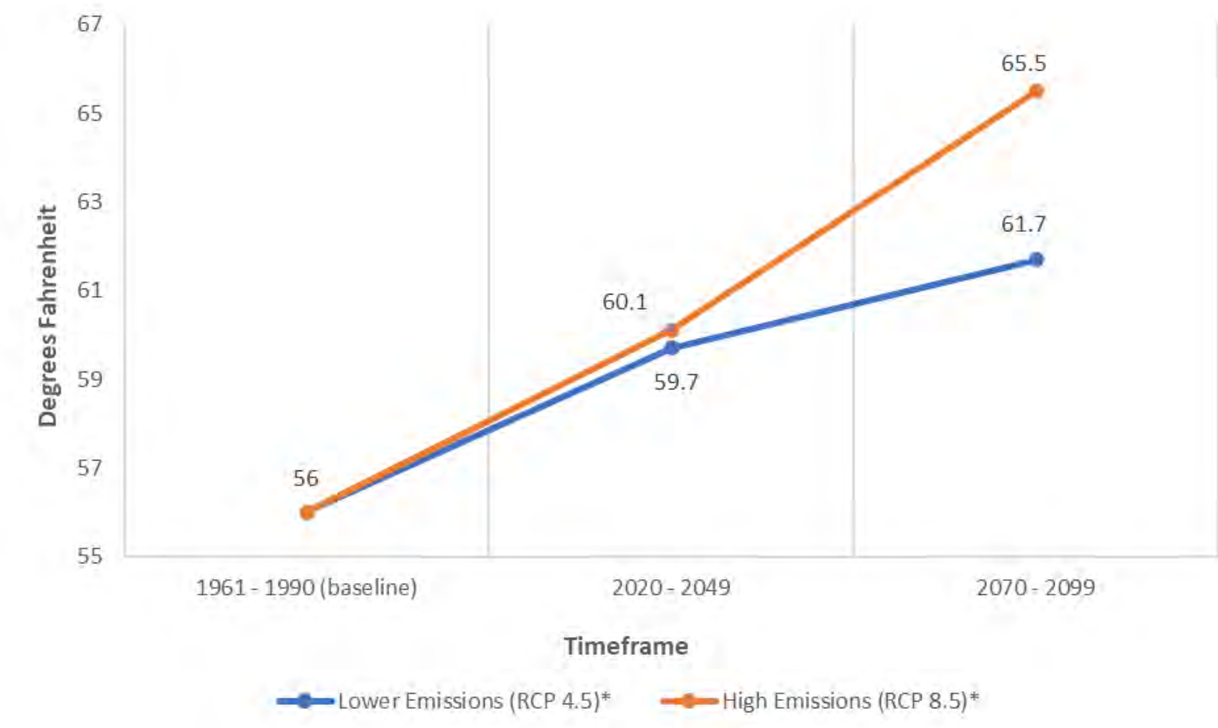
[92] https://www.weather.gov/media/sgx/documents/weatherhistory.pdf.

[93] Chapter 6 - Other hazards: Risks and mitigation. (2103). California State Hazard Mitigation Plan. Retrieved October 9, 2017 from http://www.caloes.ca.gov/HazardMitigationSite/Documents/007-SHMP%202013%20Chapter%206.pdf.

projected changes in average minimum temperature for the Reservation under different timeframes and emissions scenarios (RCPs).



*RCP 4.5 is a scenario in which emissions peak around 2040, then decline
*RCP 8.5 is a scenario in which emissions continue to rise sharply through 2050 and plateau around 2100

Figure 49. Average Minimum Temperature Projections for Torres Martinez.

VULNERABILITY ASSESSMENT

EXPOSURE

The entire Torres Martinez Reservation, including all current and future buildings, populations, agricultural lands, cultural resources, and critical facilities are vulnerable to extreme cold/freeze events. The elderly or young children without access to an adequate heat source may be at a greater risk during extreme cold events in which the temperatures dip into teens or low twenties.

Most damages associated with extreme cold/freeze events are to crops and frost-sensitive vegetation. The Reservation's agricultural resources are vulnerable to freeze events, particularly those occurring in the spring, as crop losses can have a severe economic impact or result in shortages.
All Tribal assets, including critical facilities and cultural sites, are at risk to extreme cold and freeze events. Damages to structures are typically caused by burst pipes. Structure fires are also more common during extreme cold events, as alternative or unsafe heating sources are more likely to be employed (i.e., wood fires, space heaters)

BUILT ENVIRONMENT IMPACTS

Extreme cold weather poses a significant threat to utility production, which in turn threatens facilities and operations that rely on utilities, specifically climate stabilization. As temperatures drop and stay low, increased demand for heating places a strain on the heating system, which can lead to temporary outages. These outages can impact operations throughout the community, which can result in interruptions and delays in services. Broken pipes may cause flooding in buildings, causing property damage and loss of utility service. Some of the secondary effects presented by extreme/excessive cold include dangerous conditions to livestock and pets.

Annualizing the losses from extreme cold/freeze damage overtime results in an approximate value of $5,219,509 annually (including crop and property damage). However, this value is for the Riverside County, Coachella Valley, and Imperial Valley forecast zones, including Torres Martinez. It is difficult to determine an exact value for the Reservation without detailed historic data for the Reservation. Assuming these damages were spread evenly across the forecast zones, annualized loss on the Torres Martinez Reservation would be approximately $26,000, based on the Reservation's percentage of land compared to those of the overlying zones.

POPULATION IMPACTS

The greatest danger from extreme cold is to people, as prolonged exposure can cause frostbite or hypothermia, and can become life threatening. Body temperatures that are too low affect the brain, making it difficult for the victim to think clearly or move well. This makes hypothermia particularly dangerous for those suffering from it, as they may not understand what is happening to them or what to do about it. Hypothermia is most likely at very cold temperatures but can occur at higher temperatures (above 40 degrees Fahrenheit) if the person exposed is also wet from rain, sweat, or submersion. Warning signs of hypothermia include shivering, exhaustion, confusion, fumbling hands, memory loss, slurred speech, or drowsiness. In infants, symptoms include bright red, cold skin and very low energy. A person with hypothermia should receive medical attention as soon as possible, as delays in medical treatment may result in death.

Older adults are often at elevated risk due to a high prevalence of pre-existing and chronic conditions. In the Reservation, over 20% of the population is over age 64. People who live in older housing stock and in housing with poor heating have increased vulnerability to cold-related illnesses.

ENVIRONMENT IMPACTS

Cold snaps in the spring time can impact the health of agriculture and natural areas. These impacts could include the A'Avutem (elders) garden, the hemp program, and other agricultural areas.

PROBLEM STATEMENTS FOR EXTREME COLD

Table 35. Problem Statements for Extreme Cold.

Assets	Problems Associated with Extreme Temperatures
People (including underserved communities and socially vulnerable populations)	• The elderly and those with mobility issues may not be able to leave their homes and travel safely. • Vulnerable populations may have issues getting to heating center. • First responders may also be impacted by extreme temperatures. • Pets and livestock may be adversely impacted by extreme cold.
Structures (including facilities, lifelines, and critical infrastructure)	• Older homes without insulation and single-pane glass are difficult to heat and may not provide safe living conditions. • Water lines may break during extreme cold events causing flooding.
Systems (including networks and capabilities)	• Extreme heat mitigation and adaptation has not been fully integrated into existing local plans and regulations for new development, though progress is being made.
Natural, historic, and cultural resources	• Extreme cold during the spring time may result in agricultural and tree damage.
Activities that have value to the community	• Recreational activities may be adversely impacted by extreme cold.

4.2.3.3 EXTREME HEAT

Excessive Heat, as a rule of thumb, is when the heat index reaches at least 105°F for at least three hours on two consecutive days and the nighttime air temperature does not drop below 75°F. The definition of Excessive Heat is a “rule of thumb” because the detrimental effects of high temperatures and humidity vary among segments of the population (e.g. old, young, etc.), and whether the population in general has built up a tolerance for heat (e.g. residents in desert communities fair better than visitors). While some may be better able to cope with Excessive Heat as defined, others may still be adversely affected at a lower heat index.

DESCRIPTION

Extreme heat is generally defined as temperatures that hover 10 degrees or more above the average high temperature for the region and last for an extended period. A heat wave may occur when temperatures hover 10 degrees or more above the average high temperature for the region and last for an extended period. The actual temperature threshold depends on norms for the region.[94]

Extreme heat events are usually a result of both high temperatures and high relative humidity. (Relative humidity refers to the amount of moisture in the air.) The higher the relative humidity or the more moisture in the air, the less likely that evaporation will take place. This becomes significant when high relative humidity is coupled with soaring temperatures. On hot days, the human body relies on the evaporation of perspiration or sweat to cool and regulate the body's internal temperature. Sweating does nothing to cool the body unless the water is removed by evaporation. When the relative humidity is high, then the evaporation process is hindered, robbing the body of its ability to cool itself.

While extreme heat does not typically affect buildings, the impact to the population can have grave effects. Health risks from extreme heat include heat cramps, fainting due to heat, heat exhaustion, and heat stroke. Most deaths are attributed to prolonged heat waves in large cities that rarely experience hot weather. The elderly and the ill are most at-risk, along with those who exercise outdoors in hot, humid weather.

NOAA's National Weather Service (NWS) devised the Heat Index as a mechanism to better inform the public of heat dangers. The Heat Index Chart, shown in Figure 50, uses air temperature and humidity to determine the heat index or apparent temperature.[95] In addition, information regarding the health dangers by temperature range is presented. As noted above, some populations, such as the elderly and young, are more susceptible to heat danger than other segments of the population.

[94] Extreme heat (2017). University of Washington Emergency Management. Retrieved October 9, 2017 from https://www.washington.edu/uwem/preparedness/know-your-hazards/extreme-heat/.

[95] NWS Heat Index (n.d.). NOAA. Retrieved October 9, 2017 from http://www.nws.noaa.gov/om/heat/heat_index.shtml.

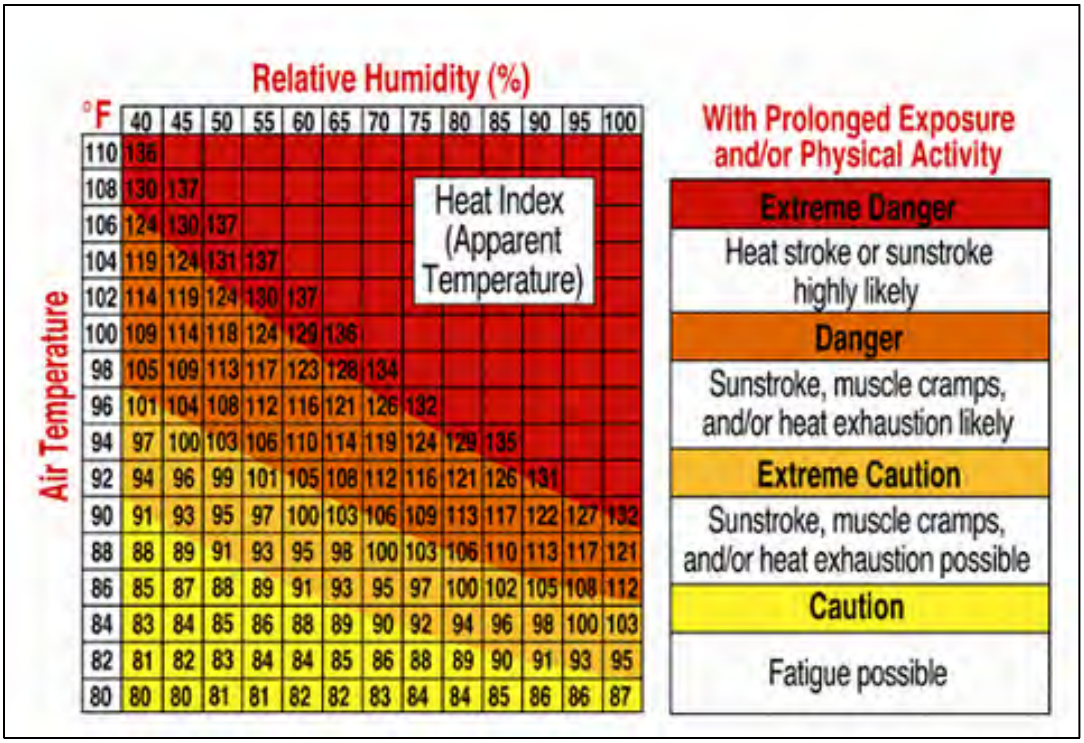


Figure 50. NWS Heat Index Chart.

Extreme heat is a dangerous situation that can result in health emergencies for susceptible and vulnerable people, such as those without shelter or who are stranded or who live in homes that are poorly insulated or without adequate cooling.

Extreme heat impacts buildings, roads, and other infrastructure. It may also impact vegetation. Dark-colored asphalt and roofs also absorb more of the sun's energy. These changes cause more developed areas to become warmer than the surrounding areas. This forms "islands" of higher temperatures, often referred to as "heat islands." Heat islands can affect communities by increasing peak energy demand during the summer, air conditioning costs, air pollution and Green House Gas emissions, heat-related illness and death, and water quality degradation (EPA).

Many conditions associated with heat waves or more severe events (including high temperatures, low precipitation, strong sunlight, and low wind speeds) contribute to a worsening of air quality in several ways. High temperatures can increase the production of ozone from volatile organic compounds and other aerosols. Weather patterns that bring high temperatures can also transport particulate matter air pollutants from other areas of the continent. Additionally, atmospheric inversions and low wind speeds allow polluted air to remain in one location for a prolonged period.

LOCATION

The entire region, including the whole Reservation is impacted by extreme heat events.

PREVIOUS OCCURRENCES

To understand extreme heat events for the planning area, average temperatures were researched. In addition, previous occurrences from NCEI were reviewed. Average high temperatures at the Torres Martinez Reservation range from the low 70s in the winter months to above 100 degrees in the summer months. Average record highs were hotter, ranging from the mid-90s in the winter months to the mid-120s in the summer months. Such temperatures, even with low humidity, can be extremely dangerous. Figure 51 shows average monthly maximum and record temperatures for a monitoring station in Thermal, CA.

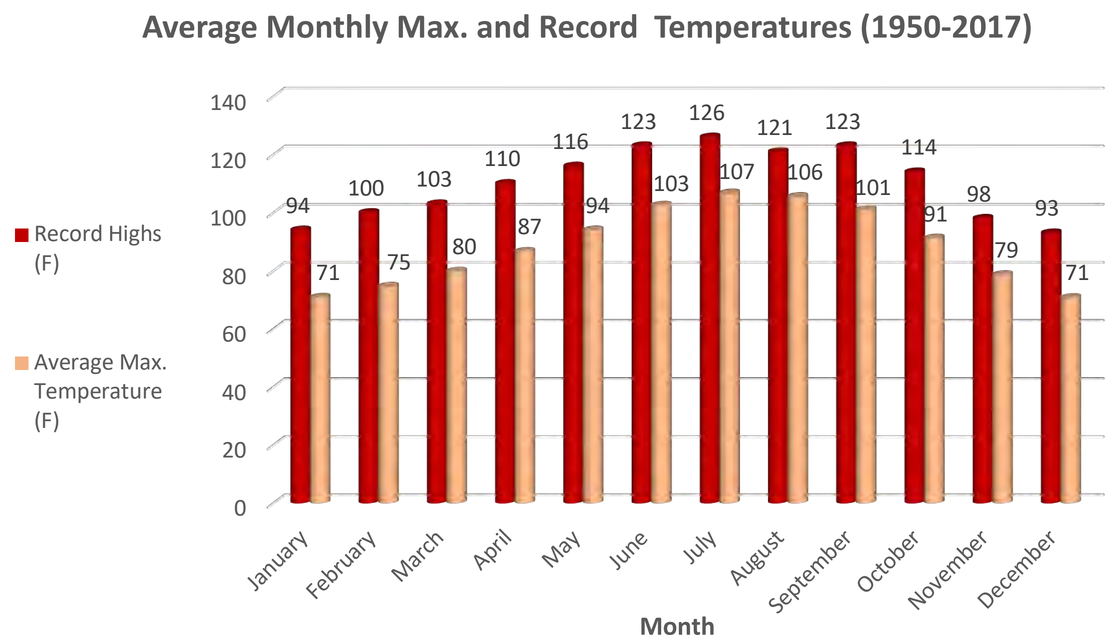


Figure 51. Average Maximum Temperatures at the Desert Resorts Regional Airport Monitoring Station in Thermal, CA.[96]

Forty-six excessive heat or heat wave events were reported by NCEI in Imperial or Riverside Counties from 1996-2024. Twenty of these events occurred in public forecast zones that include Torres Martinez Reservation lands and are listed in Table 36. When available, details are provided for those events that resulted in deaths or injuries. No crop damages were reported as a result of these events.

Table 36. NCEI Excessive Heat and Heat Wave Historic Events (1950-2024).

Location	Begin Date	Deaths/ Injuries	Narrative
Coachella Valley (Zone)	8/2/1997	1/0	One death - 25-year-old male died in home
Coachella Valley (Zone)	5/7/2001	0/19	On 5/11/01, emergency crews rescued 19 people suffering from heat exhaustion and dehydration on a freight train

[96] Western Regional Climate Center, Desert Resorts Regional Airport, CA (048892). (2016). Retrieved June 28, 2017, from https://wrcc.dri.edu/cgi-bin/cliMAIN.pl?ca8892.

Location	Begin Date	Deaths/ Injuries	Narrative
			located near the city of Cabazon. The train was bound from Palm Springs to Los Angeles and it was unclear when the people had gotten on the train. On 5/13/01, a man's body was discovered in Palm Canyon, located near the Dos Cabezas mine in extreme eastern San Diego County. Record high temperatures had been set in the Coachella Valley and San Diego County Deserts the previous week.
Coachella Valley (Zone)	7/1/2001	0/2	A female hiker and a male softball umpire suffered heat exhaustion as the temperature rose to 115 degrees over the Coachella Valley.
Coachella Valley (Zone)	7/21/2006	1/10	The strong subsidence over Southern California caused an unprecedented heat wave and widespread surface dewpoint temperatures from the upper 60s to the mid 70s resulted in record warm overnight temperatures and abnormally high humidity levels. The heat wave reached its peak on the 22nd. The temperature rose to 120 at Indio and Thermal, and 121 at Palm Springs. That same morning, numerous high minimum temperature records were broken, including 88 at Thermal, 93 at Palm Springs, and 94 at Borrego Desert Park. Many monthly records were also broken. Palm Springs experienced 10 consecutive days with a minimum temperature of 85 degrees or greater, shattering the old record of 5 consecutive days set in 1917. The heat was particularly hard on the elderly and those without air conditioning. Power outages made for an even more dangerous situation. While high temperatures near the end of the month did not exceed excessive heat criteria, low temperatures remained at record warm levels. This was particularly problematic for residents who do not have air conditioning and were unable to cool their homes at night. Also worth mentioning, the number of people treated for heat related illnesses was pulled from various media reports and is likely an underestimate of the total value.
Coachella Valley (Zone)	7/4/2007	0/0	--
Coachella Valley (Zone)	9/1/2007	0/0	--

Location	Begin Date	Deaths/ Injuries	Narrative
Coachella Valley (Zone)	6/20/2008	0/0	--
Coachella Valley (Zone)	5/12/2012	1/0	High pressure was in place over the region from the 11th through the 14th, creating a warming trend with inland temperatures 5 to 15 degrees above normal for that time of year. Temperatures in the lower deserts ranged from 97 up to 105 during these few days. An 86 year old male was hospitalized for a heat-related illness on May 12th near Mecca in the Salton Sea desert area of the Coachella Valley. The Riverside County Health Department confirmed his death on May 18 as heat-related. No mental issues were noted.
Coachella Valley (Zone)	6/28/2013	0/0	--
Imperial County Except the Lower Colorado River Valley (Zone)	6/28/2013	0/0	--
Coachella Valley (Zone)	6/29/2013	0/0	--
Coachella Valley (Zone)	7/1/2013	0/0	--
Coachella Valley (Zone)	7/3/2013	0/0	A strong ridge of high pressure cranked up temperatures over the region. Daily high temperatures were 15 to 20 degrees above average on the 19th and 20th. The Palm Springs ASOS reported a high temperature of 122 degrees, one shy of the all-time record.
Coachella Valley (Zone)	6/20/2016	0/2	The National Weather Service publication, "A History of Significant Weather Events in Southern California", describes the intense heat wave that peaked on this day with a total of 13 daily high temperature records set. Indio and Thermal both reached 121 degrees, the second highest temperatures on record for June. (source: https://www.weather.gov/media/sgx/documents/weatherhistory.pdf)
Southern California	7/6/2018	–	Strong broad upper level high pressure centered over Nevada and unusual weak offshore flow in July brough

Location	Begin Date	Deaths/ Injuries	Narrative
(including Thermal)			extreme hot weather . Mecca reported 121 degrees and Thermal hit 120 degrees. A 120-degree reading in Chino matched the all-time highest temperature ever recorded in the coastal basin of Southern California. (source: https://www.weather.gov/media/sgx/documents/weatherhistory.pdf)
Southern California (including Thermal)	8/5/2019	–	Hot weather hit the Coachella Valley. Pam Springs recorded its highest temperature of the year at 121 degrees. Ocotillo Wells and Thermal reached 120 degrees. (source: https://www.weather.gov/media/sgx/documents/weatherhistory.pdf**)**
Coachella Valley (Zone)	7/11/2023	0/0	A long-duration, excessive heat wave impacted the Coachella Valley from July 11-22. Highs in the lower deserts generally ranged from 110-120 each day, with the highest temperatures occurring on Thursday, July 20 and Friday, July 21. The following are the highest temperatures recorded through the event, and the days on which they occurred: Palm Springs AP: 120 (7/21/23); Palm Springs ranged from 113-120 through the duration of the event, with overnight lows of 83-93 degrees each day. Palm Springs broke a high temperature record of 119 (7/20), breaking the previous record of 118, and 120 (7/21), tying the previous record of 120. Indio: 119 (7/20/23); Indio ranged from 111-119 through the duration of the event, with overnight lows of 90-96 degrees each day. Indio broke a highest minimum temperature record at 94 (7/18), breaking the previous record of 91. Indio broke a high temperature record of 119 (7/20), breaking the previous record of 117, and 118 (7/21), breaking the previous record of 117. Thermal Airport: 118 (7/20/23 and 7/21/23) Thermal ranged from 111-118 through the duration of the event, with overnight lows of 77-93 degrees each day. Thermal broke a highest minimum temperature record at 89 (7/13), breaking the previous record of 88, at 92 (7/18), breaking the previous record of 86. Thermal broke a high

Location	Begin Date	Deaths/ Injuries	Narrative
			temperature record of 117 (7/20), breaking the previous record of 115.
Riverside County Mountains	7/14/2023	0/0	A long-duration, excessive heat wave occurred across the Riverside County Mountains from July 14-22. Highs reached the upper-80s and 90s each day, with a few days topping 100 degrees. The following are the highest temperatures reported during the event, and the day on which the peak temperature occurred: Idyllwild: 100 (7/15/23) Idyllwild ranged from 90-100 through the duration of the event, with overnight lows of 58-66 degrees each day. Idyllwild broke a high temperature record at 100 (7/15), breaking the old record of 97. Anza: 104 (7/15/23) Anza ranged from 95-104 through the duration of the event, with overnight lows of 59-69 degrees each day.

Based on a search of the NOAA / NCEI Storm Events Database, 396 Heat and Excessive Heat events were recorded between January 2016 and September 2024 in Imperial and Riverside Counties (including the Coachella Valley Zone and the Riverside County Mountains). Of those events, three had associated deaths, one in June 2017, when an elderly hiker died hiking on a trail in La Quinta and heat was suspected as a factor, one in June 2021, when a man collapsed walking down the street in Palm Springs, where the city tied their all-time record high temperature of 123 degrees, and one in June 2021, when a female hiker dies on the Pacific Coast Trail near Anza from heat stroke. From those events, four injuries, $1.01million in property damages, and no crop damages were recorded.[97]

EXTENT

The National Weather Service Heat Index calculates how hot it really feels when relative humidity is factored in with the actual air temperature using a 4-factor scale: caution, extreme caution, danger, extreme danger. The National Weather Service (NWS) also issues Heat Alerts. A Heat Advisory is issued 12-24 hours before the onset at least 100ºF but less than 105ºF for at least 2 hours. An Excessive Heat Watch is issued when temperatures of 105ºF or greater are forecasted for the next 24 to 72 hours. An Excessive Heat Warning is issued when temperatures of 105°F last for more than 3 hours per day for 2 consecutive days, or temperatures exceed 115°F for any period of time.

[97] https://www.ncdc.noaa.gov/stormevents/listevents.jsp?eventType=%28Z%29+Excessive+Heat&eventType=%28Z%29+Heat&beginDate_mm=01&beginDate_dd=01&beginDate_yyyy=2016&endDate_mm=09&endDate_dd=30&endDate_yyyy=2024county=IMPERIAL%3A25&county=RIVERSIDE%3A65&hailfilter=0.00&tornfilter=0&windfilter=000&sort=DT&submitbutton=Search&statefips=6%2CCALIFORNIA.

The Heat Index chart indicates how hot it really feels when relative humidity is factored in with the actual air temperature. As an example, if the air temperature is 96°F and the relative humidity is 65%, the heat index--how hot it feels--is 121°F.

The red area shown in Figure 50 without numbers indicates extreme danger. Since heat index values were devised for shady, light wind conditions, exposure to full sunshine can increase heat index values by up to 15°F. Also, strong winds, particularly with very hot, dry air, can be extremely hazardous.

PROBABILITY OF FUTURE EVENTS

California is expected to have an increase in annual average temperatures of 5 degrees Fahrenheit by 2030, and 10 degrees Fahrenheit by the end of the century (SCAG, 2019). The SCAG region is projected to have an average increase of 35 extreme heat days from 2040-2060 (SCAG, 2019). The county in the SCAG region with the highest projections is Imperial County, which is expected to have over 43 extreme heat days per year from 2040-2060 (SCAG, 2019). Riverside, San Bernardino, and Los Angeles Counties are expected to have 42, 41, and 37 extreme heat days, respectively, per year. Ventura County is projected to have 32 extreme heat days. Orange County is expected to have 15 heat days per year which is the lowest projection of extreme heat days in the SCAG region from 2040-2060 (SCAG, 2019). Extreme heat days per year are expected to more than double across the entire region after 2085 (SCAG, 2019). Riverside County is projected to have 154 days above 90°F by Mid-Century (2035–2064) where the median value for the state is 78.8 days (California Healthy Places Index). The projected temperature changes by 2099 are +3.7°F under a low-emission scenario and +6.5°F under a high-emission scenario for Riverside County (Cal-Adapt).[98]

VULNERABILITY ASSESSMENT

Overall, the extreme temperatures hazard has a high risk score compared to other hazards in the Reservation.

EXPOSURE

Extreme temperatures are not a hazard with a defined geographic boundary. The entire Reservation should be considered exposed to the hazard. Excessive heat can occur at any time during the year but is most dangerous during the summer between June and August when average temperatures are at their highest.

BUILT ENVIRONMENT IMPACTS

The impact of excessive heat is most prevalent in developed areas, where the Reservation lacks a tree canopy. Secondary impacts of excessive heat are severe strain on the electrical power system and potential brownouts or blackouts. Extreme heat can have a negative impact on transportation. Highways

[98] source: SCAG, Extreme Heat & Public Health Report, September 2020, accessed at: https://scag.ca.gov/sites/main/files/file-attachments/extremeheatpublichealthreportfinal_09302020.pdf?1634674354).

and roads are damaged by excessive heat as asphalt roads soften and concrete roads expand and can buckle, crack, or shatter. Moreover, concrete has been known to fail in extreme heat. Stress is also placed on automobile cooling systems, diesel trucks, and railroad locomotives which lead to an increase in mechanical failures. Steel rails are at risk of overheating and warping which can lead to train derailments.

POPULATION IMPACTS

Extreme heat days and average temperatures are projected to increase. The projected increase in extreme heat and heat waves is the source of one of the key health concerns related to climate change. Prolonged exposure to high temperatures can cause heat-related illnesses, such as heat cramps, heat exhaustion, heat stroke, and death. Heat exhaustion is the most common heat-related illness and if untreated, it may progress to heat stroke. People who perform manual labor, particularly those who work outdoors, are at increased risk for heat-related illnesses. Prolonged heat exposure and the poor air quality and high humidity that often accompany heat waves can also exacerbate pre-existing conditions, including respiratory illnesses, cardiovascular disease, and mental illnesses.

Older adults are often at elevated risk due to a high prevalence of pre-existing and chronic conditions. In the Reservation, over 20% of the population is over age 64. People who live in older housing stock and in housing without air conditioning have increased vulnerability to heat-related illnesses. Power failures are more likely to occur during heat waves, affecting the ability of residents to remain cool during extreme heat. Individuals with pre-existing conditions and those who require electric medical equipment may be at increased risk during a power outage. Heat impacts are more likely to be felt by residents without air conditioning, by those who work outdoors, and those with underlying health conditions.

Extreme heat can pose severe and life-threatening problems for people. According to the NWS, it is one of the leading weather-related killers in the United States, resulting in hundreds of fatalities each year and even more heat-related illnesses. Extreme heat has a special impact on the most vulnerable segments of the population - the elderly, young children and infants, impoverished individuals, and persons who are in poor health. The high-risk population groups with specific physical, social, and economic factors that make them vulnerable include:

- Older persons (age > 65)
- Infants (age < 1)
- Homeless population
- Very low- and low-income persons
- People who are socially isolated
- People with mobility restrictions or mental impairments
- People taking certain medications (e.g., for high blood pressure, depression, insomnia)
- People engaged in vigorous outdoor exercise or work or those under the influence of drugs or alcohol.

ENVIRONMENT IMPACTS

Extreme temperatures can impact agriculture causing damage to cold weather plants and reducing the growing season. Warmer weather at the end of winter and beginning of spring can produce a false spring where plants bloom early and could potentially die in a hard frost.

PROBLEM STATEMENTS FOR EXTREME HEAT

Table 37. Problem Statements for Extreme Heat.

Assets	***Problems Associated with Extreme Temperatures***
People (including underserved communities and socially vulnerable populations)	• Extreme heat will be a significant public health threat to all residents, but especially for vulnerable populations living in older homes or homes without air conditioning. • The elderly and those with mobility issues may not be able to leave their homes and travel safely. • Childcare without air conditioning pose a hazard to children. • People working in businesses outside or without air conditioning may be at risk of heat illness. • First responders may also be impacted by extreme temperatures. • Pets may be adversely impacted by extreme heat.
Structures (including facilities, lifelines, and critical infrastructure)	• Older homes without insulation and single-pane glass are difficult to cool and may not provide safe living conditions. • Businesses that require refrigerated trucks or refrigeration units may see business losses and increased utility costs. • The electric grid may become stressed and fail during extreme heat events.
Systems (including networks and capabilities)	• Resources to support moving elders to cooling stations may be limited.
Natural, historic, and cultural resources	• Extreme heat may lead to, or exacerbate, impacts to natural systems related to wildfires and invasive species (refer to the following sections). • Extreme heat may lead to additional algae blooms in ponds which would need to be treated.
Activities that have value to the community	• Recreational and outdoor activities may be adversely impacted by extreme heat.

4.2.3.4 SEVERE STORM: THUNDERSTORMS, HAILSTORMS, EXTREME WIND, AND LIGHTNING

This section discusses several of the natural hazards associated with large-scale storm events in California, their impacts, as well as ways in which they are likely to respond to climate change.

DESCRIPTION

Thunderstorms: A thunderstorm is a storm originating in a cumulonimbus cloud. Cumulonimbus clouds produce lightning, which locally heats the air to 50,000 degrees Celsius, which in turn produces an audible shock wave known as thunder. Frequently during thunderstorm events, heavy rain and gusty winds are present. Less frequently, hail is present, which can become very large in size. Tornadoes can also be generated during these events. An average thunderstorm is 15 miles across and lasts 30 minutes, but severe thunderstorms can be much larger and longer.

Three basic components are required for a thunderstorm to form: moisture, rising unstable air, and a lifting mechanism. The sun heats the surface of the earth, which warms the air above it. If this warm surface air is forced to rise, it will continue to rise as long as it weighs less and stays warmer than the air around it. As the warm surface air rises, it transfers heat from the surface of the earth to the upper levels of the atmosphere (the process of convection). The water vapor it contains begins to cool, releasing the heat, and the vapor condenses into a cloud. The cloud eventually grows upward into areas where the temperature is below freezing. Some of the water vapor turns to ice, and some of it turns into water droplets. Both have electrical charges. When a sufficient charge builds up, the energy is discharged in a bolt of lightning, which causes the sound waves we hear as thunder.

Hailstorms: Hailstones are chunks of ice that grow as updrafts in thunderstorms keep them in the atmosphere. Most hailstones are smaller in diameter than a dime, but stones weighing more than 1.5 pounds have been recorded. NOAA has estimates of the velocity of falling hail ranging from 9 meters per second (m/s) (20 mph) for a 1-centimeter (cm)-diameter hailstone to 48 m/s (107 mph) for an 8 cm, 0.7 kilogram stone.

Early in the developmental stages of a hailstorm, ice crystals form within a low-pressure front due to the rapid rising of warm air into the upper atmosphere and the subsequent cooling of the air mass. Frozen droplets gradually accumulate on the ice crystals until they develop to a sufficient weight and fall as precipitation. Hail typically takes the form of spheres or irregularly shaped masses greater than 0.75 inches in diameter. The size of hailstones is a direct function of the size and severity of the storm. High velocity updraft winds are required to keep hail in suspension in thunderclouds. The strength of the updraft is a function of the intensity of heating at the Earth's surface. Higher temperature gradients relative to elevation above the surface result in increased suspension time and hailstone size.[99] Hailstone size can range a great deal in size from 5 millimeters (mm) – approximately pea-sized – to greater than 100 mm – approximately melon-sized. Hailstones are categorized using the TORRO Hailstorm Intensity Scale, as shown in Table 38[100]. Hailstone size descriptions are provided in Table 39..

[99] Hail Basics. (n.d.). The National Severe Storms Laboratory. Retrieved October 26, 2017, from http://www.nssl.noaa.gov/education/svrwx101/hail/.

[100] Hail Scale. (2017). Tornado and Storm Research Organization. Retrieved October 27, 2017 from http://www.torro.org.uk/hscale.php.

Table 38. TORRO Hailstorm Intensity Scale (in millimeters).

	INTENSITY CATEGORY	TYPICAL HAIL DIAMETER	PROBABLE KINETIC ENERGY, J-M^2	TYPICAL DAMAGE IMPACTS	SIZE CODE
H0	Hard Hail	5	0-20	No damage	1
H1	Potentially Damaging	5-15	>20	Slight general damage to plants, crops	1-3
H2	Significant	10-20	>100	Significant damage to fruit, crops, vegetation	1-4
H3	Severe	20-30	>300	Severe damage to fruit and crops, damage to glass and plastic structures, paint and wood scored	2-5
H4	Severe	25-40	>500	Widespread glass damage, vehicle bodywork damage	3-6
H5	Destructive	30-50	>800	Wholesale destruction of glass, damage to tiled roofs, significant risk of injuries	4-7
H6	Destructive	40-60		Bodywork of grounded aircraft dented, brick walls pitted	5-8
H7	Destructive	50-75		Severe roof damage, risk of serious injuries	6-9
H8	Destructive	60-90		Severe damage to multiple roof types (including sheet and metal); damage aircraft bodywork	7-10
H9	Super Hailstorms	75-100		Extensive structural damage (including concrete and wooden walls). Risk of severe or even fatal injuries to persons caught in the open	8-10
H10	Super Hailstorms	>100		Extensive structural damage (including destruction of wooden houses and damage to brick-built homes). Risk of severe or even fatal injuries to persons caught in the open	9-10

Table 39. TORRO Hailstorm Size Code Descriptions.

SIZE CODES	DIAMETER	RELATIONAL SIZE
0	5-9	Pea
1	9-15	Mothball
2	16-20	Marble, grape
3	21-30	Walnut
4	31-40	Pigeon's egg > squash ball
5	41-50	Golf ball > Pullet's egg
6	51-60	Hen's egg
7	61-75	Tennis ball > cricket ball
8	76-90	Large orange > Soft ball
9	91-100	Grapefruit
10	>100	Melon

Hail annually causes more than $1 billion in damage to property and crops in the United States.[101] It damages buildings and homes by perforating holes in roofs and shingles, breaking windows and denting siding, and damages automobiles by denting panels and breaking windows. Hail rarely causes any deaths; however, several dozen people are injured each year in the United States.

Lightning: Lightning is a discharge of electricity that occurs between the positive and negative charges within the atmosphere or between the atmosphere and the ground. According to NOAA, the creation of lightning during a storm is a complicated process that is not fully understood. In the initial stages of development, air acts as an insulator between the positive and negative charges. However, when the potential between the positive and negative charges becomes too great, a discharge of electricity (lightning) occurs. In-cloud lightning occurs between the positive charges near the top of the cloud and the negative charges near the bottom. Cloud-to-cloud lightning occurs between the positive charges near the top of the cloud and the negative charges near the bottom of a second cloud. Cloud-to-ground lightning is the most dangerous. In summertime, most cloud-to-ground lightning occurs between the negative charges near the bottom of the cloud and positive charges on the ground.

Lightning strikes occur in very small, localized areas. For example, they may strike a building, electrical transformer, or even a person. According to FEMA, lightning injures an average of 300 people and kills 80 people each year in the United States. Direct lightning strikes can also cause significant damage to buildings, critical facilities, and infrastructure largely by igniting a fire. Lightning is also responsible for igniting wildfires that can result in widespread damages to property.

Wind: Straight-line winds are produced by the downward momentum in the downdraft region of a thunderstorm. The National Weather Service distinguishes between straight-line wind and wind produced from a tornado when conducting surveys of wind damage. When straight-line winds meet or exceed 58 miles per hour they are classified as severe by the National Weather Service. Straight-line wind intensity can be as powerful as a tornado.

High-wind events are often associated with other storms, such as hurricanes or nor'easters, but may occur independently. Windstorms may or may not be accompanied by precipitation. They vary in intensity, duration, and geographical extent. For example, they can range from short bursts of high-speed winds, as during a severe thunderstorm, to longer periods of stronger sustained winds. They typically have a few hours of lead time and can last for hours, or for up to several days if they result from a large-scale weather system. There are also seasonal effects.

There are several types of wind hazards that affect the planning area. These include high or strong wind events, thunderstorm wind events, and Santa Ana wind events. Tornadoes and dust storms are also wind events that impact the Reservation, but due to special hazards associated with these types of events, dust storms and tornadoes are listed as separate hazards.

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[101] Facts + Statistics: Hail. (2018). The Insurance Information Institute. Retrieved August 1, 2018, from https://www.iii.org/fact-statistic/facts-statistics-hail.

High Wind thresholds vary by region. In general, high wind events are those events greater than normal averages with damage potential. Wind events are common throughout the United States. However, the severity varies depending on location. Figure 52 below shows wind zones in the U.S. based on American Society of Civil Engineers (ACSE) 7-98 criteria. These wind zones represent maximum wind velocities according to FEMA wind-resistant building standards.

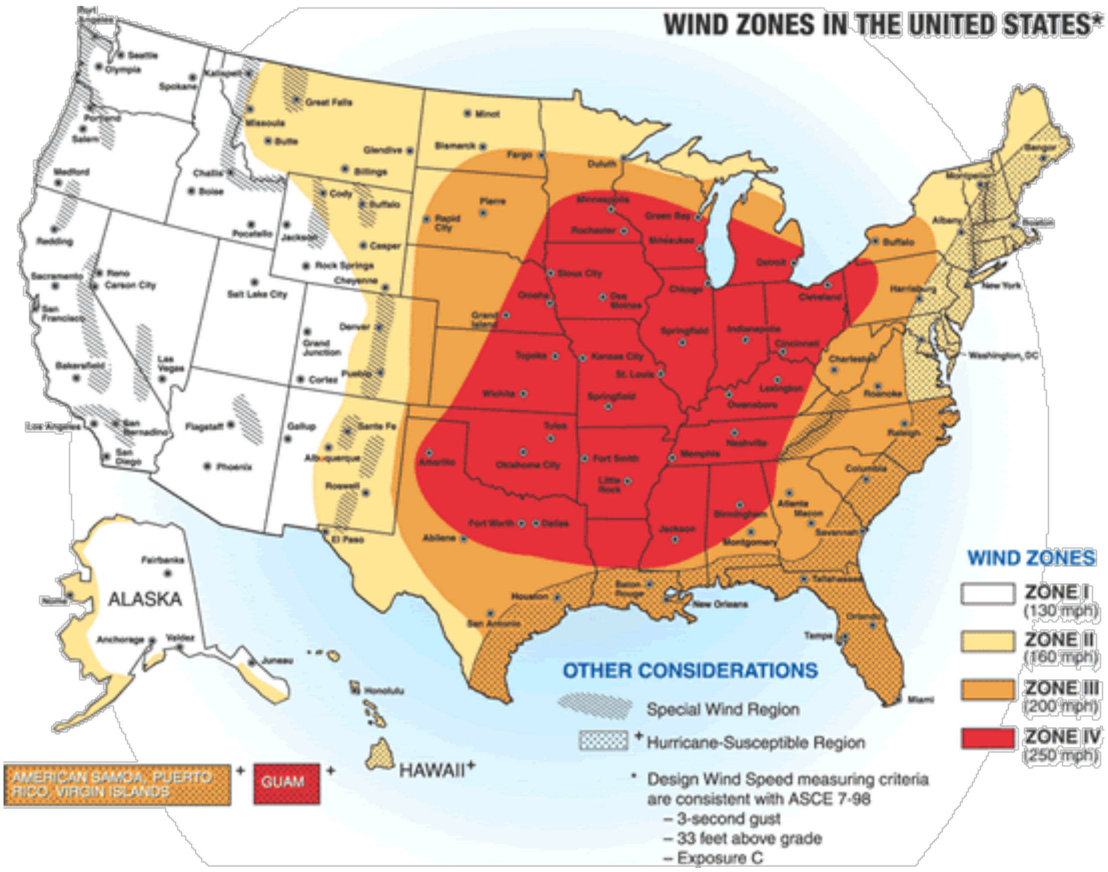

Figure 52. ASCE 7-98 U.S. Wind Zone.[102]

The National Weather Service Center issues high wind advisories or warnings. A wind advisory is issued when conditions are favorable for the development of high winds over all or part of the forecast area, but the occurrence is still uncertain. The criteria of a wind advisory are sustained winds of 31 to 39 mph and/or gusts 46 to 57 mph for any duration. A high wind warning is issued when sustained winds of 40 mph or higher are expected for at least one hour or any wind gusts are expected to reach 58 mph or more.[103] These definitions vary from state to state, and wind advisories and warnings may be higher for areas that experience high winds regularly. A Beaufort Wind Scale may also be used to describe wind severity as shown in Table 40.

[102] University of Missouri Extension. Weather-related Resources. http://extension.missouri.edu/webster/weather.aspx.

[103] National Weather Service. https://www.weather.gov/lwx/WarningsDefined#High Wind Watch.

Table 40. Beaufort Wind Scale.[104]

Beaufort Number	Wind (Knots)	Description	On the Water	On Land
0	Less than 1	Calm	Sea surface smooth and mirror-like	Calm, smoke rises vertically
1	1-3	Light Air	Scaly ripples, no foam crests	Smoke drift indicates wind direction, still wind vanes
2	4-6	Light Breeze	Small wavelets, crests glassy, no breaking	Wind felt on face, leaves rustle, vanes begin to move
3	7-10	Gentle Breeze	Large wavelets, crests begin to break, scattered whitecaps	Leaves and small twigs constantly moving, light flags extended
4	11-16	Moderate Breeze	Small waves 1-4 ft. becoming longer, numerous whitecaps	Dust, leaves, and loose paper lifted, small tree branches move
5	17-21	Fresh Breeze	Moderate waves 4-8 ft. taking longer form, many whitecaps, some spray	Small trees in leaf begin to sway
6	22-27	Strong Breeze	Larger waves 8-13 ft., whitecaps common, more spray	Larger tree branches moving, whistling in wires
7	28-33	Near Gale	Sea heaps up, waves 13-19 ft., white foam streaks off breakers	Whole trees moving, resistance felt walking against wind
8	34-40	Gale	Moderately high (18-25 ft.) waves of greater length, edges of crests begin to break into spindrift, foam blown in streaks	Twigs breaking off trees, generally impedes progress
9	41-47	Strong Gale	High waves (23-32 ft.), sea begins to roll, dense streaks of foam, spray may reduce visibility	Slight structural damage occurs, slate blows off roofs
10	48-55	Storm	Very high waves (29-41 ft.) with overhanging crests, sea	Seldom experienced on land, trees broken or

[104] Beaufort Wind Scale. http://www.spc.noaa.gov/faq/tornado/beaufort.html.

Beaufort Number	Wind (Knots)	Description	On the Water	On Land
			white with densely blown foam, heavy rolling, lowered visibility	uprooted, "considerable structural damage"
11	56-63	Violent Storm	Exceptionally high (37-52 ft.) waves, foam patches cover sea, visibility more reduced	
12	64+	Hurricane	Air filled with foam, waves over 45 ft., sea completely white with driving spray, visibility greatly reduced	

Thunderstorms are associated with the extreme wind hazard because wind is typically one component of thunderstorms. Thus, the wind and damaging lightning components of thunderstorms are discussed in this section, while other perils associated with thunderstorms, such as tornadoes and flash flooding, are discussed in separate hazard profiles.

Three conditions need to occur for a thunderstorm to form. First, it needs moisture to form clouds and rain. Second, it needs unstable air, such as warm air that can rise rapidly (this is often referred to as the "engine" of the storm). Third, thunderstorms need lift, which comes in the form of cold or warm fronts, sea breezes, mountains, or the sun's heat. When these conditions occur simultaneously, air masses of varying temperatures meet, and a thunderstorm is formed. These storm events can occur singularly, in lines, or in clusters. Further, they can move through an area very quickly or linger for several hours. Straight-line winds, which in extreme cases have the potential to cause wind gusts that exceed 100 miles per hour, are responsible for most thunderstorm wind damage. One type of straight-line wind, the downburst, can cause damage equivalent to a strong tornado and can be extremely dangerous to aviation.

While thunderstorms can occur in all regions of the United States, they are most common in the central and southern states because atmospheric conditions in those regions are ideal for generating these powerful storms. According to the National Weather Service, more than 100,000 thunderstorms occur each year, though only about 10 percent of these storms are classified as "severe." A severe thunderstorm occurs when the storm produces one of three elements: 1) Hail of three-quarters of an inch; 2) Tornado; 3) Winds of at least 58 miles per hour. Figure 53 illustrates thunderstorm hazard severity based on the annual average number of days with a thunderstorm event.

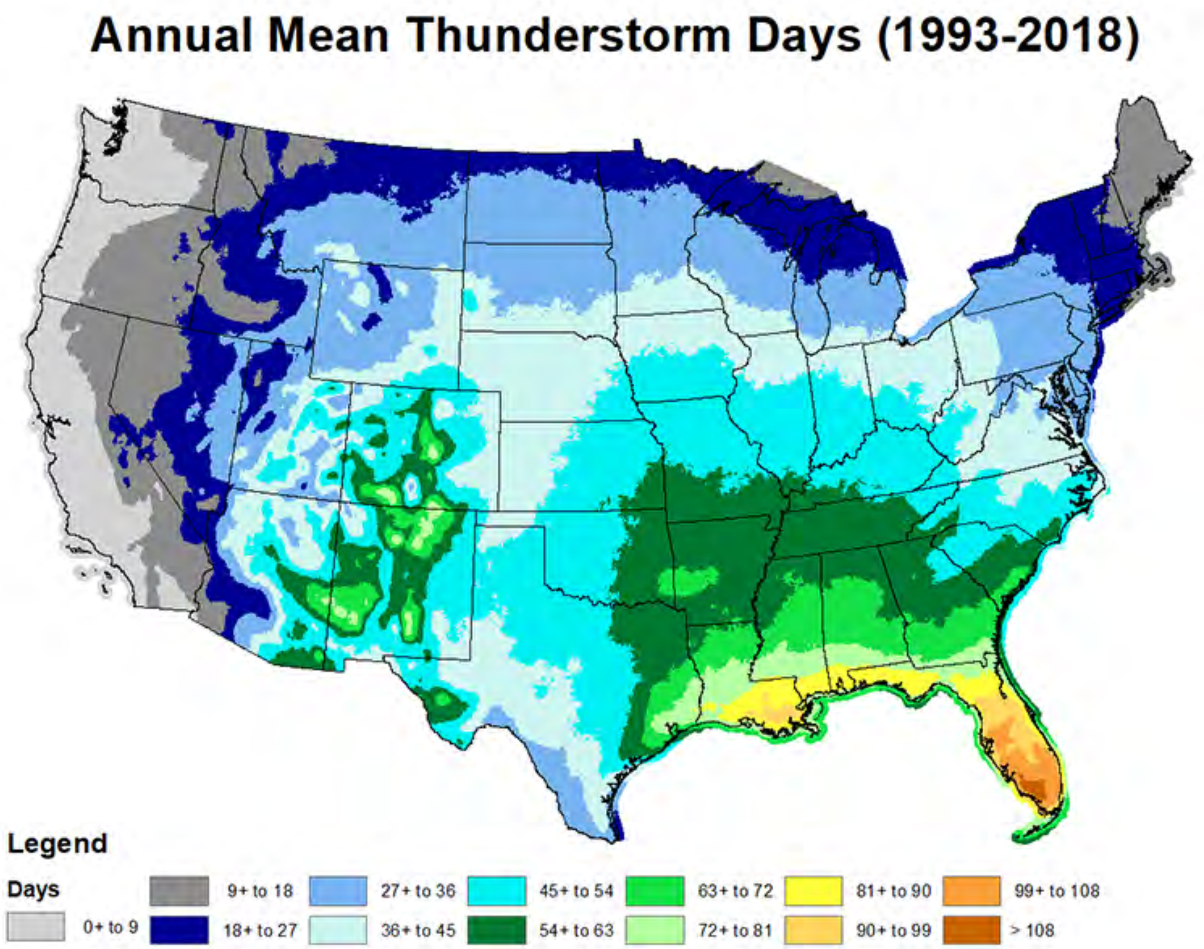

Figure 53. Average Number of Days with Thunderstorms (NOAA).

Santa Ana Winds

Santa Ana Winds are a regional wind hazard specific to southern California. Santa Ana Winds are known to cause large amounts of damage and increase the spread of wild and structural fires. Santa Ana Winds are generally defined as warm, dry winds that blow from the east. The complex topography of Southern California combined with various atmospheric conditions creates numerous scenarios that may cause widespread or isolated Santa Ana events. Santa Ana Winds form when high pressure builds over the desert (typically in the Great Basin) when temperatures are relatively cool, and cold air begins to sink. As the air is forced downslope, it compresses and warms at a rate of up to 29 degrees Fahrenheit per mile. The winds pick up speed as they travel through valleys and canyons.[105] The end result is hot, dry, fast moving winds that blow through the region on their way to the coast. Forecasters at the NWS in Oxnard

[105] University of California Los Angeles. The Santa Ana Winds. Retrieved June 13, 2017 from http://people.atmos.ucla.edu/fovell/ASother/mm5/SantaAna/winds.html.

and San Diego usually place speed minimums on these winds and reserve the use of "Santa Ana" for winds greater than 25 knots (approximately 29 miles per hour).

Santa Ana winds typically occur between October and February, with December having the highest frequency of events. Wind speeds are typically north to east at 35 knots (40 miles per hour) with gusts to 50 knots (57 miles per hour). Stronger Santa Ana winds can have gusts greater than 60 knots (69 miles per hour) over widespread areas and localized gusts greater than 100 knots (115 miles per hour). Frequently, the strongest winds in the basin occur during the night and morning hours due to the absence of a sea breeze, which can weaken Santa Ana winds during the midday hours.[106] Figure 54 shows the typical development and travel direction of Santa Ana Winds.

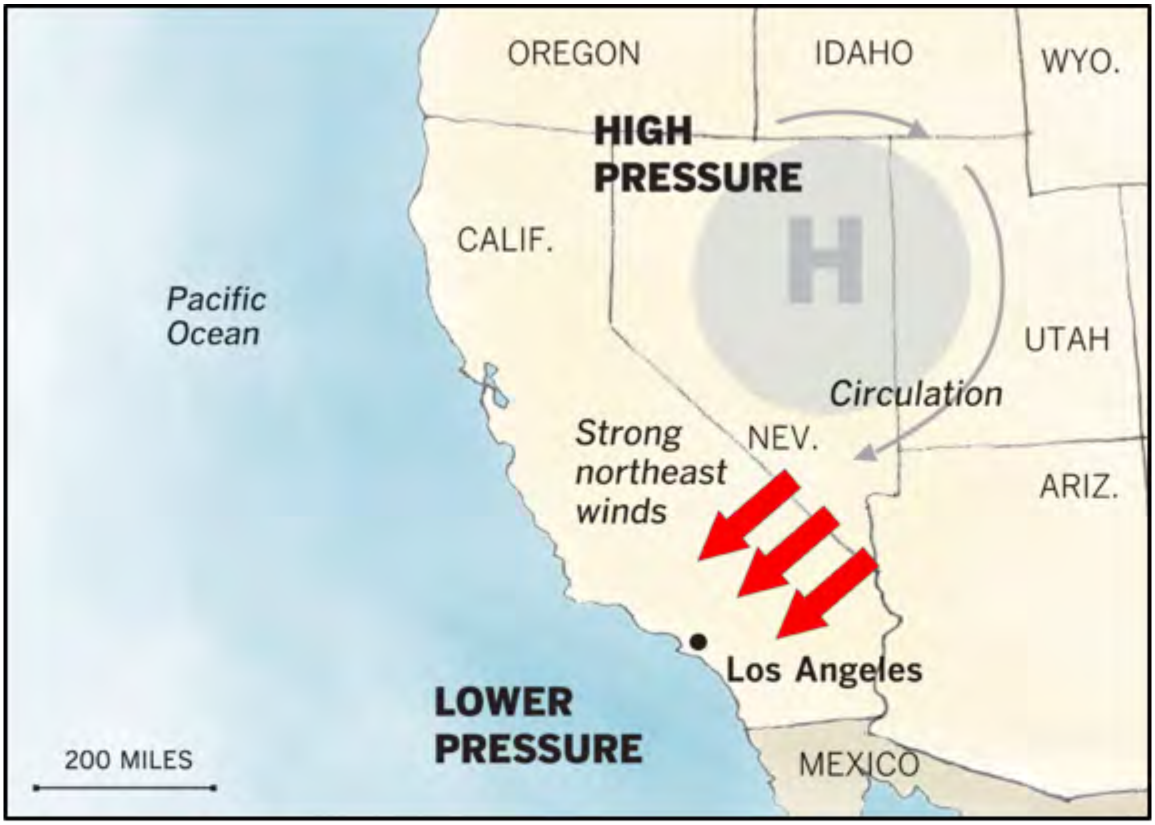

Figure 54. Figure 4.43 Santa Ana Wind Formation and Travel.[107]

LOCATION

Thunderstorms, hailstorms, high wind events, and lightning can impact the entirety of the State of California. It is assumed the Reservation is uniformly exposed to severe thunderstorms; therefore, all areas of the Reservation are equally exposed to hailstorms. According to the National Weather Service, the Torres Martinez Reservation is located in an area of the United States that receives an average of one day per year with hail events (see Figure 55).

[106] Riverside County Multi-Jurisdictional Hazard Mitigation Plan, 2012.

[107] The Los Angeles Times. (2013). Santa Ana winds and wildfires. Retrieved June 30, 2017, from http://graphics.latimes.com/storyboard-la-me-santa-ana-wildfires-SB/.

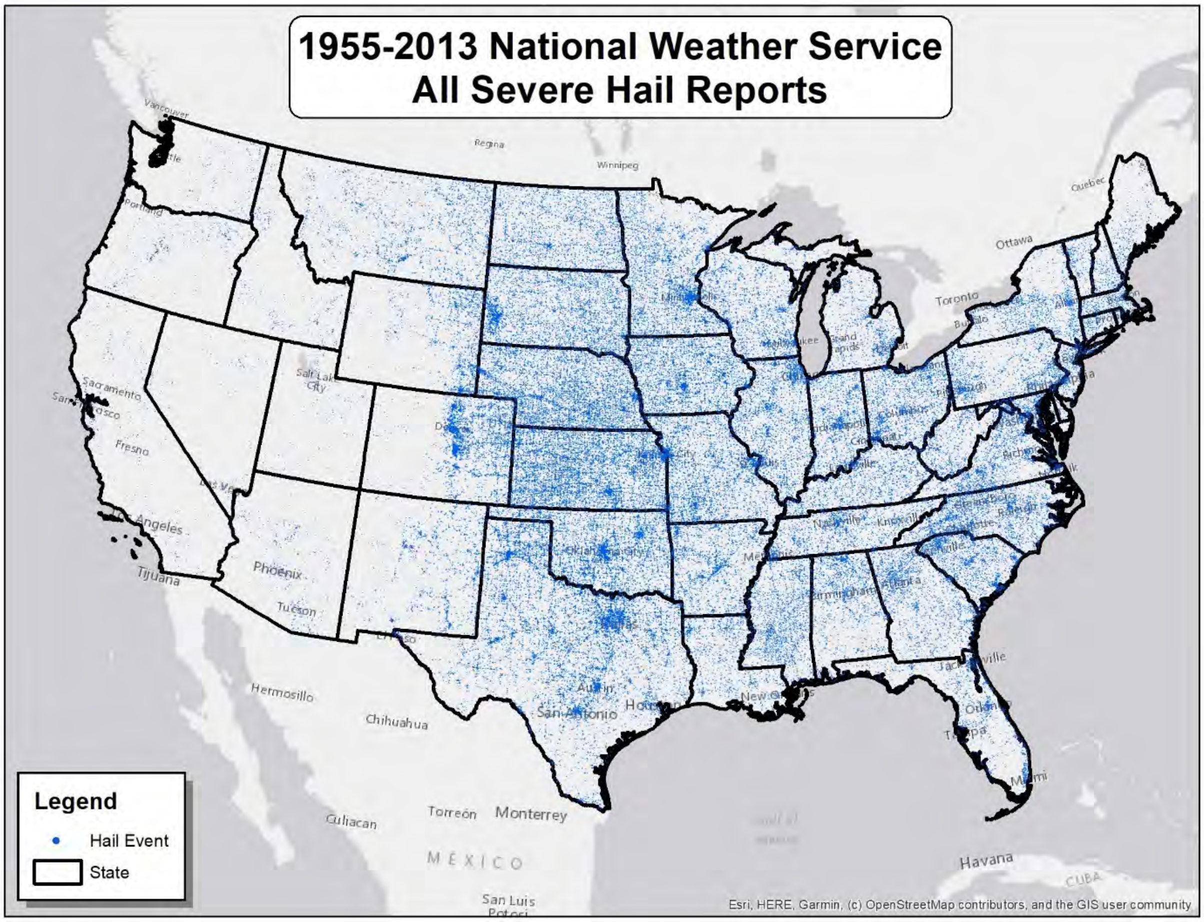

Figure 55. United States Average Number of Days per Year with Severe Hail Events.

Extreme winds, including thunderstorm wind and Santa Ana Winds, can impact the entire Reservation. The Reservation resides in an American Society of Civil Engineers (ASCE) Zone I wind zone area, and also in a special wind region as shown in Figure 52.

Lightning:

Lightning occurs randomly; therefore, it is impossible to predict where and with what frequency it will strike. It is assumed the Torres Martinez Reservation is uniformly exposed to lightning. Figure 56 was compiled with data from 2007-2023 to show the frequency of cloud-to-ground lightning flashes per square mile per year.[108] This can be used to demonstrate location and measure extent. The Torres Martinez Reservation area receives approximately 0 to 1.5 strikes per square mile per year.

[108] National Risk Index. (2024). FEMA. Retrieved November 1, 2024, from https://hazards.fema.gov/nri/.

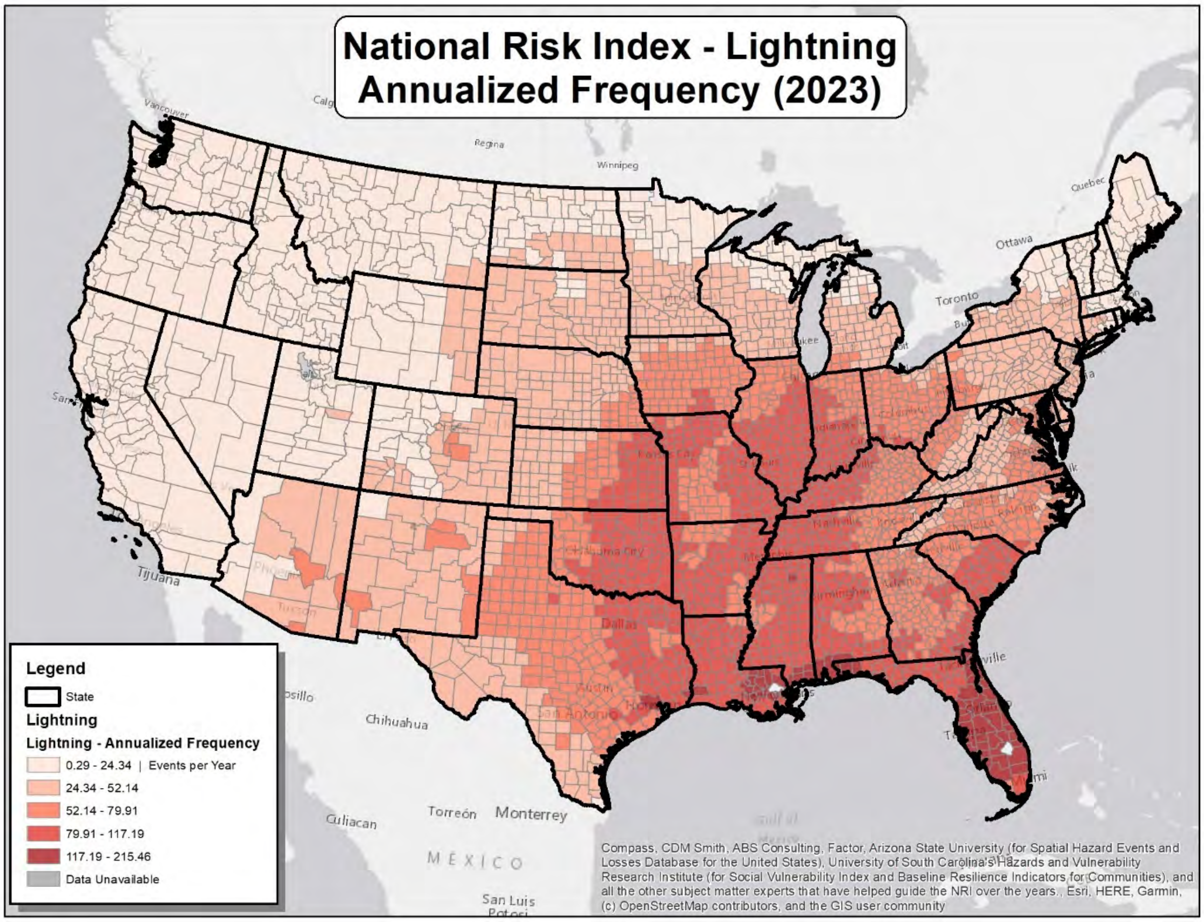

Figure 56. Average Lightning Strikes (per square mile per year).

PREVIOUS OCCURRENCES

Hailstorms:

The National Centers for Environmental Information (NCEI) Storm Events Database reports hail information by county and, when the information is available, by town or by coordinate location. The town most closely associated with the Reservation is Thermal, CA. Of the 38 hailstorm events recorded for Riverside and Imperial Counties from 1960 until 2024, NCEI did not report any hail events in Thermal or at coordinate locations that fall within the Reservation. It should be noted that hail is notorious for causing substantial damage to cars, roofs, and other areas of the built environment that may not be reported to the National Centers for Environmental Information as reports are typically limited to public reports and absent of private insurance claim reporting. Since 2017, three hail events were recorded for Riverside County, one in Indio from 12-13 October 2018, with 1.00-inch hail, and no deaths, injuries, property damage, or crop damage reported; one in Murrieta on 11 March 2021, with ¼- to ½-inch hail, no deaths, injuries, or crop damage, and $10,000 in property damage reported; and one in Palm Desert with 1” hail and $20,000 in property damage reported.

The NOAA Storm Events database lists ten hailstorms affecting the area from 2012 through 2023, as provided in Table 41.

Table 41. NCEI Severe Storm Database Entries Covering Hail in the Reservation. [109]

Date	Description	Losses Reported
8/24/2013	A Cooperative Observer Program (COOP) observer located in Eagle Mountain reported that large hail, estimated to be one inch in diameter, fell for 30 minutes. No damage was reported due to the large hail.	None
9/3/2023	Riverside County. There was 2" deep of 0.5 hail and 1-3" of water flowing across Highway 243. Broken tree branches were all over the roadway from hail damage.	$1,000
9/9/2013	Imperial County. Stronger storms generated large hail as well as strong and gusty outflow winds.	None
8/20/2014	Riverside County. The public reported 1-inch hail in Menifee from an early morning thunderstorm. Local news media reported large hail cracked a vehicle windshield in Menifee from the same storm.	$500
8/21/2014	Imperial County. Stronger storms produced large hail in addition to gusty microburst winds. According to the California Highway Patrol, a strong thunderstorm in El Centro produced dime-sized hail, or hail with a diameter of 0.75 inches.	None
7/18/2015	Imperial County. According to a local newspaper report, hailstones with a diameter of 1.25 inches were observed in the town of Heber, just to the south of El Centro. No damage was reported due to the large hail, however.	None
9/8/2015	Riverside County. Several hail reports, mostly nickel-sized, but a few larger. Activity decreased on the 9th with only isolated thunderstorms formed.	None
10/12/2018	Riverside County. Broadcast media reported quarter sized (1 inch) hail in Indio. No damages or injuries were reported.	None
3/11/2021	Riverside County. Thunderstorms late afternoon on March 11 produced 1/4 to 1/2 inch hail.	$10,000
7/14/2024	Riverside County. Video of large hail landing in a homeowner's pool. Estimate 1 inch or quarter size.	$20,000

NOAA's NCEI Storm Events Database was investigated for past high wind and thunderstorm wind events. Wind events were researched for high wind, strong wind, and thunderstorm wind categories. NCEI reports wind events by county. Town, forecast, and/or coordinate locations are provided for some

[109] https://www.ncdc.noaa.gov/stormevents/; accessed 22 Sept 2024.

events, but not all. Therefore, all events reported may not have impacted the Torres Martinez Reservation. However, the data provides a general sense of frequency and magnitude for the Torres Reservation. A total of 262 wind events and approximately $17.1 million in damages (2017 dollars) were reported for the general area. In addition, eight injuries were reported. A summary of each NCEI wind category is provided below.

High Winds

Between 2013 and 2023, forty-six high wind events were reported in the "Coachella Valley Zone" and/or the "Imperial County Except the Lower Colorado River Valley Zone" (both of these National Weather Service forecast zones overlie parts of the Torres Martinez Reservation). These events resulted in $158K in crop and property damages. The maximum wind speed reported was 78 knots (90 mph). Two injuries were also reported from these events.

Strong Winds

Between 2013 and 2023, thirteen strong wind events were reported in the "Coachella Valley Zone" and/or the "Imperial County Except the Lower Colorado River Valley Zone" (both of these National Weather Service forecast zones overlie parts of the Torres Martinez Reservation). The events resulted in a combined damage total of $2,085,000. Maximum reported wind speed was 49 knots (56 mph). There were no deaths or injuries reported.

Thunderstorm Winds

Between 2013 and 2023, the NCEI storm database reported ninety-five thunderstorm wind events for Imperial and Riverside Counties. The events resulted in a combined damage total of $11,086,500 and had a maximum wind speed of 88 knots (101 MPH). Of those events, three were reported in Thermal, CA (the town associated with the Reservation). These events resulted in a $8,005,500 in damages and had a maximum wind speed of 60 knots (69 mph). It is likely that additional events impacted the Reservation.

Details for the event occurring in Thermal are described in more detail below as found on the NCEI website:

July 17, 2015 (thunderstorm wind): $500 in damages[110]

Considerable moisture from Hurricane Dolores to the south, along with monsoon moisture from the southeast resulted in widespread showers and thunderstorms over most of the hydrologic service area (HSA) for the 17th-19th. Microburst wind damage occurred in Tierrasanta, along with additional damage from a haboob in the Anza Borrego State Park and wind damage from a thunderstorm in Palm Desert. Thunderstorm winds knocked over and a tree, which blocked the east bound lanes at 66th Avenue and Harrison Street in the town of Valerie.

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[110] https://www.ncdc.noaa.gov/stormevents/eventdetails.jsp?id=596595.

September 8, 2017 (thunderstorm wind): $5,000 in damages[111]

The month picked up where August left off, with an active monsoon pattern bringing periods of showers and thunderstorms to the mountains and deserts. The storms were confined to the deserts where intense isolated strong/severe thunderstorms on the 7th, 8th and 9th produced damage and impacts. Multiple large trees and a fence were also toppled near the airport.

July 23, 2019 (thunderstorm wind), Thermal, CA:[112]
An upper level high set up over the Four Corners region, allowing moisture to move into Southern California. Showers set up over the coast and valleys on July 22nd, and inland thunderstorms developed in the afternoon. On July 23rd, a severe thunderstorm set up over the Coachella Valley and brought 70 mph winds to Mecca. This resulted in over 8 million dollars in damages to power lines throughout the city.

An estimated 8 million in damage reported from thunderstorms microburst. Up to 20 utility poles downed, snapped or damaged in Imperial Irrigation District. Thunderstorms collapsed on desert floor. Strong winds also brought down a large tree onto a vehicle, trapping a man inside.

Lightning:
There were 18 events reported by NCEI from 2013 until 2023 throughout Imperial and Riverside Counties resulting in $38,500 of property damage and 7,100 of crop damage. One of those events was reported in Thermal, the town most closely associated with the Torres Martinez Reservation. The reported event resulted in $500 worth of property damage. Before 2013, there have been lightning events in Imperial and Riverside Counties that have resulted in deaths, injuries, and damages. It is likely that not all previous lightning events have been reported. Detailed information on the lightning event reported in Thermal can be found in Table 42.

Table 42. NCEI Historic Lightning Strikes in Thermal, CA.

Date	Location	Deaths/ Injuries	Property Damage	Details
7/18/2015	Thermal, CA	0/0	$500	Considerable moisture from Hurricane Dolores to the south, along with monsoon moisture from the southeast resulted in widespread showers and thunderstorms over most of the HSA for the 17th-19th. Rainfall ranged from one-half of an inch up to around 4 inches. Over 2000 lightning strikes reported on July 18, some starting small brush fires.

[111] https://www.ncdc.noaa.gov/stormevents/eventdetails.jsp?id=722821.
[112] https://www.ncdc.noaa.gov/stormevents/eventdetails.jsp?id=848213.

Date	Location	Deaths/ Injuries	Property Damage	Details
				CHP reported multiple palm trees on fire due to a lightning strike near the intersection of Jackson St. and 61st Ave.

EXTENT

Hailstorms:
According to the TORRO Scale, hailstones can exceed 100 mm (3.9 inches) in diameter, known as super hail. There are no recorded hailstorm events on the Torres Martinez Reservation. The largest magnitude of hail reported in either of the counties containing Reservation lands (Imperial and Riverside) was 1.75 inches. It should be noted that larger-sized hailstones are possible in the planning area.

Wind Events:
The strength of thunderstorms is typically measured in terms of its effects, namely the speed of the wind, the presence of significant lightning, and the size of hail. High winds are defined by the NWS as sustained non-convective winds of 35 knots (40 mph) or greater lasting for 1 hour or longer, or gusts of 50 knots (58 mph) or greater for any duration (NCDC, 2018). A thunderstorm is classified as “severe” when it produces damaging wind gusts in excess of 58 mph (50 knots), hail that is 1 inch in diameter or larger (quarter size), or a tornado (NWS, 2013).

Lightning:
One method of measuring lightning extent is flash density. According to Figure 56 above, Southern California, including the Torres Martinez Reservation, receives approximately 0-1.5 lightning strikes per square mile per year (though additional lightning flashes that do not strike or are not recorded are likely). Lightning can also be measured in terms of damage caused. The greatest amount of damage reported from lightning in Thermal was $500. However, costlier events are possible and likely have occurred in the past (particularly due to structural fires).

PROBABILITY OF FUTURE EVENTS

Climate models show projections that the frequency and intensity of severe thunderstorms (which include tornadoes, hail, and winds) will increase (USGCRP, 2017).

Hailstorms:
Out of the 38 hailstorm events recorded in Imperial and Riverside Counties, none were recorded on the Reservation. However, due to the small planning area, looking at the county-level probability is also useful. With 38 events in 65 years for Imperial and Riverside Counties combined, there is a 58-percent annual occurrence rate for hail storm events. Based on historic events both on the Reservation and

within the overlying counties, an approximate probability of “possible” was assigned to the Torres Martinez Reservation (less than 10 percent annual probability).

Wind Events:
According to NCEI, 262 wind events were reported in the last 10 years. This means that there are several occurrences every year which results in a probability of highly likely.

Lightning:
According to NCEI, one lightning event was reported in 20 years. However, is it likely that lightning strikes have gone unreported, as lightning is a regular occurrence in the planning area. Due to the small planning area, looking at the county-level rate is also useful. With 36 events in 65 years for Imperial and Riverside Counties combined, there is a 56-percent annual occurrence rate for lightning events. Based on historic occurrences for the Reservation and the overlying counties, a probability of “likely” (between a 10 and 90 percent annual probability) was assigned.

VULNERABILITY ASSESSMENT

EXPOSURE

All current and future buildings, critical facilities, cultural sites, and populations on the Torres Martinez Reservation are at risk of severe storm hazard**s**.

BUILT ENVIRONMENT IMPACTS

There are some associated dollar losses with hail in the surrounding area and hail is capable of causing damage, particularly to roofs, vehicles, and exposed metal and glass. Hail can also cause damage to crops.

In the region, there has been $10,248,500 in damage in 11 years which results in an annualized loss of $931,682. This is not the annualized loss for the Reservation which is a subset of this number, but it does show that property and crop damage is a concern.

There are also some reported damages from lightning in the planning area. Although this damage is very small and the annualized loss would be negligible over time.

POPULATION IMPACTS

Some traffic accidents associated with severe storm events include injuries and deaths. However, the number of injuries and deaths reported for accidents is generally low. Populations considered most vulnerable to hail, microburst and thunderstorm impacts in the Reservation are identified based on a number of factors including their physical and financial ability to react or respond during a hazard. Senior and low-income populations in the Reservation are particularly susceptible to storms. The Tribe should be aware of the potential needs of residents within these population segments in the event of a hazard occurrence.

According to NOAA's NCEI, hail caused two injuries in Riverside and Imperial Counties between 1960 and 2024 while high winds have caused 5 injuries and no fatalities. So, injuries and fatalities are possible but unlikely.

It is possible that lightning-related damage or injuries have gone unreported. Lightning may result in electrical damage (including to electrical systems and to electronics), fires, and injury or death. In addition, falling limbs caused by lightning strikes to trees may damage buildings or vehicles.

ENVIRONMENT IMPACTS

Severe storms including hail, wind, thunderstorms, and microbursts can cause damage to parks and other, natural areas.

PROBLEM STATEMENTS FOR SEVERE STORM: THUNDERSTORMS, HAILSTORMS, EXTREME WIND, AND LIGHTNING

Table 43. Problem Statements for Severe Storm: Thunderstorms, Hailstorms, Extreme Wind, and Lightning

Assets	Problems Associated with Severe Storm: Thunderstorms, Hailstorms, Extreme Wind, and Lightning
People (including underserved communities and socially vulnerable populations)	• People on the Reservation have been disrupted by severe weather events and other more frequent wind and thunderstorm events. • Vulnerable people living in isolated areas may be more susceptible to severe weather impacts.
Structures (including facilities, lifelines, and critical infrastructure)	• Downed trees and aerial utilities can cause damage to structures, utilities (especially electric), and critical infrastructure.
Systems (including networks and capabilities)	• Downed trees and powerlines can cause disruption to first responders.
Natural, historic, and cultural resources	• These can be adversely impacted depending on the specific locations of damage.
Activities that have value to the community	• These can be adversely impacted depending on the specific locations of damage.

4.2.3.5 TORNADO

DESCRIPTION

A tornado is a violent windstorm characterized by a twisting, funnel-shaped cloud extending to the ground. Tornadoes are most often generated by thunderstorm activity (but sometimes result from hurricanes and other tropical storms) when cool, dry air intersects and overrides a layer of warm, moist air forcing the warm air to rise rapidly. The damage caused by a tornado is a result of the high wind velocity and wind-blown debris, also accompanied by lightning or large hail. According to the National Weather Service, tornado wind speeds normally range from 40 miles per hour to more than 300 miles per hour. The most violent tornadoes have rotating winds of 250 miles per hour or more and are capable of causing extreme destruction and turning normally harmless objects into deadly missiles. Each year, an average of over 800 tornadoes is reported nationwide, resulting in an average of 80 deaths and 1,500 injuries.[113] According to the NOAA Storm Prediction Center (SPC), the highest concentration of tornadoes in the United States has been in Oklahoma, Texas, Kansas, and Florida respectively. Although the Great Plains region of the Central United States does favor the development of the largest and most dangerous tornadoes (earning the designation of "tornado alley"), Florida experiences the greatest number of tornadoes per square mile of all U.S. states (SPC, 2002). Figure 57 shows tornado activity in the United States based on the number of recorded tornadoes between 1994 and 2023.

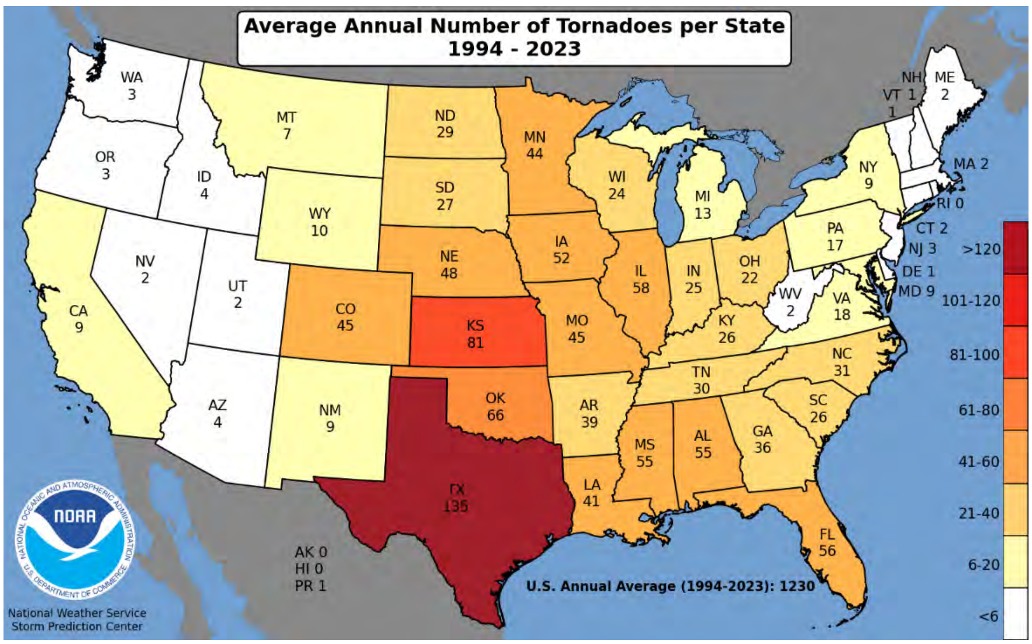

Figure 57. US Tornado Activity.[114]

Tornadoes are most likely to form in the late afternoon and early evening. Most tornadoes are a few dozen yards wide and touchdown briefly, but even small short-lived tornadoes can inflict tremendous damage. Highly destructive tornadoes may carve out a path over a mile wide and several miles long. The destruction caused by tornadoes ranges from light to inconceivable depending on the intensity, size and duration of the storm. Typically, tornadoes cause the greatest damage to structures of light construction, including residential dwellings (particularly mobile homes). Tornadic magnitude is reported according to the Fujita and Enhanced Fujita Scales. Tornado magnitudes prior to 2005 were determined using the traditional version of the Fujita Scale (Table 44). Tornado magnitudes that were determined in 2005 and later were determined using the Enhanced Fujita Scale (Table 4.37).

Table 44. The Fujita Scale (Effective Prior to 2005).[115]

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113 NOAA, 2009.

114 https://www.spc.noaa.gov/wcm/ustormaps/1994-2023-stateavgtornadoes.png.

115 NWA.

F-SCALE NUMBER	INTENSITY	WIND SPEED	TYPE OF DAMAGE DONE
F0	GALE TORNADO	40–72 MPH	Some damage to chimneys; breaks branches off trees; pushes over shallow-rooted trees; damages to sign boards.
F1	MODERATE TORNADO	73–112 MPH	The lower limit is the beginning of hurricane wind speed; peels surface off roofs; mobile homes pushed off foundations or overturned; moving autos pushed off the roads; attached garages may be destroyed.
F2	SIGNIFICANT TORNADO	113–157 MPH	Considerable damage. Roofs torn off frame houses; mobile homes demolished; boxcars pushed over; large trees snapped or uprooted; light object missiles generated.
F3	SEVERE TORNADO	158–206 MPH	Roof and some walls torn off well-constructed houses; trains overturned; most trees in forest uprooted.
F4	DEVASTATING TORNADO	207–260 MPH	Well-constructed houses leveled; structures with weak foundations blown off some distance; cars thrown, and large missiles generated.
F5	INCREDIBLE TORNADO	261–318 MPH	Strong frame houses lifted off foundations and carried considerable distances to disintegrate; automobile sized missiles fly through the air in excess of 100 meters; trees debarked; steel reinforced concrete structures badly damaged.
F6[116]	INCONCEIVABLE TORNADO	319–379 MPH	These winds are very unlikely. The small area of damage they might produce would probably not be recognizable along with the mess produced by F4 and F5 wind that would surround the F6 winds. Missiles, such as cars and refrigerators would do serious secondary damage that could not be directly identified as F6 damage. If this level is ever achieved, evidence for it might only be found in some manner of ground swirl pattern, for it may never be identifiable through engineering studies.

Table 45. The Enhanced Fujita Scale (Effective 2005 and Later).[117]

EF-SCALE NUMBER	INTENSITY PHRASE	3 SECOND GUST (MPH)	TYPE OF DAMAGE DONE
EF0	GALE	65–85	Some damage to chimneys; breaks branches off trees; pushes over shallow-rooted trees; damages to sign boards.
EF1	MODERATE	86–110	The lower limit is the beginning of hurricane wind speed; peels surface off roofs; mobile homes pushed off foundations or overturned; moving autos pushed off the roads; attached garages may be destroyed.
EF2	SIGNIFICANT	111–135	Considerable damage. Roofs torn off frame houses; mobile homes demolished; boxcars pushed over; large trees snapped or uprooted; light object missiles generated.
EF3	SEVERE	136–165	Roof and some walls torn off well-constructed houses; trains overturned; most trees in forest uprooted.

[116] F6 is not always included but has been used to describe extremely strong tornadoes that far surpass F5 levels.
[117] National Weather Service.

EF-SCALE NUMBER	INTENSITY PHRASE	3 SECOND GUST (MPH)	TYPE OF DAMAGE DONE
EF4	DEVASTATING	166–200	Well-constructed houses leveled; structures with weak foundations blown off some distance; cars thrown and large missiles generated.
EF5	INCREDIBLE	Over 200	Strong frame houses lifted off foundations and carried considerable distances to disintegrate; automobile sized missiles fly through the air in excess of 100 meters; trees debarked; steel re-enforced concrete structures badly damaged.

LOCATION

Tornadoes have the potential to strike anywhere, thus the entire planning area is at risk to tornadoes. They are more common in open spaces (such as the plains in Tornado Alley). Tornadoes are rarer in areas where there are lots of hills or mountains. Once a touchdown occurs, it may only affect a small area or travel for miles, leaving substantial destruction in its path. Further, it is impossible to predict where and with what magnitude a tornado will strike.

PREVIOUS OCCURRENCES

According to NOAA's NCEI database, there have been 34 tornado events in Riverside and Imperial Counties from 1955 through 2023 resulting in $24.037M in property damage. One historic tornado event on the Torres Martinez Reservation was reported by both the Tribe and NOAA NCEI (Figure 61). This tornado occurred on August 6, 2015, and had an EF-1 magnitude (86-100 miles per hour). NCEI reports that the tornado touched down in Mecca and dissipated in Thermal and resulted in over $24,437,000 (2024 dollars) in total damages (including Tribal and non-Tribal lands). Torres Tribal officials noted that the tornado destroyed approximately 100 power poles on the Reservation but caused minimal damage to structures. Thirty-eight families were evacuated to a local hotel due to a lack of air-conditioning and food spoilage caused by power outages. Sixty-two homes were affected by power outages. Damages from this event are shown in Figure 58, Figure 59, and Figure 60.

Figure 58. Downed Power Poles from the 2015 Tornado.

Figure 59. A Roof was Torn Off by the 2015 Tornado.

Figure 60. A Mobile Home Sustained Damage from the 2015 Tornado.

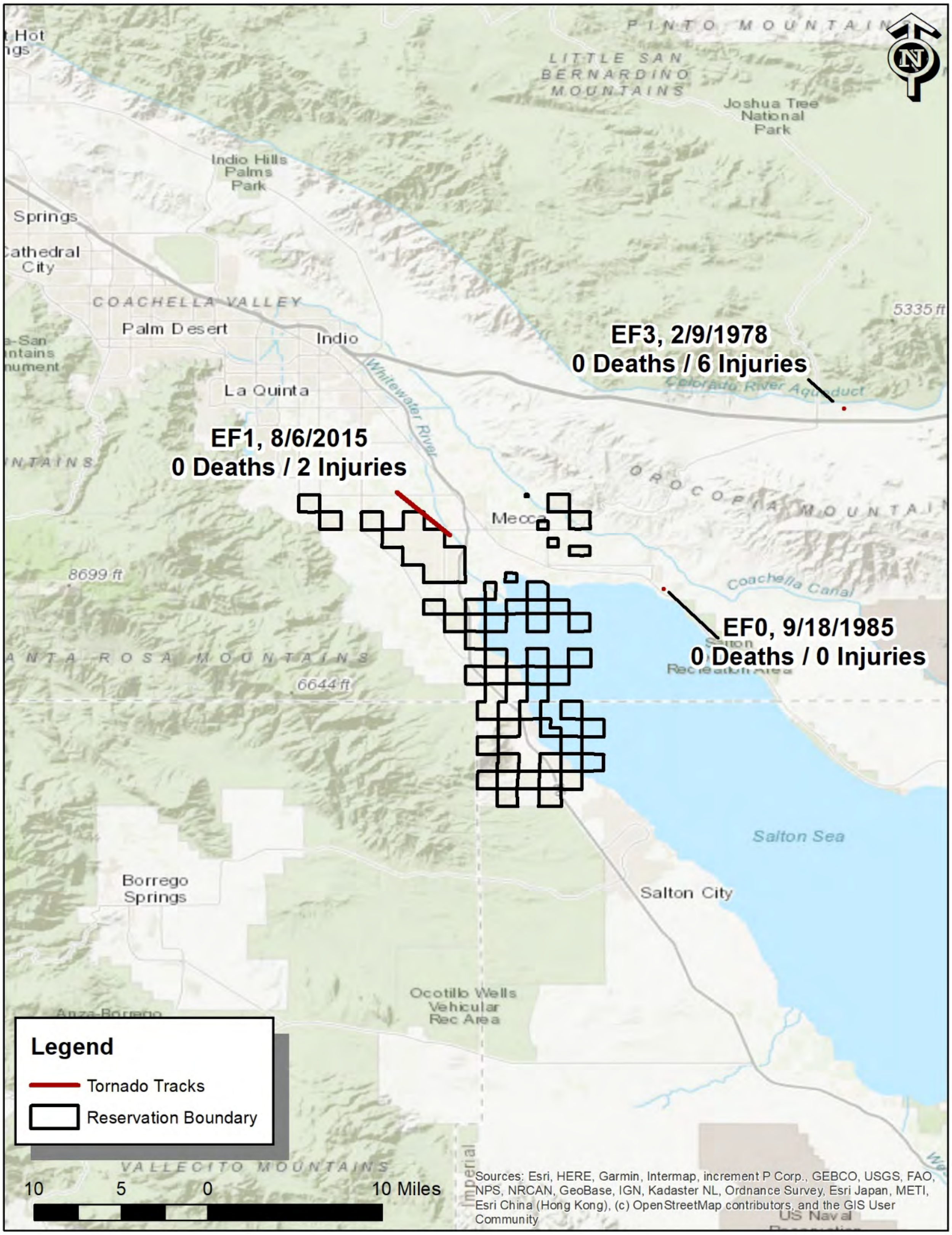

Figure 61. Previous Tornado Occurrences on the Torres Martinez Reservation.[118]

EXTENT

The greatest tornado to impact the Reservation was the EF-1 tornado that occurred in 2015 (86 to 100 miles per hour). However, stronger tornadoes are possible.

The NWS rates tornadoes using the Enhanced Fujita scale (EF scale), which does not directly measure wind speed but rather the amount of damage created. This scale derives 3-second gusts estimated at the point of damage based on the assignment of 1 out of 8 degrees of damage to a range of different structure types. These estimates vary with height and exposure. This method is considerably more sophisticated than the original Fujita scale, and it allows surveyors to create more precise assessments of tornado severity. Table 46 shows the expected damage for each EF Rating.

Table 46. Enhanced Fujita Scale Expected Damage.

EF Rating	Wind Speeds	Expected Damage		
EF-0	65-85 mph	'Minor' damage: shingles blown off or parts of a roof peeled off, damage to gutters/siding, branches broken off trees, shallow rooted trees toppled.		
EF-1	86-110 mph	'Moderate' damage: more significant roof damage, windows broken, exterior doors damaged or lost, mobile homes overturned or badly damaged.		
EF-2	111-135 mph	'Considerable' damage: roofs torn off well constructed homes, homes shifted off their foundation, mobile homes completely destroyed, large trees snapped or uprooted, cars can be tossed.		
EF-3	136-165 mph	'Severe' damage: entire stories of well constructed homes destroyed, significant damage done to large buildings, homes with weak foundations can be blown away, trees begin to lose their bark.		
EF-4	166-200 mph	'Extreme' damage: Well constructed homes are leveled, cars are thrown significant distances, top story exterior walls of masonry buildings would likely collapse.		
EF-5	> 200 mph	'Massive/incredible' damage: Well constructed homes are swept away, steel-reinforced concrete structures are critically damaged, high-rise buildings sustain severe structural damage, trees are usually completely debarked, stripped of branches and snapped.		

Source: National Weather Service

Tornado watches and warnings are issued by the local NWS office. A tornado watch is released when tornadoes are possible in an area. A tornado warning means a tornado has been sighted or indicated by

[118] NOAA NCEI.

weather radar. The current average lead time for tornado warnings is 13 minutes. Occasionally, tornadoes develop so rapidly that little, if any, advance warning is possible.

PROBABILITY OF FUTURE EVENTS

Based on 34 events over 69 years, expected approximate annual probability is 50 percent, or one event every two years. However, this is based on all events in Imperial and Riverside Counties. There has only been one tornado reported on the Reservation during this period. Therefore, a probability of "possible" (between 1 percent and 10 percent annual chance) was assigned.

VULNERABILITY ASSESSMENT

EXPOSURE

All current and future buildings, critical facilities, cultural resources, and populations are considered at risk to tornadoes. Tornadoes are capable of causing major damage, injuries and deaths. Additional impacts include power failure, loss of communications, business disruption, and downed trees and debris. Power failure can result in the need to relocate those impacted, especially when combined with extreme temperatures. This occurred after the 2015 tornado event, when families without power were relocated due to extreme heat and lack of air conditioning.

BUILT ENVIRONMENT IMPACTS

High winds, heavy rain, lightning and/or hail associated with tornadoes, thunderstorms and microbursts can cause damage to utilities, structures, roads, and trees (potentially causing vehicle accidents), and injuries and death.

Tornadoes generally cause the greatest damage to structures of light construction, including residential dwellings and vulnerable manufactured homes. Structural vulnerability is also related to building construction type and age. Wood-frame structures are more susceptible to high winds; steel and concrete are more resistant. Even if a building remains structurally sound, broken glass from windows can cause injuries inside and outside the building and badly damage building contents. Failures of windows and doors can greatly increase storm damage. Wind entering the building changes the pressure differential between the building's interior and exterior, causing more windows to break. If wind-driven rain and water reach the interior, materials can be damaged or ruined. Partially completed buildings are also vulnerable if their components have not yet been fully connected, or if structural features intended to withstand strong winds have not yet been completed.

Annualizing the losses from tornado damage overtime results in an approximate value of $354,159 annually (based on the one tornado event occurring in 2015). However, this includes damages incurred on Tribal and non-Tribal lands. Without detailed historic data, it is not possible to calculate annualized loss solely for damages occurring on the Reservation.

POPULATION IMPACTS

Populations considered most vulnerable to tornado impacts in the Reservation are identified by a number of factors including their physical and financial ability to react or respond during a hazard and the location and construction quality of their housing. The flood vulnerability assessment summarizes the senior and low-income populations in the Reservation. It should be noted that there may be overlap within the two categories, so that the total number of persons exposed may be lower than what is shown in the table. However, the Reservation should be aware of the potential needs of residents within these population segments in the event of a hazard occurrence.

ENVIRONMENT IMPACTS

Tornadoes can cause damage to parks, and other, natural areas. It also can cause damage to structures housing hazardous materials. Some areas of the Reservation may be out of service until trees are removed.

PROBLEM STATEMENTS FOR TORNADOES

Table 47. Problem Statements for Tornadoes.

Assets	Problems Associated with Tornadoes
People (including underserved communities and socially vulnerable populations)	• Vulnerable populations may need support seeking protected shelter. • Those without cell phones may not get weather alerts. • People without basements are susceptible to tornado impacts. • May be difficult to warn and evacuate vulnerable populations.
Structures (including facilities, lifelines, and critical infrastructure)	• Structures and critical infrastructure can all be impacted by tornadoes. • Roadways may be blocked due to downed trees and other debris. • Electric grid may be impacted by winds and downed trees.
Systems (including networks and capabilities)	• It may be difficult to provide services if roads are impassable and the electric grid is down.
Natural, historic, and cultural resources	• Historic and cultural resources may be impacted by tornado winds. • Winds may damage trees and cause natural areas to close for cleanup.
Activities that have value to the community	• Outdoor events could be impacted by potential tornado activity. This includes Speedway events.

4.2.4 BIOLOGICAL HAZARDS

4.2.4.1 AGRICULTURAL PESTS AND DISEASES

DESCRIPTION

Countless species of insects and animals live in, on, or among crops and livestock; some are harmless, and some have the ability to cause damage. Damaging infestations can happen under certain conditions when relatively harmless pests can become hazardous. For example, trees may be weakened during a drought and become more susceptible to pests that would otherwise be relatively harmless.[119] In addition, if unchecked by local predators, invasive species' populations can grow in numbers that are detrimental to crops the invasive species might use as a food source. Furthermore, some pests may cause a problem by carrying and spreading disease among crops or livestock. Agricultural pests and diseases can result in human and economic health disasters by impacting farmers, farm workers, and shippers of agricultural products. They can also result in an increase in food prices or in food shortages. In addition, pests and diseases that destroy large expanses of forest or woodland areas can increase wildfire risk due to increased fuel load.[120]

Many different pests could impact the planning area, including different insect species. Chewing insects strip plants of leaves, boring insects bore into plant stem or roots, and sucking insects suck liquid out of leave of stems, and in doing so can excrete a liquid called "honeydew," which promotes the growth of mold.[121] Although not comprehensive of all pests that could impact the planning area, below are a list of agricultural pests and diseases that have been identified has a potential threat on or near the Torres Martinez Reservation:[122]

Asian Citrus Psyllid and the Citrus Greening Disease (Huanglongbing):
The Asian citrus psyllid feeds on citrus trees and plants. The insect can damage plants by withdrawing large amounts of sap and by producing large amounts of "honeydew," which can coat leaves and cause mold to grow. More serious damage can occur as the Asian citrus psyllid is also capable of carrying and infecting citrus plants with a bacterium that causes a disease called Huanglongbing (HLB). HLB is also called Citrus Killing or Citrus Greening Disease, because the disease causes the citrus fruit to turn green and bitter-tasting.

The Glassy-Winged Sharpshooter:

[119] Imperial County Multi-Jurisdictional Hazard Mitigation Plan.

[120] California State Hazard Mitigation Plan, Section 6.6.1.

[121] Imperial County Multi-Jurisdictional Hazard Mitigation Plan.

[122] The pests and diseases included in this plan were identified after a comprehensive search of news articles and agency (state and federal) websites. However, this list is not comprehensive of all pests and diseases that could impact the planning area.

The glassy-winged sharpshooter was first reported in California in 1994 but is native the southwestern US and northeastern Mexico. This insect feeds on many plants and is capable of spreading a bacterium that causes Pierce's Disease, which is fatal to grapevines.[123]

Mediterranean Fruit Fly (Medfly)

The Mediterranean Fruit Fly, or the Medfly, is considered a serious threat to California's agricultural industry, as it impacts 250 types of fruits and vegetables, including citrus, grapes, pitted fruits, and tomatoes. Once infested with larvae, the fruit or vegetable becomes unfit for consumption. The state of California spends millions of dollars annually to prevent the Medfly from infesting agricultural areas.[124]

Other agricultural pests noted in the Riverside County Hazard Mitigation Plan that may impact the Reservation include:

- Africanized honey bee
- Bark beetle
- Citrus leafminer
- Gypsy moth
- Honey bee tracheal mite
- Japanese beetle
- Lesser snow scale
- Magnolia white scale
- Oriental fruit fly
- Red imported fire ant
- Sting nematode
- Tropical palm scale
- Varroa mite/honey bee
- Silverleaf whitefly

An invasive species is any kind of living organism, plant, insect, fish, fungus, or bacteria that is not native to an ecosystem. Invasive species have the potential to displace native species, reduce native wildlife habitat, reduce forest health and productivity, alter ecosystem processes, and degrade recreation areas. These species tolerate a variety of habitat conditions, grow and reproduce rapidly, compete aggressively

[123] California Department of Food and Agriculture. Glassy-winged Sharpshooter. Retrieved from https://www.cdfa.ca.gov/pdcp/Glassy-winged_Sharpshooter.html.

[124] Mohan, G. (2016, February 12). Medfly quarantine expands in San Fernando Valley. Los Angeles Times. Retrieved from http://www.latimes.com/business/la-fi-medfly-20161202-story.html.

for resources (food, water, and sunlight) and lack natural enemies or pests to control their populations (USDA). Invasive plant species found in and around the Reservation include:

- Giant reed (Arundo donax)
- Castor bean (Ricinus communis)
- Stinknet (Oncosiphon piluliferum)
- Sahara Mustard (Brassica tournefortii)
- Salt Cedar (Tamarix ramosissima)
- Russian Thistle (Salsola tragus)
- Mustard species

LOCATION

The Imperial County and the Riverside County hazard mitigation plans identify agricultural pests and diseases as a potential hazard. The California State Hazard Mitigation Plan also identifies pest and disease as a hazard. It is assumed that all agricultural lands within the Reservation are uniformly exposed to agricultural pests and diseases. However, because of the Reservation's reliance on agricultural products, it is assumed that the entire Reservation would be impacted by a pest infestation or agricultural disease outbreak. Below are details of areas that have been impacted by specific pests or diseases.

The Asian Citrus Psyllid (ACP) has been detected in Imperial and Riverside Counties. Figure 4.68 shows detections of the Asian citrus psyllid and a quarantine map for the Asian citrus psyllid and HLB (citrus greening) in the southwestern US from June 2017. The map shows that both Imperial County and Riverside County (including Reservation areas) have detected the ACP and are under quarantine for the Asian citrus psyllid, but not HLB. Based on information provided by the California Department of Food and Agriculture (CDFA), the Torres Martinez Reservation is subject to the ACP Statewide Quarantine - Riverside (QB Status: Active; Created Date: 8/5/2024; Approved Date: 8/8/2024).[125]

[125] https://cdfa.maps.arcgis.com/apps/webappviewer/index.html?id=a1c46000bf474fdbad97834b82e2cce8).

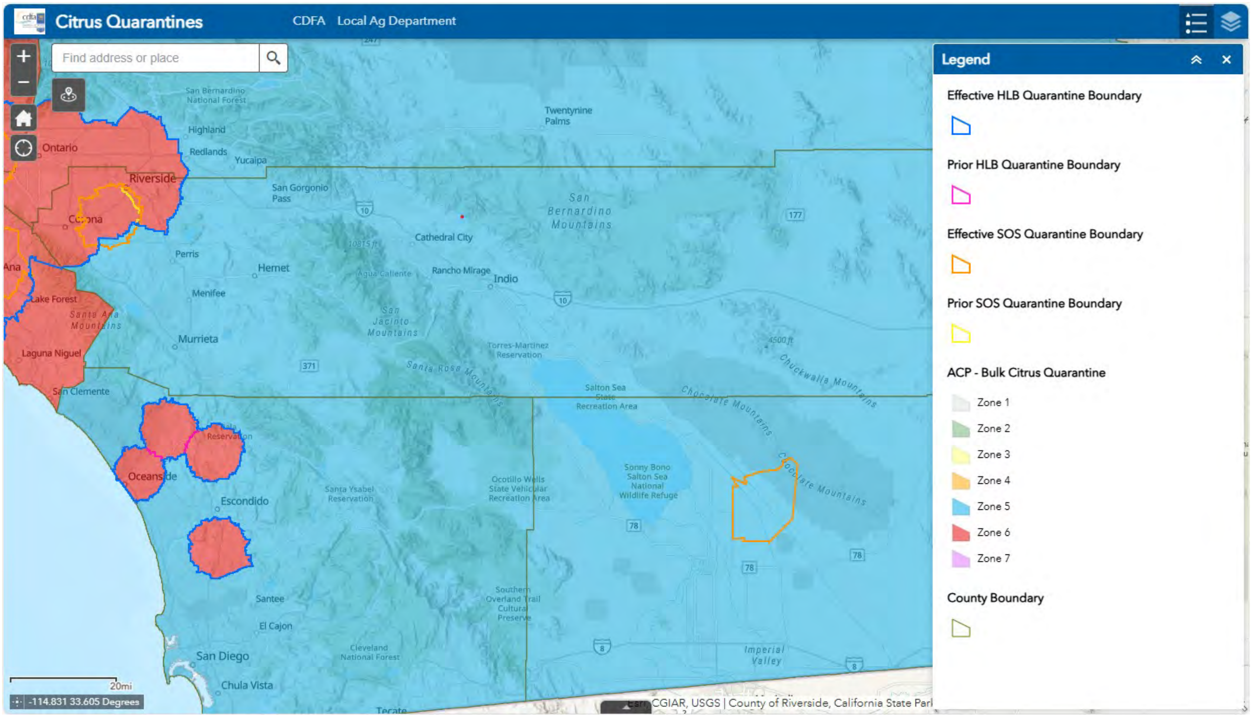

Figure 62. Asian Citrus Psyllid and HLB Detections and Quarantine in the Southwestern US.[126]

Pierce's Disease, which is spread by the glassy-winged sharpshooter, has been reported in all of Riverside County and in a part of Imperial County. According to the CFDA, part of the area infested within Imperial County includes the southern portion of the Torres Martinez Reservation (see Figure 63).

[126] Citrus Pest and Disease Prevention Program. Retrieved from http://www.californiacitrusthreat.org/pest-disease/.

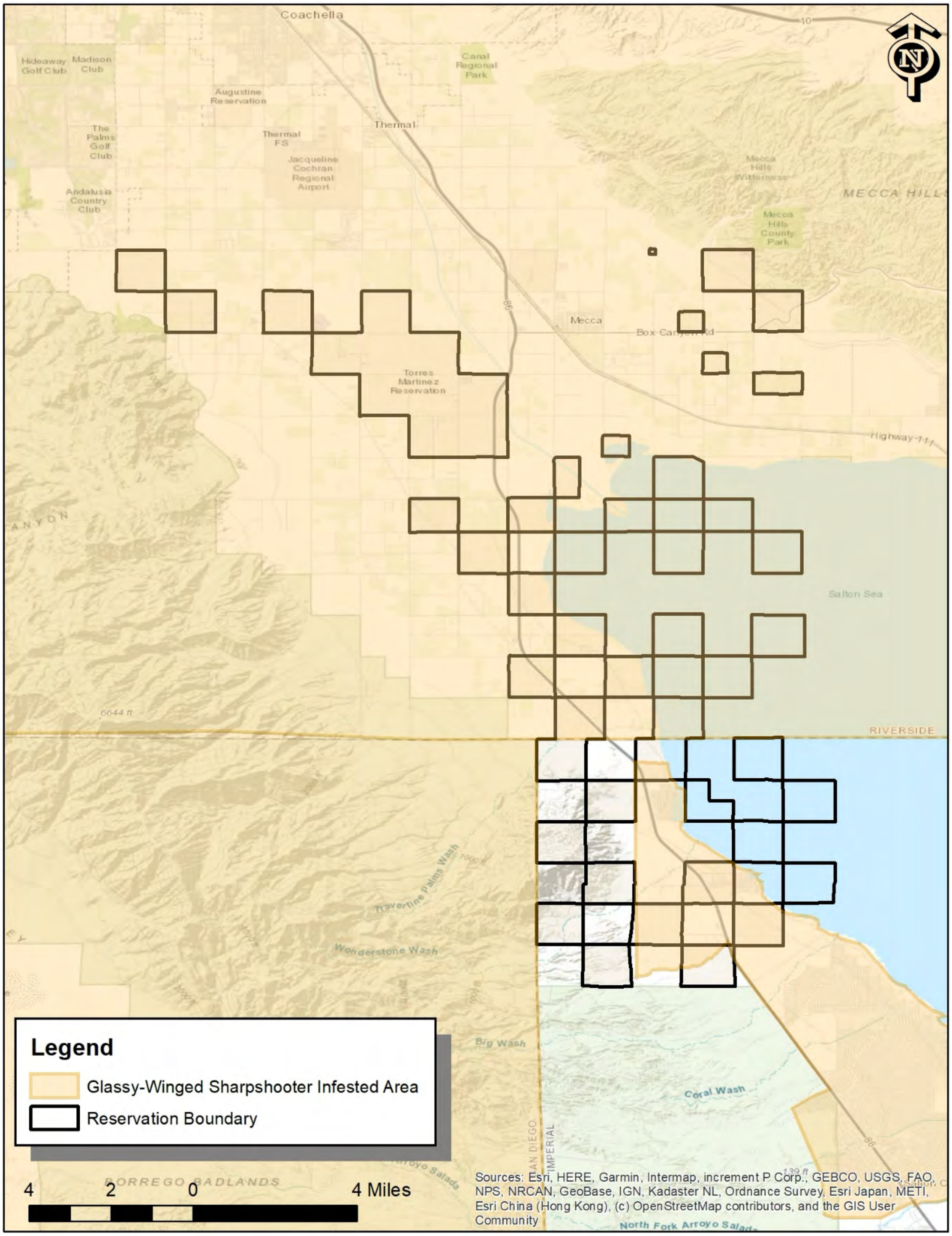

Figure 63. Pierce's Disease Infestation in Riverside and Imperial Counties.[127]

The damage rendered by invasive species is significant. Experts estimate that about 3 million acres within the U.S. are lost each year to invasive plants. The massive scope of this hazard means that the entire State experiences impacts from these species. Furthermore, the ability of invasive species to travel distances (either via natural mechanisms or accidental human interference) allows these species to propagate rapidly over a large geographic area. Similarly, in open freshwater and marine ecosystems, invasive species can quickly spread once introduced, as there are generally no physical barriers to prevent establishment, outside of physiological tolerances, and multiple opportunities for transport to new locations (by boats, for example). The entire geographic area of the Reservation is believed at risk for invasive species propagation.

PREVIOUS OCCURRENCES

Information regarding historic agricultural pest infestations and diseases, and invasive species were gathered from the USDA, the CDFA, relevant state and county hazard mitigation plans, and local news sources.

From local news and agency sources:

- Imperial and Riverside Counties have had ongoing detections of the **Asian citrus psyllid** since at least 2012.[128] As of 2024, both counties were still under quarantine for the pest. HLB remains a threat to the planning area.
- The first outbreak of Pierce's Disease occurred in Temecula, approximately 55 miles from the Reservation, in 1999 when over 300 acres of grapevines were infected.[129] According to the CDFA, both Riverside and Imperial Counties, as 2024, were infested by the **glassy-winged sharpshooter**.
- The **Medfly** has infested different parts of California since the 1950s. More recently, infestations have been recorded in the San Fernando Valley (approximately 135 miles from the Reservation), and Los Angeles (approximately 115 miles from the Reservation). It should be noted that a medfly infestation is possible within the planning area.

From the Imperial County hazard mitigation plan:

- The **pink hibiscus mealybug** (PHM) was first detected in Imperial Valley during August 1999.This represented the first North American record for the PHM. Population densities of PHM on mulberry, silk oak, hibiscus and natal plum were determined to be high in several communities in southern Imperial Valley. A 100-square mile area in urban Imperial County was infested, including parts of El Centro and Calexico. The PHM feeds on both plants and crops, and it threatens nearly 30 different crops produced in Imperial County.

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[127] California Department of Food and Agriculture, 2024.

[128] McCarthy, G. (2012, February 2). Insect That Can Carry Citrus Killing Disease At Coachella Valley's Doorstep. Palm Desert Patch. Retrieved from https://patch.com/california/palmdesert/citrus-killing-disease-at-coachella-valley-s-doorstep.

[129] California Department of Food and Agriculture. Glassy-winged Sharpshooter. Retrieved from https://www.cdfa.ca.gov/pdcp/Glassy-winged_Sharpshooter.html.

- The **citrus leafminer** (CLM) is a small moth native to Asia. In California, CLM was found in backyard citrus in a few locations in January 2000 in Imperial County adjacent to the Mexican border. By the fall of 2001, CLM had spread to other areas of Imperial Valley and is now found from Winterhaven to Niland, attacking nursery stock; commercial groves of lemons, grapefruit, and oranges; and backyard citrus. It is expected to move northward from Imperial County and eventually infest citrus in all areas of the State.
- In 1991, **silverleaf whitefly** became a devastating pest of melon and squash crops, destroying 96% of Imperial County's fall melon crop and resulting in an estimated loss to growers of $12.5 million dollars. In succeeding years, the County's fall melon production dropped from approximately 12,000 acres annually to under 2,000 acres. In the late 1990's a related problem arose - a virus plant disease transmitted by the sweet potato whitefly resulted in $12.7 million crop damage.
- In Imperial County the **pink bollworm caterpillar** has caused the amount of land planted with cotton to drop from 140,000 acres to only 7,000 acres during the past 17 years.
- Imperial County alfalfa growers occasionally suffer losses to spring and summer hay cuttings due to **leafhopper** infestations. Three species have been found damaging alfalfa in California: the southern garden leafhopper (Empoasca solona), the potato leafhopper (E. fabae), and the stunted and have very short intermodes. Stunting and yellowing may persist into the next cutting cycle, even in the absence of leafhoppers. The prevalent species in the Imperial Valley are E. solana and E. mexara and damage may occur from May through September.

EXTENT

The extent of pest infestation and disease, and invasive species can be measured in terms of damages. No damage figures were available for the study area or the state of California at the time of this plan. However, devastating impacts to agriculture are possible on the Reservation. For instance, in Florida, the HLB disease is estimated to have caused over $3.6 billion in economic losses over five years.[130]

PROBABILITY OF FUTURE EVENTS

Since there are no detailed records of historical occurrences, determining a probability based on past events is not feasible. However, noting the current outbreaks and infestations, along with the threat of existing, new, or unknown pests and diseases, the agricultural and diseases, and invasive species hazard was assigned a probability of highly likely (greater than 90 percent annual chance).

As the climate changes, farmers will have to contend with a wide range of pests, diseases and invasive species. Some existing species will adapt to changes, while others will not be able to thrive in new conditions. Climate change also brings about the threat of new species that could not exist in the previous climate but will thrive in future conditions. As temperatures in the planning area are expected

[130] California State Hazard Mitigation Plan, Section 6.6.1.

to increase, and drought events are projected to become longer and more frequent, weakened crops may become more susceptible to pests and diseases.

From the California State Hazard Mitigation Plan:

> *Continued climate change is likely to alter the abundance and types of many pests, lengthen pests' breeding season, and increase pathogen growth rates. For example, the pink bollworm, a common pest of cotton crops, is currently a problem only in southern desert valleys because it cannot survive winter frosts elsewhere in the state. However, if winter temperatures rise 3 to 4.5°F, the pink bollworm's range would likely expand northward, which could lead to substantial economic and ecological consequences for the state. Temperature is not the only climatic influence on pests. For example, some insects are unable to cope in extreme drought, while others cannot survive in extremely wet conditions.*[131]

Furthermore, while warming speeds up the lifecycles of many insects, suggesting that pest problems could increase, some insects may grow more slowly as elevated carbon dioxide levels decrease the protein content of the leaves on which they feed (California Climate Change Center 2006). Possible future strategies to address climate change influences on insect pests and diseases might include:

- Inventory and monitor invasive species that threaten crops.
- Downscale climate change data to allow informed decisions on biodiversity planning by farmers and rural communities.
- Strengthen the dissemination of knowledge, appropriate technologies and tools to improve management practices related to agricultural biodiversity and ecosystem services. The above strategies were derived from Food and Agriculture Organization of the United Nations, Climate Change for Food and Agriculture, Technical Background Document from the Expert Consultation, 2008, available at: ftp://ftp.fao.org/docrep/fao/meeting/013/ai784e.pdf.

VULNERABILITY ASSESSMENT

The Torres Martinez Reservation and its surrounding area contains agricultural lands. In addition, many of the inhabitants of the Reservation rely on farm work. Pests, diseases, and invasive species will continue to be a threat to the economy and health of the Reservation. In addition, they increase the need for pesticide usage on crops, which can impact the health of those on the Reservation by worsening air and/or water quality through agricultural application and runoff.

EXPOSURE

The entire Reservation has the potential to be exposed to pests and diseases, and invasive species. Climate change will make the area more attractive to pests who have not been found there traditionally.

BUILT ENVIRONMENT IMPACTS

[131] California State Hazard Mitigation Plan, Section 6.6.1.

Although the built environment is not as susceptible to pests as the natural environment, it can help spread the invasive species. This includes vehicles that could move the species from one location to another. Trees, which are damaged or killed by invasive pests, can become hazards to people, property, utility lines, and roadways when they fall. Many dead trees in one area can also become fuel for wildfires interconnecting the two hazards.

Although it is likely that the Reservation has incurred damages from agricultural insects, pests, and diseases, no damages have been reported. Without reported damages, estimating annualized loss for the Torres Martinez Reservation is not possible.

POPULATION IMPACTS

The direct population impacts are minimal. However, the indirect impacts could destroy livelihoods.

ENVIRONMENTAL IMPACTS

Most of the natural features in the Reservation have some susceptible pests including the parks and agricultural areas. Trees that have been damaged by other events such as fire, wind, flooding, and animal browsing are more susceptible to diseases and pests. Certain species of trees are more susceptible based on the need of the damaging organism. Climate change will increase the probability of invasive pests which will pose increased environmental impacts in the future.

PROBLEM STATEMENTS FOR AGRICULTURAL INSECTS, PEST, AND DISEASES

Table 48. Problem Statements for Agricultural Insects, Pests, and Diseases.

Assets	Problems Associated with Dust and Wind Erosion
People (including underserved communities and socially vulnerable populations)	• None apparent or projected.
Structures (including facilities, lifelines, and critical infrastructure)	• None apparent or projected.
Systems (including networks and capabilities)	• Additional Reservation resources may be required in areas where invasives pests have been confirmed. This includes coordination with other organizations focused on agricultural pests and diseases.
Natural, historic, and cultural resources	• The ACP and glassy-winged sharpshooter are issues that need to be addressed locally.
Activities that have value to the community	• Recreational activities may be adversely impacted, depending on location, and especially in parks and natural areas.

4.2.4.2 INFECTIOUS DISEASE

DESCRIPTION

The 2023 California State Hazard Mitigation Plan (SHMP) addresses the epidemic, pandemic, and vector-borne disease hazard as a profiled hazard. It indicates that floods are the leading cause of weather-related infectious disease outbreaks, and that flooding increases the chance of spreading waterborne diseases such as hepatitis A and cholera.

While major disease outbreaks are uncommon, public health emergencies can become standalone disasters that compound the threat of other natural hazards and exceed local and state capacity. Precedent for federal assistance in response to public health emergencies has been set by the COVID-19 pandemic, which resulted in a major disaster declaration in all states, territories, and the District of Columbia. Given that COVID-19 has resulted in excessive public expenditures and resulted in a disaster declaration, and in light of heightened concerns about tick and mosquito-borne illnesses, this plan addresses infectious diseases.

Coronavirus Disease 2019 (COVID-19) is an infectious disease caused by the SARS-CoV-2 virus. The virus can spread in small liquid particles from the mouth or nose of infected persons when they cough, sneeze, speak, sing, or breathe. Most people infected with the virus experience mild to moderate respiratory illness and recover without requiring special treatment. However, some become seriously ill and require medical attention. Older adults and those with underlying medical conditions such as cardiovascular disease, diabetes, weakened immune system, chronic respiratory disease, or cancer are more likely to develop serious illness. Anyone at any age can get sick with COVID-19 and become seriously ill or die (World Health Organization 2022a). Other subsections included in the 2023 California State HMP include: pandemic influenza, vector-borne diseases, and valley fever.

Public health risks, such as those presented by infectious diseases and vector-borne illnesses, are present within every community. An infectious disease is one that is caused by micro-organisms, such as bacteria, viruses, and parasites. A vector-borne illness is an infectious disease that is transmitted to humans by blood-feeding arthropods, including ticks, mosquitoes, and fleas, or in some cases by mammals (e.g., rabies). Infectious diseases cause illness, suffering and even death, and place an enormous financial burden on society.

Most infectious diseases are caused by pathogens that can be spread, directly or indirectly, from person to person. Such diseases may be seasonal (seasonal influenza) or, in the case of new diseases, result in a global pandemic. Infectious disease dynamics depend on a range of factors, including land use, human behavior, climate, efficacy of healthcare services, population dynamics of vectors, population dynamics of intermediate hosts and the evolution of the pathogens themselves. Many of these diseases require continuous monitoring, as they present seasonal threats to the population.

An epidemic emerges when an infectious disease occurs suddenly in numbers that are more than normal expectancy. Infectious disease outbreaks put a strain on the healthcare system and may cause continuity issues for local businesses. These outbreak incidents are a danger to emergency responders, healthcare providers, schools, and the public. This can include influenza (e.g., H1N1), pertussis, West

Nile virus, and many other diseases. A pandemic is an epidemic that has spread over a large area, that is, it is prevalent throughout an entire country, continent, or the whole world.

On March 11, 2020, the World Health Organization (WHO) officially declared the Coronavirus disease 2019 (COVID-19) outbreak a pandemic due to the global spread and severity of the disease. COVID-19 is a respiratory illness that can spread from person to person. COVID-19 is a highly contagious, viral upper respiratory illness that was first detected in China in late 2019. The virus quickly spread throughout the world and has resulted in a global pandemic ongoing at the time of this plan. COVID-19 symptoms include cough, difficulty breathing, fever, muscle pain, and loss of taste or smell. Severe cases may result in death, especially in individuals over the age of 65 or with underlying medical conditions, such as diabetes, lung disease, asthma, obesity, or those who are immunocompromised. COVID-19 spreads from person to person through respiratory droplets in the air or on surfaces.

LOCATION

Some infectious diseases have shown geographic patterns in California: Lyme disease has been reported in 56 of the 58 counties in California, with the highest incidence of disease occurring in the northwest coastal and northern Sierra Nevada counties with western-facing slopes (UC 2016). Over 65 percent of valley fever cases in California are reported from the Central Valley and Central Coast regions (CDPH 2021b).

In general, epidemics, pandemics, and vector-borne diseases can occur without regard for location; therefore, all of California is at risk. Location-based factors such as population density, travel, and the length of time spent in a location all contribute to the spread of infectious diseases. For example, influenza and COVID-19 are more likely spread by persons in close contact. Indoor areas where people are in close contact with each other appear to be significant vectors for diseases that are spread through respiratory droplets (CDPH 2022i).

Eleven of California's 58 counties identified public-health-related events as a hazard of interest in their local hazard mitigation plans, and Riverside County is included in that group.

PREVIOUS OCCURRENCES

The first cases of COVID-19 in California were confirmed in January 2020 among residents who had returned from China. By February, the first COVID-related death in the State occurred in Santa Clara and the first community-transmission (no known exposure to the virus) case was documented in Solano County. Following numerous Emergency Declarations at the local level and positive cases increasing by the day, California's Governor declared a State of Emergency on March 4, 2020 (CalMatters 2022). On March 22, 2020, the State of California was included in the FEMA Major Disaster Declaration for the COVID-19 pandemic (FEMA 2020f). Other major disease events in recent California history include the following:

- In 2009 a pandemic of H1N1 influenza, popularly referred to as the swine flu, was first identified in the United States in southern California (Jhung, et al. 2011). It resulted in many hospitalizations and deaths (CDPH 2010).
- From 2003 to 2021, there were 7,388 human cases of West Nile virus reported in California, with 332 deaths, and 1,347 horse cases.
- Since the reemergence of St. Louis encephalitis virus in California in 2015, 28 human cases of St. Louis encephalitis virus disease have been identified.

EXTENT

Well-established scales for characterizing total impacts of infectious diseases are not present for applied uses such as a hazard mitigation plan. Nevertheless, commonly accepted methods are in place for characterizing active transmission, such as color scales (yellow, orange, red).

PROBABILITY OF FUTURE EVENTS

Based on the historical epidemic, pandemic, and vector-borne disease events in California, the State has a high probability of future events occurring within the next 25 years. According to FEMA and CDPH, California experienced more than three epidemic, pandemic, or vector-borne disease events every year between 2013 and 2022. It is reasonable to expect similar averages in the future.

The probability of infectious disease in the planning area is extremely variable. Many public health risks occur seasonally and are ongoing, such as the common cold and influenza. Major disease outbreaks such as the current COVID-19 pandemic are much less common but can last for long periods.

Based on the information available regarding occurrences of greatest concern, the infectious disease hazard has been assigned a probability of likely for the foreseeable future.

VULNERABILITY ASSESSMENT

EXPOSURE

Exposure of State-Owned or -Leased Facilities, Critical Facilities, and Community Lifelines Epidemic, pandemic, and vector-borne disease events will not directly impact State-owned or -leased facilities by causing damage to these assets. However, the functionality of the assets could be impacted if the people who operate the facilities are sick and unable to do so.

Estimates of Loss Health hazard events are not likely to result in any losses associated with damage or impairment to Tribe assets. All losses from this hazard would be associated with impacts on operations and the economy. The people who staff and maintain State facilities, as well as those served by the facilities, are vulnerable to the hazard. Large rates of infection may result in an increase in the rate of hospitalization, which may overwhelm hospitals and medical facilities and lead to decreased service for those seeking medical care (Gilligan 2021). Potential statewide economic impacts include unemployment, price increases, and supply chain interruptions (Center on Budget and Policy Priorities 2022). Burnout and workforce shortages may be seen among first responders and public health and healthcare workers. Depending on the industry, worker morbidity and mortality increases, as do workplace disruptions (CDC 2022c); (National Library of Medicine 2021); (Peters, et al. 2022). Significant economic disruption can occur due to death, loss of work time, food insecurity, and costs of treating or preventing the spread of the virus or disease.

Overall, the infectious disease hazard has a moderate risk score compared to other hazards in the Reservation.

The risk associated with communicable disease in the region has not been formally quantified, due to the difficulty in predicting specific occurrences, and the lack of complete data on impacts. However, the potential risk and impact of communicable diseases is often presumed to be very high in the chaos that follows natural disasters (WHO, 2006).

Natural disasters, particularly meteorological and geological events such as hurricanes, floods and earthquakes, can bring about serious health consequences. These disasters can affect vector breeding sites and vector-borne disease transmission. In a flood hazard area, initial flooding may wash away existing mosquito breeding sites, but standing water caused by heavy rainfall or overflow of rivers can create new breeding sites. This can result (with typically some weeks delay) in an increase of the vector population and potential for disease transmission, depending on the local mosquito vector species and its preferred habitat. The crowding of infected and susceptible hosts, a weakened public health infrastructure and interruptions of ongoing control programs are all risk factors for vector-borne disease transmission.

The major causes of communicable disease from natural disasters can be categorized into four areas: Infections due to contaminated food and water, respiratory infections, vector and insect borne diseases, and infections due to wounds and injuries. The most common causes of morbidity and mortality in this situation are diarrheal disease and acute respiratory infections.

- Waterborne diseases: Diarrheal disease outbreaks can arise subsequent to drinking water contamination, and have been reported after flooding and related movement. Hepatitis A and E have fecal-oral transmission in areas with poor water sanitation.
- Diseases associated with crowding: Acute respiratory infections are the main cause of morbidity and mortality among unsettled people and are seen predominantly in children less than 5 years old.
- Vector-borne diseases: The most common vector-borne diseases are carried by mosquitoes and ticks and include Lyme Disease, Rocky Mountain Spotted Fever, West Nile Virus, and Eastern equine encephalitis. Environmental changes after disaster could increase vector breeding sites and proliferation of disease vectors.

- Infections due to wounds and injuries: The potentially significant threats to persons suffering a wound are tetanus, staphylococci, and streptococci.

BUILT ENVIRONMENT IMPACTS

All human-occupied critical facilities are assumed to be at risk of contamination from a communicable disease. If facilities supporting emergency response lost their functionality because of contamination, delays in emergency services could result. Additionally, with a significant human disease outbreak, resources of health care systems such as ambulance services, hospitals, and medical clinics could quickly become overwhelmed. In most cases, critical infrastructure would not be affected by communicable disease. Scenarios that would affect infrastructure include the contamination of the water supplies and diseases that require special provisions in the treatment of wastewater. Should an epidemic necessitate quarantine or incapacitate a significant portion of the population, support of and physical repairs to infrastructure may be delayed, and services may be disrupted for a time due to limitations in getting affected employees to work.

POPULATION IMPACTS

High death counts during a natural disaster (either human or animal) can indicate an increased risk of outbreaks associated with the size, health status, and living conditions of the population displaced by the natural disaster. Crowding, inadequate water and sanitation, and poor access to health services, often characteristic of sudden population displacement, increase the risk of communicable disease transmission.

Populations that are vulnerable to communicable diseases include the economically disadvantaged, racial and ethnic minorities, the uninsured, low-income children, the elderly, the homeless, and those with other chronic health conditions, including severe mental illness. It may also include rural residents, who often encounter barriers to accessing healthcare services, transportation, or the internet.

ENVIRONMENT IMPACTS

Infectious diseases can also impact livestock and other animals. Some of the most common communicable diseases include Eastern Equine Encephalitis, Equine Herpes Virus, West Nile Virus, and Avian Influenza. While Zoonotic diseases (those transmissible between humans and animals or via an animal vector) are also a concern for the region, those events are best addressed in a pandemic or contagious disease plan rather than this hazard mitigation plan.

PROBLEM STATEMENTS FOR INFECTIOUS DISEASE

Table 49. Problem Statements for Infectious Disease.

Assets	Problems Associated with Infectious Diseases
People (including underserved communities and socially vulnerable populations)	• Future flu pandemics may adversely impact all residents and present additional complications to the elderly and those with pre-existing conditions.
Structures (including facilities, lifelines, and critical infrastructure)	• Not applicable.
Systems (including networks and capabilities)	• May impact medical and response services. • Large scale closures/shutdowns due to pandemic response can negatively impact the Tribe's ability to deliver routine operations and services.
Natural, historic, and cultural resources	• Tribal elders are keepers of Historical and Cultural resources and are particularly vulnerable to infectious disease.
Activities that have value to the community	• May impact in-person social events.

4.2.4.3 WILDFIRE

DESCRIPTION

A wildfire is any fire occurring in a wildland area (i.e. grassland, forest, brush land) except for fire under prescription.[132] Wildfires are part of the natural management of forest ecosystems but may also be caused by human factors.

Nationally, over 80 percent of forest fires are started by negligent human behavior such as smoking in wooded areas or improperly extinguishing campfires. The second most common cause for wildfire is lightning. In the planning area, brush fires caused by dry vegetation and desert heat are common. There are three classes of wildland fires: surface fire, ground fire, and crown fire. A surface fire is the most common of these three classes and burns along the floor of a forest, moving slowly and killing or damaging trees. A ground fire (muck fire) is usually started by lightning or human carelessness and burns on or below the forest floor. Crown fires spread rapidly by wind and move quickly by jumping along the tops of trees. Wildland fires are usually signaled by dense smoke that fills the area for miles around. In the planning area, brush fires are known to jump from place to place due to patches of

[132] Prescription burning, or "controlled burn," undertaken by land management agencies is the process of igniting fires under selected conditions, in accordance with strict parameters.

vegetation and winds. The Santa Ana winds (discussed under "Extreme Winds"), are known to cause or spread wildfires.

Wildfire probability depends on local weather conditions, outdoor activities such as camping, debris burning, and construction, and the degree of public cooperation with fire prevention measures. Drought conditions and other natural hazards (such as tornadoes, hurricanes, etc.) increase the probability of wildfires by producing fuel in both urban and rural settings. Cyclical climate events, such as El Niño-La Niña, can also have a dramatic effect on the risk of wildfires. Fewer fires are typically seen during El Niño (when more rain is present) and larger, more frequent fires are typical during La Nina events.

Many individual homes and cabins, subdivisions, resorts, recreational areas, organizational camps, businesses and industries are located within high wildfire hazard areas. Further, the increasing demand for outdoor recreation places more people in wildland areas during holidays, weekends, and vacation periods. Unfortunately, wildland residents and visitors are rarely educated or prepared for wildfire events that can sweep through brush and timber and destroy property within minutes.
Wildfires can result in severe economic losses as well. Businesses that depend on timber, such as paper mills and lumber companies, experience losses that are often passed along to consumers through higher prices, and sometimes jobs are lost. The high cost of responding to and recovering from wildfires can deplete state resources and increase insurance rates. The economic impact of wildfires can also be felt in the tourism industry if roads and tourist attractions are closed due to health and safety concerns.

LOCATION

In order to best portray the potential for fire locations, the United States Department of Agriculture (USDA) Wildfire Hazard Potential (WHP) data was consulted.[133] The objective of the WHP map is to "depict the relative potential for wildfire that would be difficult to for suppression resources to contain."[134] This data source integrates several measures:[135]

> *The WHP map builds upon spatial estimates of wildfire likelihood and intensity generated in 2014 with the Large Fire Simulator (FSim) for the Fire Program Analysis system (FPA), as well as spatial fuels and vegetation data from LANDFIRE 2010 and point locations of fire occurrence from FPA (ca. 1992 - 2012). With these datasets as inputs, the USDA Forest Service produced an index of WHP for all of the conterminous United States at a 270-meter resolution. The WHP map is represented in two forms: 1) continuous integer values, and 2) five WHP classes of very low, low, moderate, high, and very high. Areas mapped with higher WHP values represent fuels with a higher probability of*

[133] Note: State level sources such as the California Fire and Resource Assessment Program (FRAP) data were investigated. Unfortunately, Tribal lands were not included. However, all surrounding land was categorized as very high risk (the highest risk ranking).
[134] Wildfire Hazard Potential. (2014). USDA. Retrieved from https://www.firelab.org/project/wildfire-hazard-potential.
[135] http://www.firelab.org/project/wildland-fire-potential.

experiencing torching, crowning, and other forms of extreme fire behavior under conducive weather conditions, based primarily on 2010 landscape conditions.

The data for Torres Martinez can be seen in Figure 64. A majority of the Reservation is categorized as a "non-burnable," due to the lack of trees and other potential fuels, but areas ranging from "very low" to "high" potential for wildland fire are located within the Reservation boundaries. The Reservation's valley location (e.g., the absence of steep slopes) make it less susceptible to wildfires than the mountainous lands surrounding it.

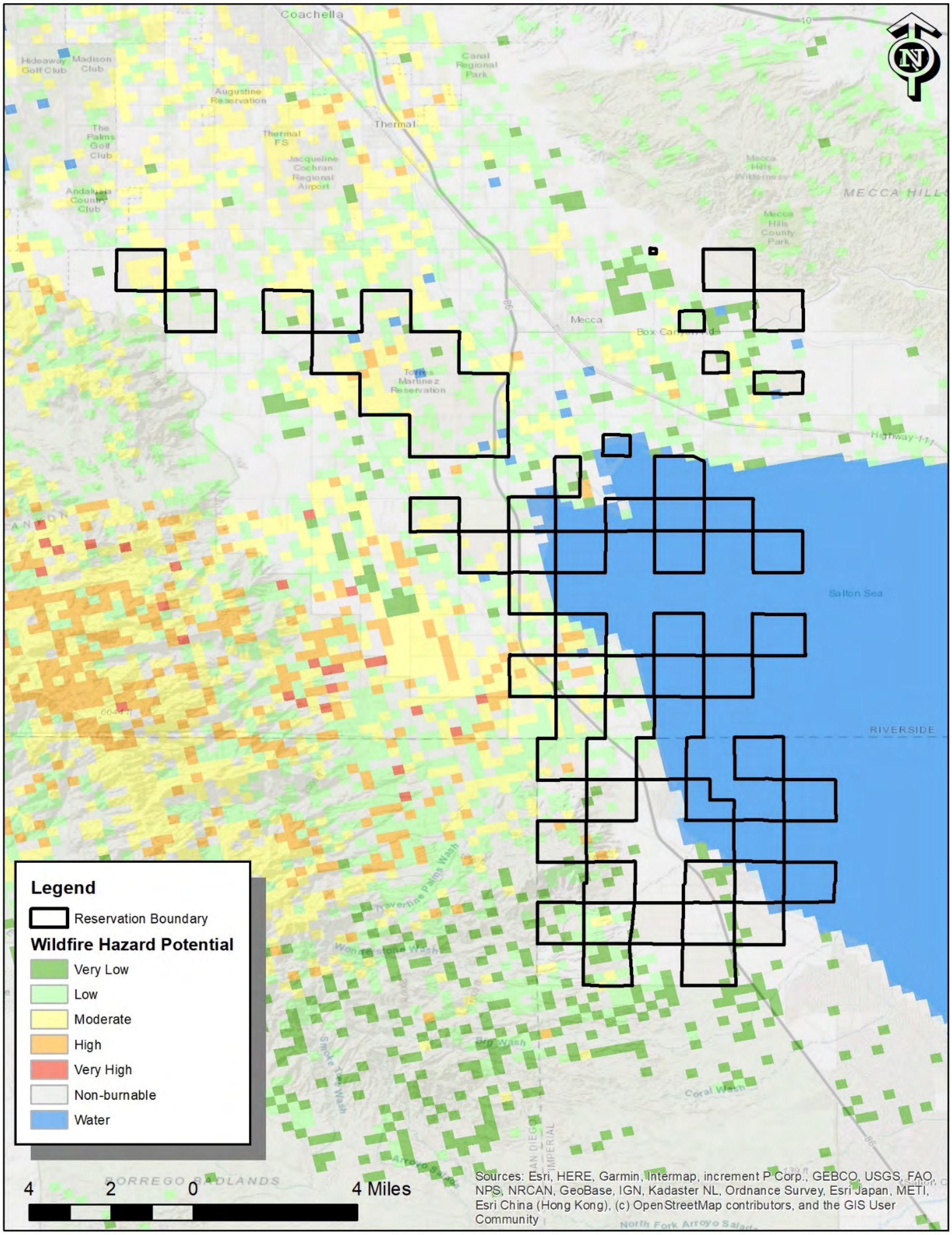


Figure 64. USDA Wildfire Hazard Potential (Wildfire Hazard Location).

In addition, wildfire location may be determined by investigating areas where development is near undeveloped areas. The area where urban development meets vegetated, wildfire prone undeveloped lands is known as the Wildland Urban Interface (WUI). There are several areas on the Reservation where this interface exists, mostly on the southern part of the Reservation. The University of Wisconsin Spatial Analysis for Conservation and Sustainability (SILVIS) Lab produces Wildland Urban Interface data for the nation. This data was used to map WUI areas on the Torres Martinez Reservation.

The SILVIS Lab defines the Wildland-Urban Interface as:[136]

> *WUI is composed of both interface and intermix communities. In both interface and intermix communities, housing must meet or exceed a minimum density of one structure per 40 acres (16 ha). Intermix communities are places where housing and vegetation intermingle. In intermix, wildland vegetation is continuous, more than 50 percent vegetation, in areas with more than 1 house per 16 ha. Interface communities are areas with housing in the vicinity of contiguous vegetation. Interface areas have more than 1 house per 40 acres, have less than 50 percent vegetation, and are within 1.5 mi of an area (made up of one or more contiguous Census blocks) over 1,325 acres (500 ha) that is more than 75 percent vegetated. The minimum size limit ensures that areas surrounding small urban parks are not classified as interface WUI.*

Figure 65 shows the WUI for the Torres Martinez Reservation.

[136] Radeloff, V.C., R.B. Hammer, S.I Stewart, J.S. Fried, S.S. Holcomb, and J.F. McKeefry. 2005. The Wildland Urban Interface in the United States. Ecological Applications 15: 799-805. Retrieved from http://silvis.forest.wisc.edu/maps/wui.

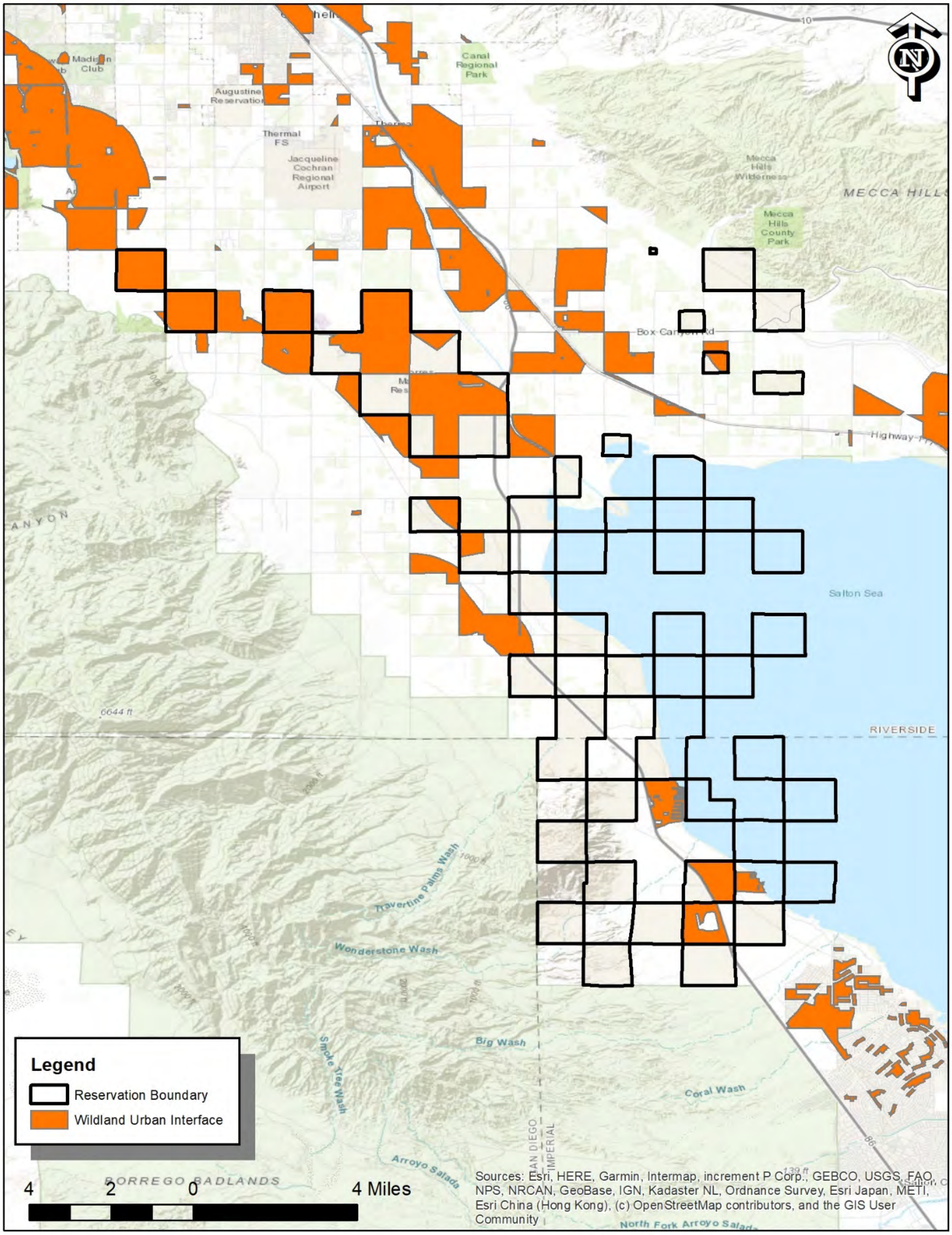


Figure 65. WUI Areas (Silvis Lab).

Torres Tribal officials note that wildfire occurrences are more prevalent in areas where weeds and brush are unmaintained. Officials also noted that wildfires are often close to homes, and can jump from place to place, causing more or larger fires.

PREVIOUS OCCURRENCES

Data for historic wildfires on the Torres Martinez Reservation was obtained from the USGS Wildland Fire Information program.[137] Figure 66 shows the historic fire locations by acreage on the Reservation from 1878 through 2020 for large wildfires of 10 acres or more and all wildfires in 2023 regardless of size. During this time, there was a total of 70 wildfires on the Reservation, resulting in a total of 658.6 acres burned, or an average of 9.4 acres per fire. Several large fires have occurred on the Reservation, including the 2003 Martinez Road fire, which resulted in 325 acres burned, and the 2015 Harrison Fire, which resulted in 80 acres burned. Overall, most fires reported (67 percent) were one acre or less. This is in keeping with Tribal information, which states that most fires experienced on the Reservation are smaller brushfires that can occur close to homes and jump easily. Damage estimates for reported fires were not available. According to information from the Tribe and the EPA, illegal dumping and subsequent burning of solid waste and agricultural chemicals is a common cause of fires, when burning unintentionally spreads to wildland areas and requires suppression.[138] Tribal officials are concerned that the number of total fires identified by State and federal agencies is underrepresenting the total wildfire occurrences on the Reservation.

[137] Federal Wildland Fire Occurrence Data. (2017). USGS. Retrieved October 10, 2017 from https://wildfire.cr.usgs.gov/firehistory/data.html.

[138] United States v. Torlaw Realty, Inc. et al. (2005). US EPA. Retrieved October 10, 2017 from https://quicksilver.epa.gov/work/09/2117894.pdf.

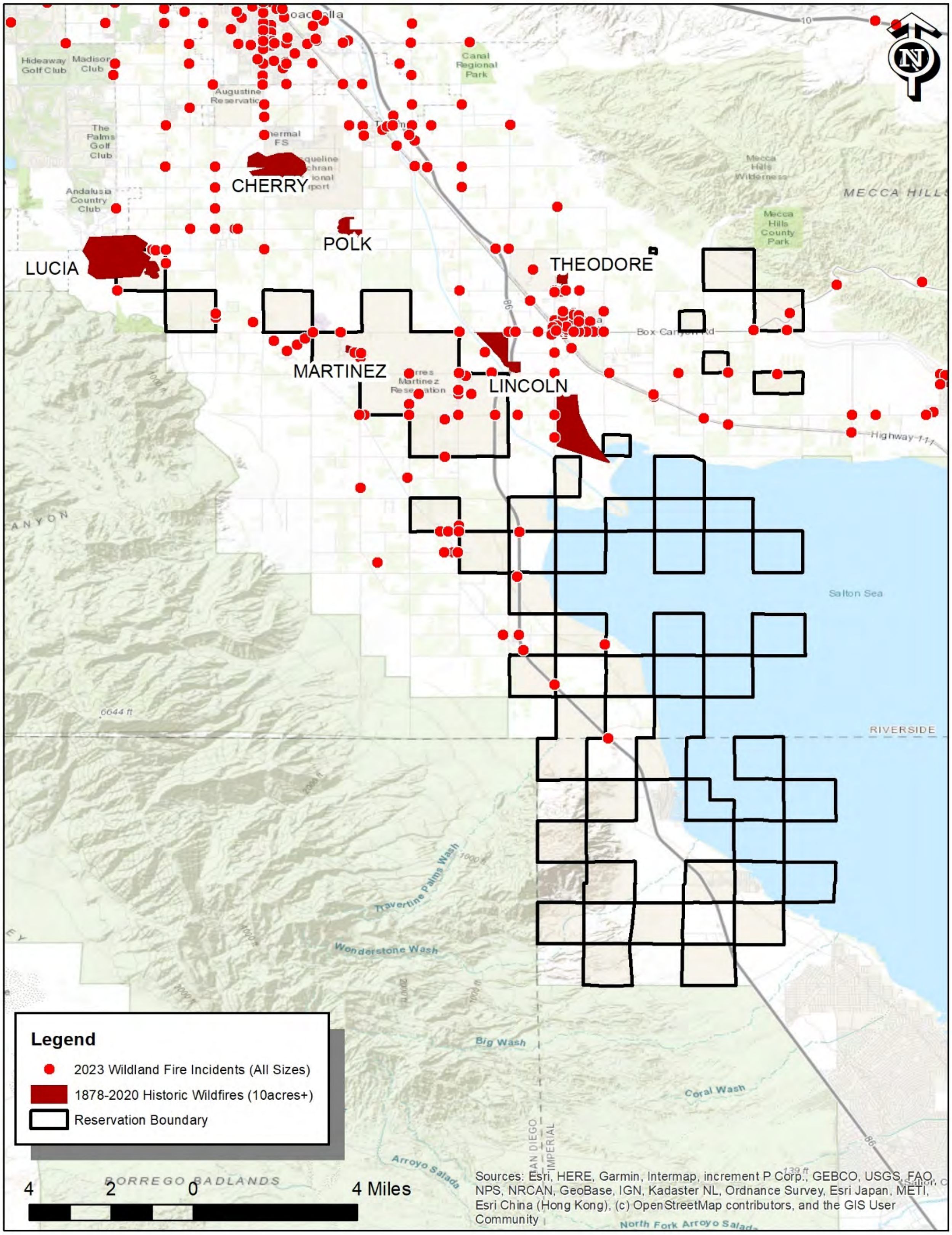


Figure 66. Torres Martinez Historic Fire Occurrences, 1878-2023.

According to the NOAA's NCEI database, there were 226 wildfire events reported in Riverside and Imperial Counties between 1996 and 2024 which caused $77.891M in property damage, 1.047M in crop damage, 11 deaths, and 145 injuries. Table 50 provides wildfire information for Coachella Valley (Zone), Imperial County Except the Lower Colorado River Valley (Zone), and Thermal.

Table 50. Historic Fires Impacting the Torres Martinez Reservation.

Location	Begin Date	Property/ Crop Damage	Deaths/ Injuries	Narrative
Thermal Airport	9/8/2000	$0/$0	0/0	Lightning started a wildfire in the Santa Rosa Mountains. About 35 acres were burned before it was fully contained.
Coachella Valley (Zone)	7/21/2004	$0/$0	0/0	A fire burned 2 acres near the northwest side of Mecca. One firefighter suffered from heat exhaustion.
Coachella Valley (Zone)	10/26/2006	$10.3M/$0	Unreported/5	The Esperanza Fire was intentionally set during the early morning hours of the 26th at the foot of the San Jacinto Mountains near Cabazon. The fire destroyed 34 homes and 20 outbuildings and resulted in an estimated $10.3 million in damage. Five firefighters were overtaken by the flames while trying to protect a house in Twin Pines near Poppet Flats.
Coachella Valley (Zone)	9/26/2007	$0/$0	0/0	The Polk Fire burned 100 acres south of Thermal Airport near Polk Street and Avenue 62. The cause of the Polk Fire was a vehicle fire. There were no reports of damage or injury.
Coachella Valley (Zone)	3/22/2009	$60K/$0	0/0	A vegetation fire fueled by gusty winds spread through Lake Cahuilla Park near La Quinta. The fire destroyed playground equipment, an awning of a building, and 35 palm trees.
Coachella Valley (Zone)	4/3/2009	$250K/$0	0/0	A 50-acre brush fire in Palm Springs, driven by strong gusty winds, damaged two homes and led to the evacuation of 50 other homes. The fire began in the late afternoon, burning desert scrub near a residential neighborhood. Strong, gusty winds spread the fire towards the neighborhood, resulting in the damage of two homes and the evacuation of approximately 50 other homes. No major injuries were reported.

Location	Begin Date	Property/ Crop Damage	Deaths/ Injuries	Narrative
Coachella Valley (Zone)	9/24/2011	$0/$0	0/0	The Windy Point fire started around 1753 PST on the 24th, west of the Palm Springs Tramway in steep, rocky terrain. During the firefight, State Highway 111 was closed in both directions. The fire burned 541 acres before being fully contained around 1700 PST on the 26th. At no time were any structures damaged or threatened and despite the rocky terrain, no injuries occurred.
Coachella Valley (Zone)	3/15/2014	$35K/$0	0/0	The Pierce Fire began around 1537 PST on the 15th near the intersection of Avenue 66 and Pierce Street in Thermal. Initially reported at 10 acres, the fire burned at a moderate rate of spread through medium to heavy brush, increasing rapidly to 200 acres over just a few hours. Road closures were in effect along north and southbound Highway 86 between Avenue 86 and Avenue 80, as well as Avenue 66 from Avenue 86 to Pierce Street. The fire burned a total of 350 acres before being fully contained at 2234 PST on the 15th. The fire downed power lines in the area and destroyed one outbuilding. No injuries to firefighters or civilians were reported.
Coachella Valley (Zone)	7/23/2018	$500K/$0	3/0	The Martinez Fire broke out on the Torres Martinez Reservation in Mecca around 1400 PST on July 23rd. Seven homes were destroyed and the fire affected 30 Tribal members in total. Members were displaced from their homes and lost all of their possessions. Dry conditions and temperatures in the 120s helped exasperate the fire. Seven homes were destroyed. Approximately 30 Tribal members were displaced from their homes and lost nearly all of their possessions. Three firefighters suffered minor injuries in the blaze.

Location	Begin Date	Property/ Crop Damage	Deaths/ Injuries	Narrative
Coachella Valley (Zone)	1/19/2021	$0/$0	0/0	The vegetation fire burned 43 acres near Ave 72 and Pierce St, south of Oasis. Began during onset of Santa Ana winds.
Coachella Valley (Zone)	11/11/2021	$0/$0	0/0	CAL FIRE Riverside County Fire reported a two-acre wildfire on the southeast side of Desert Hot Springs.
Coachella Valley (Zone)	6/17/2024	$10K/$0	0/0	Temperatures soared again starting June 14, 2024. Palm Springs reached 115F both June 14 and 15. In Riverside the high temperatures hit the mid to upper 90s on June 15. The Hesperia wildfire began on June 15, The Stoddard fire burn 475 acres just north of Victorville and started June 11. The Lisa fire started on June 16 and scorched 890 acres near Highway 60 and Jack Rabbit Trail, East of Moreno Valley. And in Palm Springs the Tuscany fire erupted to just over 100 acres on June 17.

In addition to the fires reported by NOAA and USGS, Torres Tribal officials provided information on several fires that have occurred on Reservation lands, including:

- **November 1, 2012**: A fire occurred at the southwest corner of Martinez Road and Polk Street, inside a thicket of brush. CAL FIRE arrived on scene and promptly put out the fire. No injuries were reported. The cause of the fire is believed to be a human-caused fire that got out of control.
- **August 9, 2013**: A vegetation fire occurred off Polk Street, burning approximately 0.5 acres. The fire was extinguished by the Bureau of Land Management (BLM) and Riverside County. No structures were reported as damaged. According to the BLM report, the fire occurred in the Wildland Urban Interface.
- **June 4, 2015**: A wildland fire was observed on June 1st on the north side of Avenue 66, between Harrison and Tyler streets. The point of origin is believed to be Allotment Number 112. The fire is estimated to have burned 75 acres, and required 10 fire engines, two water tenders, one bulldozer, one air tanker, and one helicopter to extinguish. Both CAL FIRE and the Bureau of Indian Affairs wildland firefighters were on the scene. Twenty families were evacuated as a precaution. Costs to abate the fire are estimated to be over $1 million. After the fire was extinguished, two truckloads of waste (water bottles, fire retardant containers, and household garbage) were removed from the site. Figure 67 shows the location of this fire.

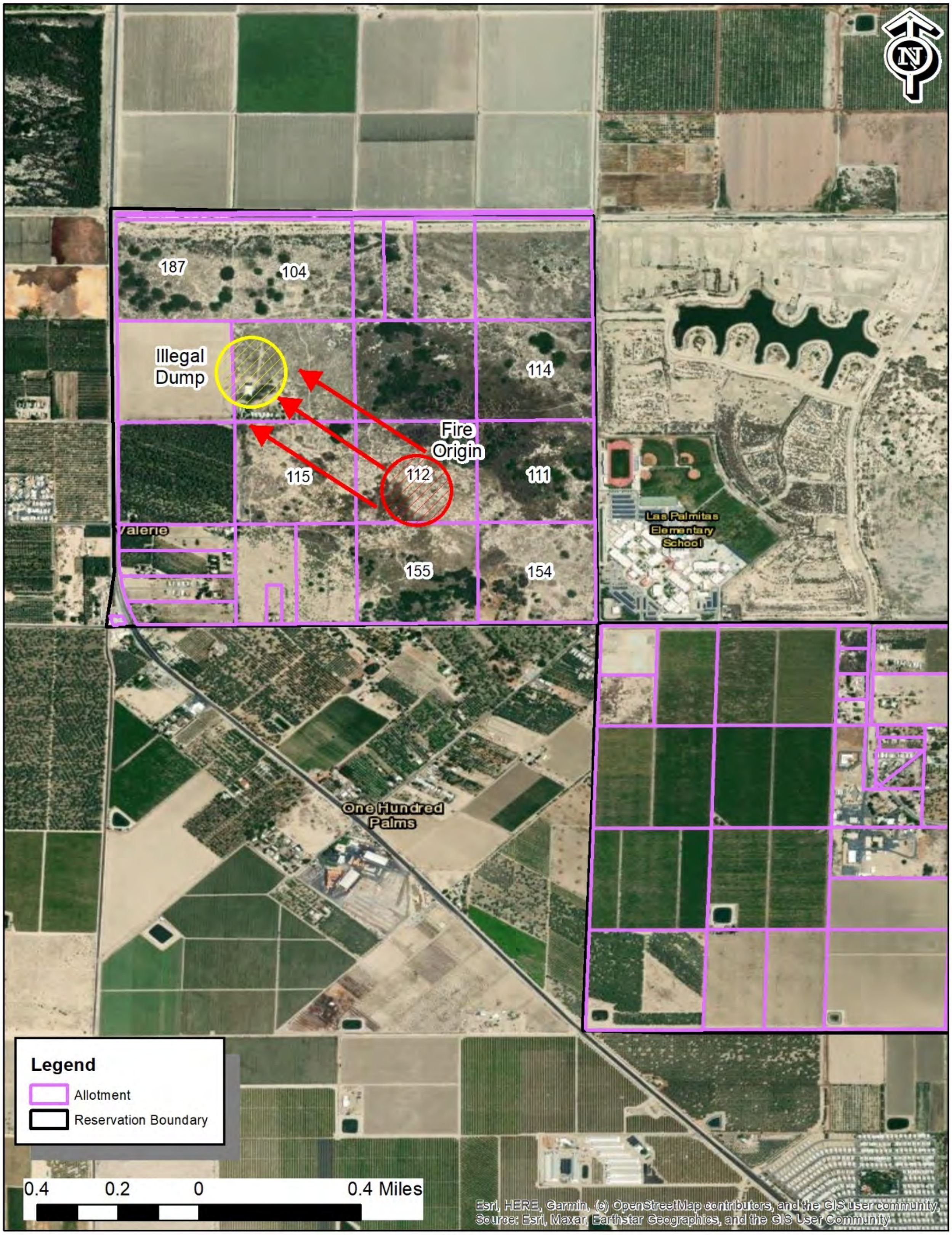


Figure 67. Origin and Spread of the Allotment #112 Fire.

EXTENT

Wildfire extent can be determined by size, such as area burned, or by the number of wildfires occurring in a given year. Smaller brush fires are common on the Torres Martinez Reservation; the largest recorded fire was the 2003 Martinez Road fire, which burned 325 acres. The highest number of reported fires in a year that directly impacted the Reservation was 10 fires in 2006, according to USGS wildland fire reporting data. This was followed by 9 fires in 2002. Larger fires are possible; years with a greater number of reported fires are also possible.

PROBABILITY OF FUTURE EVENTS

Wildfire events will be an ongoing occurrence on the Torres Martinez Reservation. The likelihood of wildfires increases during drought cycles and abnormally dry conditions. Dry, windy conditions with an accumulation of vegetative fuel (such as weeds) could create conditions for a large fire that spreads quickly. Fire data indicated 70 fires directly impacted the Reservation between 1980 and 2016. This results in approximately two fires per year. Santa Ana winds are strongest in September and October, which results in an increased risk for large fires. A probability of “highly likely” (greater than 90 percent annual probability) was assigned.

Climate change can be expected to increase wildfire frequency and severity on the Torres Martinez Reservation. As previously noted, the wildfire season has expanded to date. Warmer temperatures cause drought conditions by reducing soil moisture, which in turn creates an environment conducive to wildfires. Average maximum temperatures on the Reservation are projected to increase from a baseline of 88.9°F to upwards of 93.8 by 2050°F and 96.7°F by 2099. Figure 49, located in the Extreme Heat hazard profile, shows the projected increase in average maximum temperatures on the Reservation under different emissions scenarios and timelines).

In addition, climate change may create an environment in which agricultural pests, especially non-native pests, thrive. Crops and wild vegetation that due to pest infestations can become fuel for wildfire to ignite and spread quickly. Continuing weed abatement programs could reduce the impact that dead vegetation may have on wildfires.

VULNERABILITY ASSESSMENT

The California Department of Forestry and Fire Protection (CAL FIRE) provides information about wildfire risk, and the Office of the State Fire Marshal, which is focused on fire prevention, collaborates with federal, state, and local agencies, tribes, non-profit entities, and stakeholders to prepare California communities against wildfires. California’s seasonally dry Mediterranean climate lends itself to wildfires.[139]

[139] https://osfm.fire.ca.gov/what-we-do/community-wildfire-preparedness-and-mitigation.

EXPOSURE

The Tribe actively works to implement mitigation strategies to lessen the wildfire threat and is working to employ additional actions. They currently employ firebreaks to mitigate the spread of wildfires, and the Reservation has an ongoing weed abatement program to remove potential fuel for fires. They have also taken action to reduce illegal dumping and burning of waste, which can cause wildfires when burning gets out of control and spreads to surrounding wildlands.[140] Additional activities can be found in the Capability Assessment Chapter and new actions can be found in the Mitigation Strategy Chapter.

Despite these efforts, wildfires continue to occur and impact the Reservation. Therefore, all current and future buildings, including critical facilities, as well as cultural resources and populations, are considered at risk to wildfires. Wildfires can result in property damages, infrastructure damages (such as damaged power lines and utility poles), decreased air quality, injuries, and death. Areas that do not experience burning may still experience damages or injuries due to smoke. Fires also interrupt business on the Reservation which causes lost revenue. Without reports of damage, it is difficult to estimate annualized losses from wildfires. However, given major fires, it is assumed that some losses may have occurred. Further, indirect losses, such as economic losses due to Reservation evacuation are also possible. Evacuations off of the Reservation have been necessary in the past but, typically, residents can shelter in place.

BUILT ENVIRONMENT IMPACTS

Wildfires destroy homes and other structures in both rural and urban areas. As an example, the Camp Fire of 2018 destroyed over 18,800 structures in Butte County.[141]

Some Reservation areas or structures may be more vulnerable than others. According to Torres Tribal officials, most homes on the Reservation are not insured and do not have smoke detectors. In addition, there are no sprinklers installed at the Tribal headquarters buildings. Buildings that are not up to the California Uniform Building Code, including mobile homes or structures that are located close together, may be more vulnerable to wildfires. In addition, the Reservation has only two hydrants to fight fire (at the Hill and Administration Building) to fight fires, so trucks must bring their own water.

Fire season in California was historically contained to summer and fall months. However, many scientific resources cite that the season is becoming year-round, and there is agreement that the season has expanded. It is starting earlier, sometimes in April and ending later. This is largely due to earlier snow melt caused by rising temperatures and warmer summer temperatures. In general, wildfires in the

[140] United States v. Torlaw Realty, Inc. et al. (2005). US EPA. Retrieved October 10, 2017 from https://quicksilver.epa.gov/work/09/2117894.pdf.
[141] https://www.omegaenv.com/environmental-consulting-firm-blog/a-detailed-guide-to-understanding-california-wildfire-damage/.

western U.S. are increasing in size and frequency.[142] The severity of wildfires largely depends on fuel, weather, and terrain.

Fuel varies on the Reservation, but the primary sources are grasses weeds, and Tamarisk. Tamarisk, also known as Tamarix or Saltcedar, is an invasive shrub or small tree that can increase the frequency and severity of wildfires in the Western U.S. Lighter fuels, such as grasses, tend to catch fire and spread fast. However, they are typically easier to contain than fires that have started to ignite larger fuel sources, such as trees. Further, increased fuel, potentially due to lack of wild or prescribed fire or downed trees from wind events, can also impact wildfire severity. The weather also has major impact on wildfire risk. The Santa Ana Winds, typically strongest in September and October, make it very difficult to fight fires. Rain can work in the favor of wildfire firefighter, helping to quell flames and moisten fuel sources. Terrain, including both slopes and barrier features, can impact the spread of fire. Fire tends to move faster uphill. Barriers, such as lakes and highways, can slow the spread as well. Lastly, drought can impact the severity of wildfire and the ability to fight it.

Building material and landscaping around the buildings can also impact vulnerability. For example, wood shakes can ignite quickly due to embers. Vegetation may also catch roofs on fire if there are blowing embers in the area. The vegetation around a structure can also impact risk. Keeping a buffer area (defensible space) between the woodlands and structure can decrease risk. As noted above, Torres Martinez has a firebreak program in place. In addition, there are proactive landscaping schemes that can be used such as avoiding pine straw and mulch.

Tribal Assets

Areas that reside in the WUI (interface and intermix areas) are considered at a higher risk to wildfires. Figure 68 shows WUI areas, identified by risk level, across the entire Reservation, and Figure 69 shows WUI risk where Tribal assets are clustered. However, it should be noted that assets outside of the WUI are also at-risk; many of the historic reported wildfires on the Reservation did not occur inside of the WUI.

There was one building identified in the wildfire high hazard area, Church of Sacred Hearts of Jesus and Mary, and twenty-six buildings in the wildfire moderate hazard area. These include the buildings in Table 51 and shown in Figure 70. The assets and associated replacement values are detailed in Table 51.

Table 51. Torres Martinez Assets Located within Wildfire High and Moderate Risk Areas.

Asset Type	Number	Number of Critical Facilities	Number of Cultural Resources	Approximate Replacement Value	Approximate Content Value	Approximate Total Value
Administrative and	19	11	0	$ 8,444,053	$ 8,744,402	$17,188,455

[142] Dennison, P. E., S. C. Brewer, J. D. Arnold, and M. A. Moritz (2014), Large wildfire trends in the western United States, 1984–2011, Geophys. Res. Lett., 41, 2928–2933, doi:10.1002/2014GL059576. http://onlinelibrary.wiley.com/doi/10.1002/2014GL059576/abstract.

Asset Type	Number	Number of Critical Facilities	Number of Cultural Resources	Approximate Replacement Value	Approximate Content Value	Approximate Total Value
Maintenance Buildings						
Religious Building	1	0	1	$372,573	$372,573	$745,146
Residential - Mobile Home	4	3	0	$278,671	$139,335	$418,006
Residential - Single Family Dwelling	3	3	0	$611,221	$305,611	$916,832
TOTAL	**27**	**17**	**1**	**$9,706,518**	**$9,561,921**	**$19,268,439**

Critical Facilities
A total of 17 critical facilities are located in the WUI area, including the well/water tanks, and backup well, the Social Services Building, Tribal Hall, Former Health Clinic, A'avutem Senior Center, Tanf Executive Building, Planning Building, Cash Assistance, Maintenance Building and Shop, Committee Building #36, Committee Building #37, Quonset Hut, Archives, Fiber Hut, residential dwellings, and the proposed Emergency Equipment Carport. Critical facilities within WUI areas are shown in Figure 70.

Cultural Resources
There is one cultural resource located within the high and moderate risk wildfire areas, the Church of Sacred Hearts of Jesus and Mary. Figure 71 shows Torres Martinez cultural resources in WUI areas.

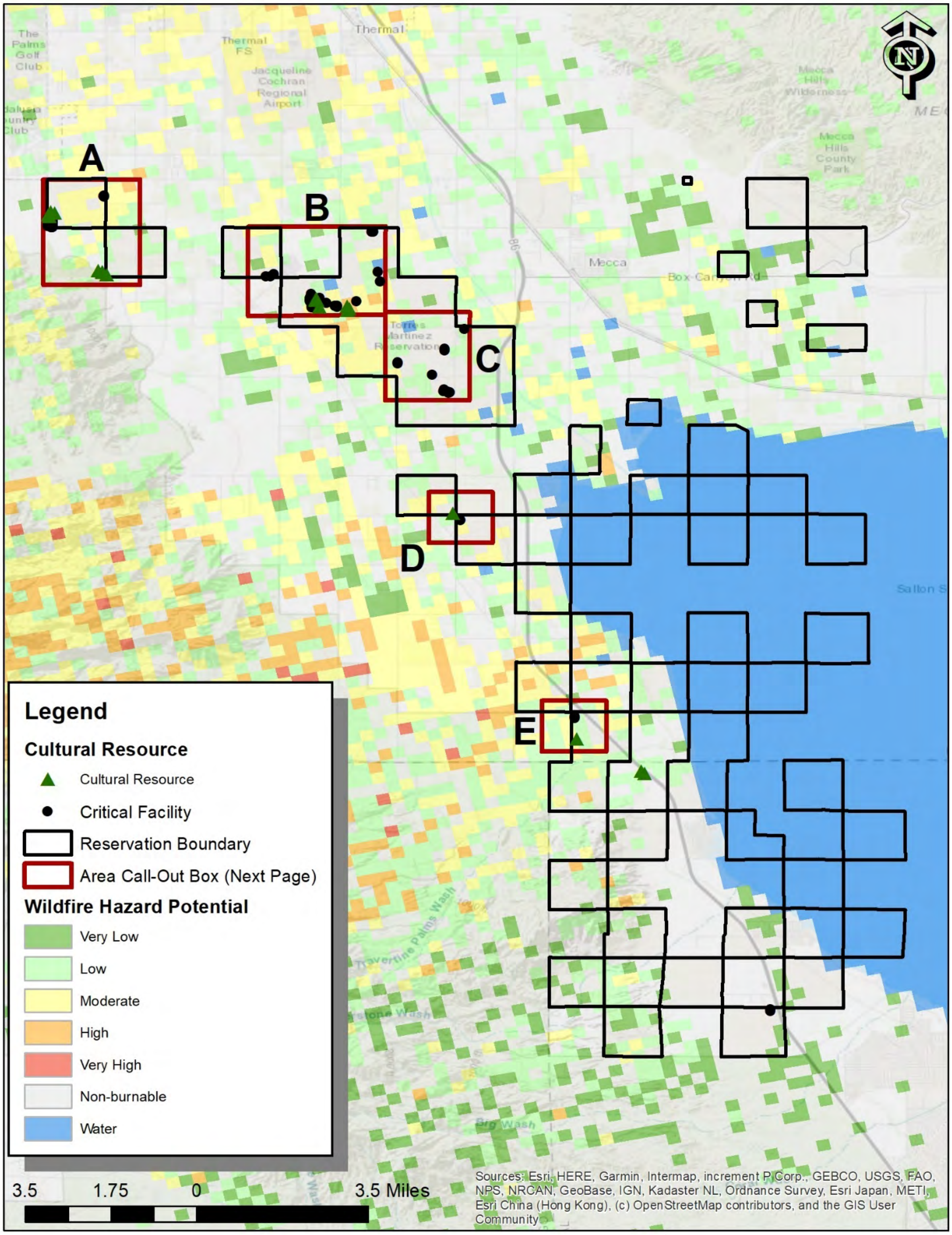


Figure 68. Torres Martinez Clustered Asset Areas in Wildfire High and Moderate Risk Areas.

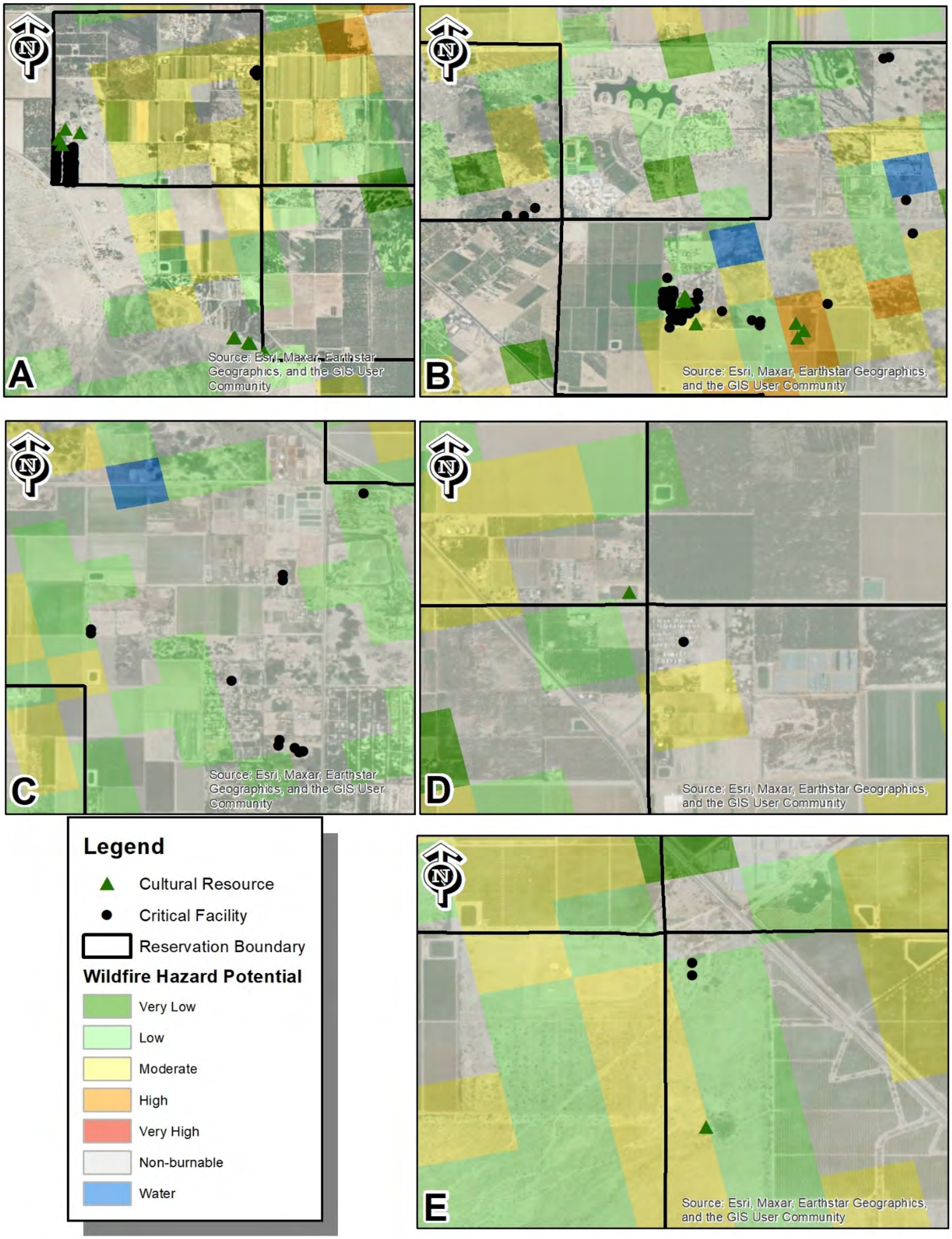


Figure 69. Torres Martinez Tribal Assets in Wildfire High and Moderate Risk Areas.

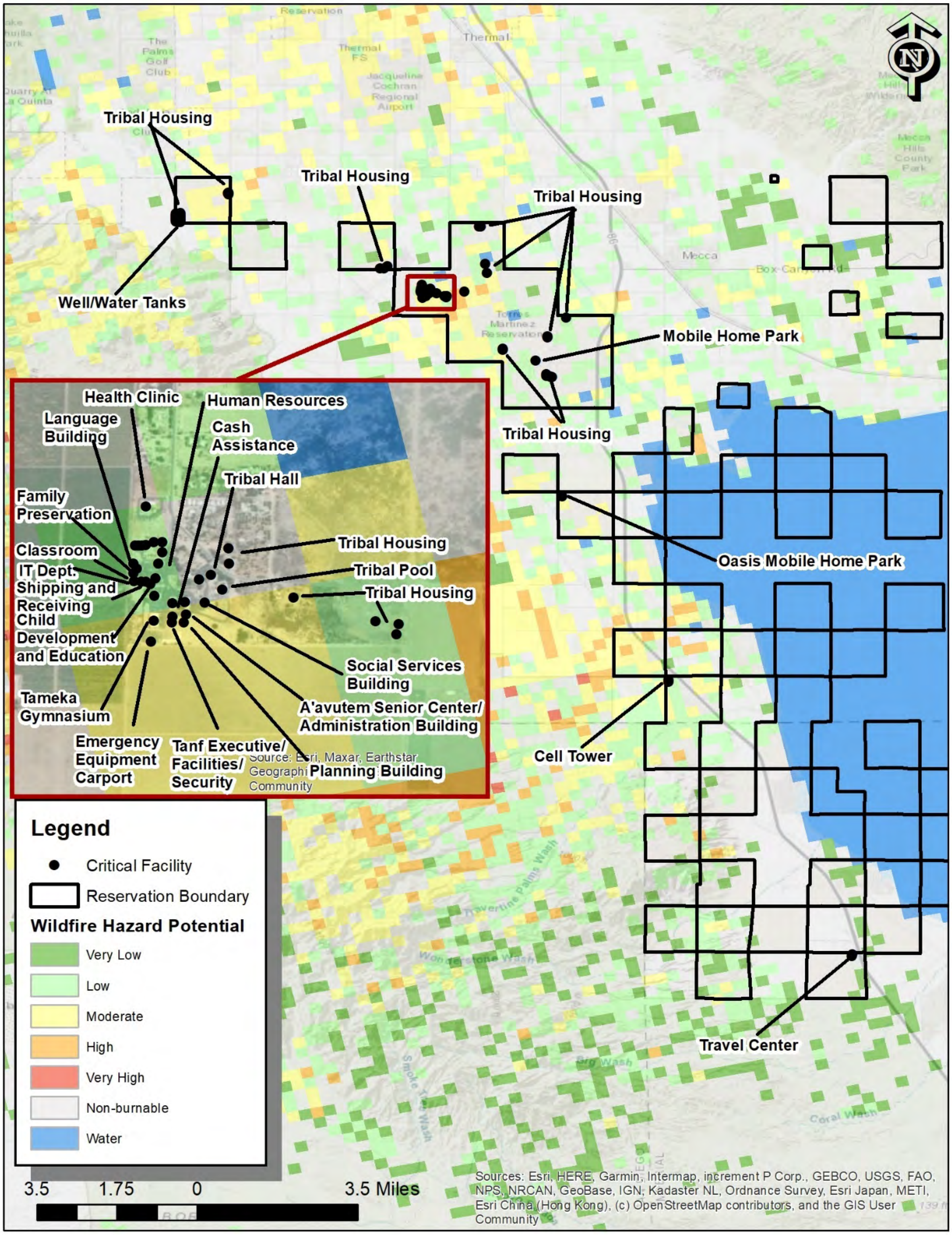


Figure 70. Torres Martinez Critical Facilities in Wildfire High and Moderate Risk Areas.

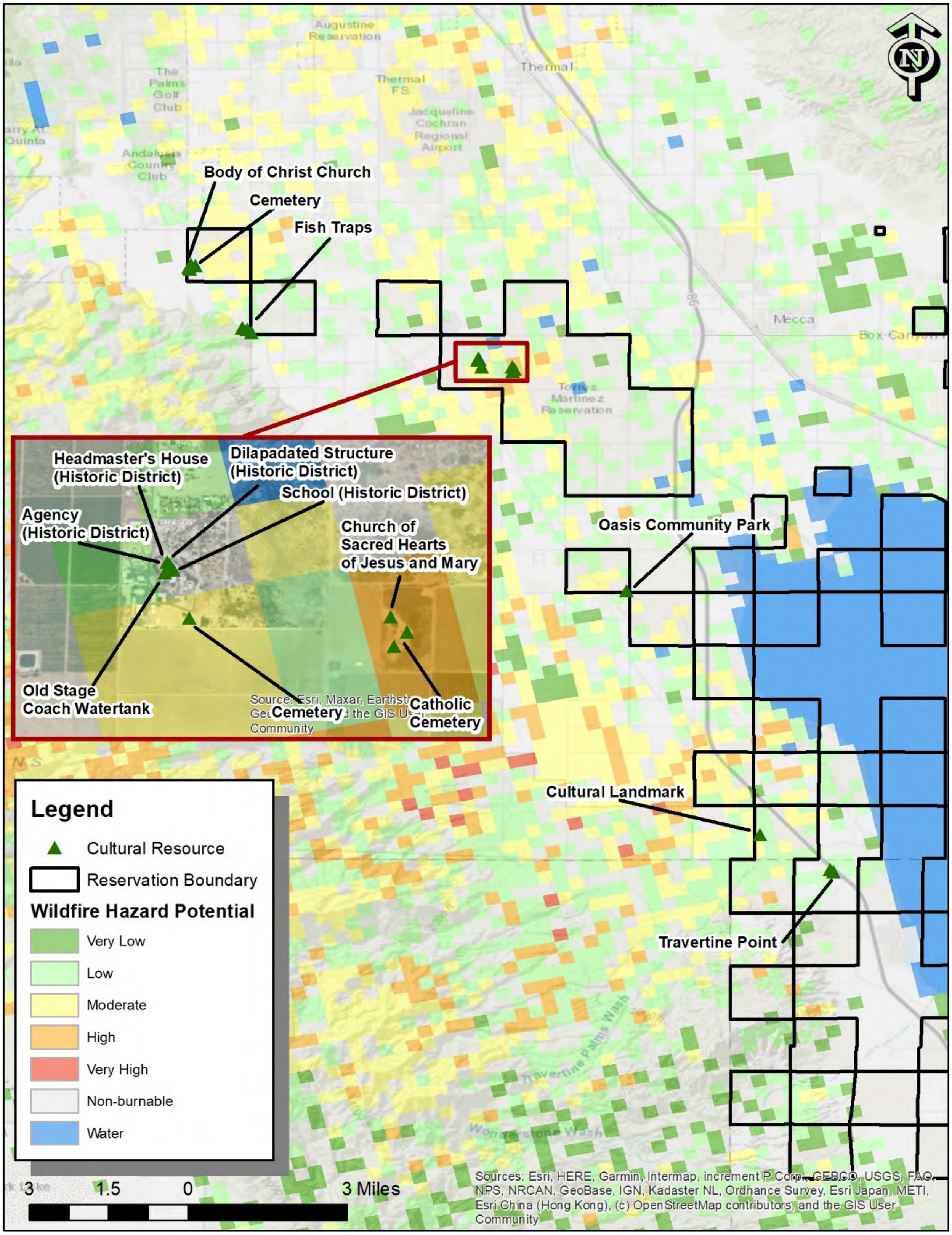


Figure 71. Torres Martinez Cultural Resources in Wildfire High and Moderate Risk Areas.

Without reported damages from previous events, it is not possible to estimate annualized losses for the Torres Martinez Reservation.

POPULATION IMPACTS

Wildfires cause civilian deaths and firefighter fatalities. The Camp Fire of 2018 was the deadliest in California's history, causing 85 civilian deaths. Wildfires also result in poor air quality, which is likely to cause respiratory illnesses and deaths, especially among people aged 65 or older.

Populations considered most vulnerable to wildfire impacts are identified based on a number of factors including their physical and financial ability to react or respond during a hazard and the location and construction quality of their housing. Senior and low-income populations are particularly susceptible to wildfires. The Tribe should be aware of the potential needs of residents within these population segments in the event of a hazard occurrence.

With the increased probability of regional wildfires in the future due to climate change, populations may be impacted more often due to air quality issues.

ENVIRONMENT IMPACTS

Many of the natural features on the Reservation are susceptible to wildfire, including the trees and parks.

Wildfires significantly impact the environment, contributing to greenhouse gas (GHG) emissions and climate change.

- GHG Emissions: During a typical wildfire season, California's wildfires release about 1.2 billion metric tons of GHGs. This emission negates much of the state's efforts to cut emissions through other means.
- Climate Impact: The GHGs released during wildfires add to global warming. For example, in 2020, wildfires emitted nearly 112 million metric tons of carbon and 1.2 million tons of fine particulate matter (PM 2.5). This is 120 times more fine particulate matter than all the vehicles in California produced that year.[143]

In 2018, California developed the Fourth Climate Change Assessment[144] that described the hotter conditions associated with climate change potentially leading to loss of soil moisture. The assessment cited a study finding that by the year 2100, if greenhouse gas emissions continue to rise, the frequency of extreme wildfires would increase and the average area burned statewide would increase by 77 percent.

[143] https://www.omegaenv.com/environmental-consulting-firm-blog/a-detailed-guide-to-understanding-california-wildfire-damage/.
[144] https://www.climateassessment.ca.gov/state/overview/

PROBLEM STATEMENTS FOR WILDFIRES

Table 52. Problem Statements for Wildfires.

Assets	Problems Associated with Wildfires
People (including underserved communities and socially vulnerable populations)	• Populations with severe asthma may be adversely impacted by wildfires in the vicinity. • Older residents are found in the higher wildfire probability areas. Evacuating and recovering from a wildfire may be difficult for them.
Structures (including facilities, lifelines, and critical infrastructure)	• Some residential structures are found in the higher probability burn areas. Structures without defensible zones are more susceptible to wildfires and brush fires. • Areas where wildland and human activity is at an increased level may result in ignitions.
Systems (including networks and capabilities)	• Wildfires often cause roads to be closed requiring detours.
Natural, historic, and cultural resources	• Wildfires may adversely impact forested and other vegetated areas of the Reservation.
Activities that have value to the community	• Recreational activities may be adversely impacted by wildfires, depending on location.

4.2.5 TECHNOLOGICAL

4.2.5.1 HAZARDOUS MATERIALS INCIDENT

A hazardous material is any solid, liquid, or gas that can harm people, other living organisms, property, or the environment. Chemical manufacturers, distributors and vendors are sources of hazardous materials, as are hazardous materials waste sites and many users, including service stations and hospitals. Spills or releases can occur during production, storage, transportation, use, or disposal. Most incidents occur at fixed facilities, such as an industrial plant, however, spills are also common along railroads, highways, pipelines, and waterways.

DESCRIPTION

Hazardous materials (HAZMAT) can be found in many forms and quantities that can potentially cause death; serious injury; long-lasting health effects; and damage to buildings, homes, and other property in varying degrees. Such materials are routinely used and stored in many homes and businesses and are also shipped daily on the nation’s highways, railroads, waterways, and pipelines. This subsection on the hazardous material hazard is intended to provide a general overview of the hazard, and the threshold for identifying fixed and mobile sources of hazardous materials is limited to general information on rail, highway, and local and FEMA-identified fixed HAZMAT sites determined to be of greatest significance as appropriate for the purposes of this plan.

Hazardous material (HAZMAT) incidents can apply to fixed facilities as well as mobile, transportation-related accidents in the air, by rail, on the nation's highways, and on the water. Approximately 6,774 HAZMAT events occur each year, 5,517 of which are highway incidents, 991 are railroad incidents, and 266 are due to other causes.[145] In essence, HAZMAT incidents consist of solid, liquid, and/or gaseous contaminants that are released from fixed or mobile containers, whether by accident or by design as with an intentional terrorist attack. A HAZMAT incident can last hours to days, while some chemicals can be corrosive or otherwise damaging over longer periods of time. In addition to the primary release, explosions and/or fires can result from a release, and contaminants can be extended beyond the initial area by persons, vehicles, water, wind, and possibly wildlife as well.

HAZMAT incidents can also occur as a result of or in tandem with natural hazard events, such as floods, hurricanes, tornadoes, and earthquakes, which in addition to causing incidents can also hinder response efforts. In the case of Hurricane Floyd in September 1999, communities along the Eastern United States were faced with flooded junkyards, disturbed cemeteries, deceased livestock, floating propane tanks, uncontrolled fertilizer spills, and a variety of other environmental pollutants that caused widespread toxicological concern.

Hazardous material incidents can include the spilling, leaking, pumping, pouring, emitting, emptying, discharging, injecting, escaping, leaching, dumping, or disposing into the environment of a hazardous material, but exclude: (1) any release which results in exposure to poisons solely within the workplace with respect to claims which such persons may assert against the employer of such persons; (2) emissions from the engine exhaust of a motor vehicle, rolling stock, aircraft, vessel or pipeline pumping station engine; (3) release of source, byproduct, or special nuclear material from a nuclear incident; and (4) the normal application of fertilizer.

LOCATION

As a result of the 1986 Emergency Planning and Community Right to Know Act (EPCRA), the Environmental Protection Agency provides public information on hazardous materials. One facet of this program is the collection of information from industrial facilities on the releases and transfers of certain toxic agents. This information is then reported in the Toxic Release Inventory (TRI). The locations of TRI sites indicate where such activity is occurring. There are not any TRI sites located on the Torres Martinez Reservation, and five TRI sites are located to the north of the Reservation, in Riverside County.

The Torres Martinez Reservation also experiences issues with illegal dumping of hazardous materials, such as agricultural chemicals. Illegal dumping occurs when hazardous materials are dumped or placed without the proper precautions or approvals. Figure 72 shows the location of TRI sites near the Reservation, as well as the location of illegal dumping sites. In addition, there may be additional,

[145] Technological Hazards. (n.d.). FEMA. Retrieved from https://www.fema.gov/media-library-data/20130726-1545-20490-2423/mhira_te.pdf.

unknown sites of illegal dumping on the Reservation. As a result of sites and potential mobile incidents, all areas of the Reservation are considered to be at risk to this hazard.

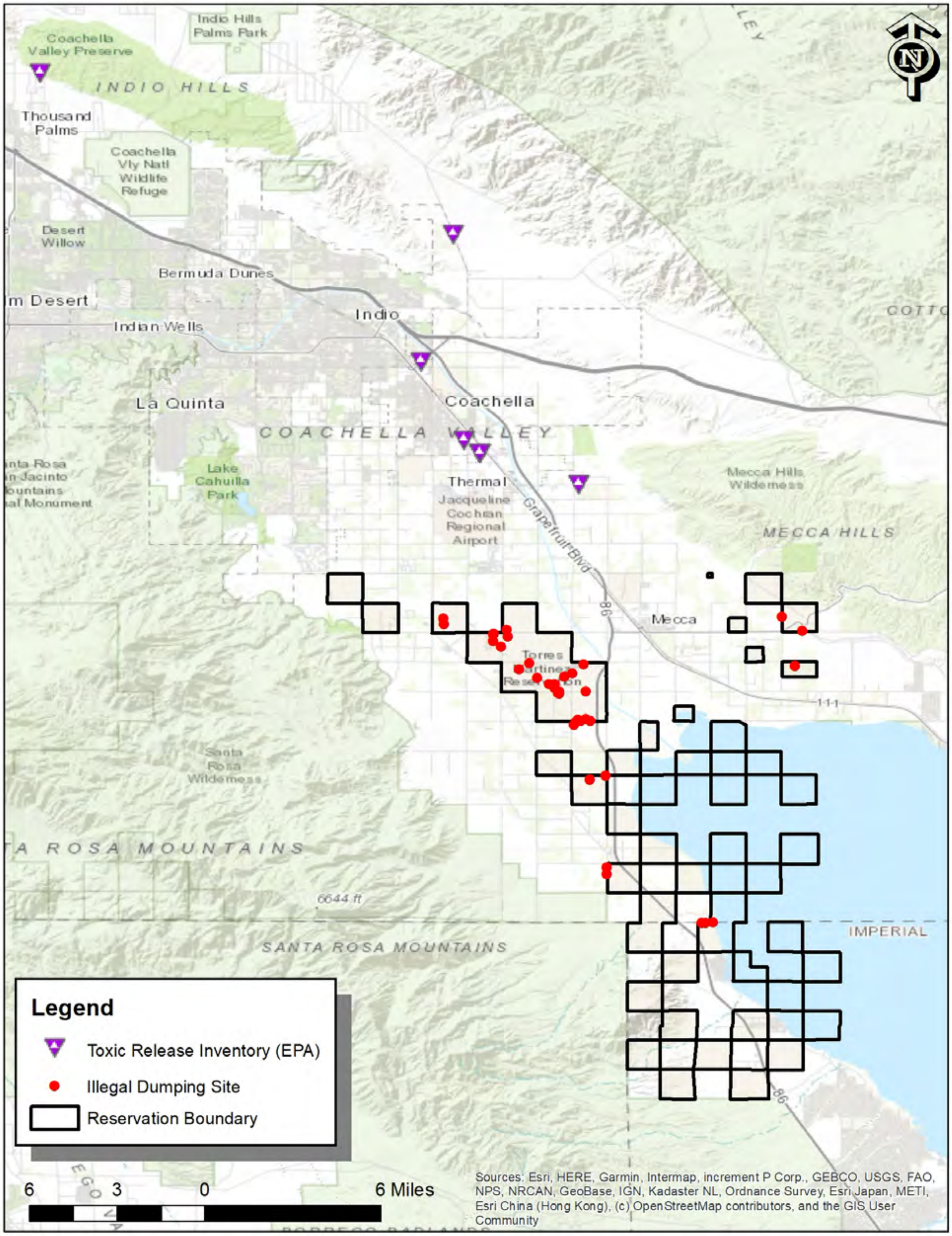


Figure 72. Hazardous Materials Sites on or near the Torres Martinez Reservation.

In addition to fixed sites, highway and railway corridors, such as Highway 111 and Highway 86 near the Reservation, are most likely to be the site of mobile hazardous materials incidents. The U. S. Department of Transportation (USDOT) has specific rules for shipping hazardous materials. Hazardous materials are defined by the U. S. Department of Transportation in accordance with the Federal Hazardous Material Law regulations. A USDOT hazardous material classification is applied if a material, in a particular amount and form, poses an unreasonable risk to health, safety or property.

PREVIOUS OCCURRENCES

The U.S. Department of Transportation Pipeline and Hazardous Materials Safety Administration (PHMSA) lists historical occurrences throughout the nation. A "serious incident" (in bold in the table below) is a hazardous materials incident that involves:

- a fatality or major injury caused by the release of a hazardous material,
- the evacuation of 25 or more persons as a result of release of a hazardous material or exposure to fire,
- a release or exposure to fire which results in the closure of a major transportation artery,
- the alteration of an aircraft flight plan or operation,
- the release of radioactive materials from Type B packaging,
- the release of over 11.9 galls or 88.2 pounds of a severe marine pollutant, or
- the release of a bulk quantity (over 199 gallons or 882 pounds) of a hazardous material.

However, prior to 2002, a hazardous material "serious incident" was defined as follows:

- a fatality or major injury due to a hazardous material,
- closure of a major transportation artery or facility or evacuation of six or more persons due to the presence of hazardous material, or
- a vehicle accident or derailment resulting in the release of a hazardous material.

The PHMSA incidents specific to the Reservation boundaries were not available in the PHSMA database. Therefore, incidents occurring in areas approximate to the Reservation were pulled, including the towns of Thermal, Mecca, Valerie, Salton Sea Beach, and Desert Shores. Incidents in Imperial and Riverside County were also searched. Table 53 presents detailed information on historic HAZMAT incidents reported in the area. Since 1978, one HAZMAT incident has been reported in Imperial County, one has been reported in Mecca, and two have been reported in Thermal. The incident in Mecca was a rail accident that resulted in the release of four different chemicals, as detailed in the table below. These incidents did not result in any injuries or fatalities but did result in a total of $960,475 (2024 dollars) in damages. All four incidents are considered "serious incidents" as defined by the PHMSA.

Table 53. PHSMA-Reported HAZMAT Incidents.

Report Number	Date	Location	Quantity Released (LGA)	Damages (2024 dollars)	Mode of Transportation
I-1978070921	3/30/1978	Imperial County	3,406	$0	Highway
I-2008050632	3/3/2008	Mecca	20,000	$234,719	Rail
I-2008050632	3/3/2008	Mecca	8,000	$234,719	Rail
I-2008050632	3/3/2008	Mecca	15,200	$234,719	Rail
I-2008050632	3/3/2008	Mecca	20	$234,719	Rail
I-1988070405	7/3/1988	Thermal	450	$0	Highway
E-2018010044	12/28/2017	Thermal	50	$21,599	Highway

One additional mobile HAZMAT incident was reported by Torres Martinez Tribal officials. On July 13, 2011, Tribal Emergency Management was alerted to liquid at the intersection of Avenue 66 and Martinez Road, causing cars to hydroplane. The substance was identified as oil. Maintenance was dispatched to absorb the spill and Riverside County Department of Transportation was contacted. In addition to mobile HAZMAT incidents, the Tribe has also reported an illegal dumping incident that was discovered on February 2, 2011, at on Allotment 119 during a chemical fire. During the incident, 300 tons of sulfur, an unknown amount of AG Zinc 78, and an unknown amount of a pesticide called Seven 10 Dust were recovered, including 12 pallets that each contained 36 fifty-pound bags of chemicals. Among the chemicals was one pallet of AG Zinc 78, 78 bags of sulfur, and several pallets on Seven 10 dust. No injuries or fatalities were reported as a result of the event. Damage costs associated with the chemical fire and with cleaning up the site were not reported.

EXTENT

The extent of hazardous materials incidents can be defined in terms of amount of material released. According to USDOT PHMSA, the largest hazardous materials incident reported near the Reservation is a rail incident in 2008 that resulted in the release of 43,220 liquid gallons (including four different chemicals). In addition, the largest known event to have occurred on the Reservation was the dumping of up to 432 fifty-pound bags (21,600 pounds) of agricultural chemicals.

Unless exempted, facilities that use, manufacture, or store hazardous materials in the United States fall under the regulatory requirements of the Emergency Planning and Community Right to Know Act (EPCRA) of 1986. Under EPCRA regulations, hazardous materials that pose the greatest risk for causing catastrophic emergencies are identified as Extremely Hazardous Substances (EHSs). Releases of EHSs can occur during transport to and from fixed site facilities. Transportation-related releases are generally more troublesome because they may occur anywhere, including close to human populations, critical facilities, or sensitive environmental areas. Transportation-related EHS releases are also more difficult to mitigate due to the variability of locations and distance from response resources.

With any hazardous material release, the severity of an incident depends on several extenuating circumstances, including weather conditions, terrain, and compliance (or lack thereof) with codes, type of material released, and response time for emergency personnel. As a general guideline, there are three levels of hazardous materials incidents, ranging from easily contained by local responders to those that require vast amounts of resources (NFPA, 2008).

- Level 1: An incident involving hazardous materials that can be contained, extinguished, and/or abated using resources immediately available to the public sector responders. Level 1 incidents present little risk to the environment and/or public health with containment and cleanup.
- Level 2: An incident that is beyond the capabilities of the first responders on the scene and could be beyond the public sector responders having jurisdiction. Level 2 incidents might require the services of a state or regional response team or other state or federal assistance. This level can pose immediate and long-term risks to environmental and public health.
- Level 3: An incident that is beyond the capabilities of a single state or regional response team and requires additional assistance. Level 3 incidents can require resources from state and federal agencies and private industry. These incidents generally pose extreme, immediate, and/or long-term risks to the environment and public health.

PROBABILITY OF FUTURE OCCURRENCES

The probability of hazardous materials events is difficult to determine given their unpredictability. In addition to reported events, it is possible that other illegal dumping incidents have occurred that were unreported or are yet to be discovered. Therefore, a probability of likely (10 to 90 percent annual probability) was assigned to this hazard.

VULNERABILITY ASSESSMENT

EXPOSURE

Historical evidence indicates that the Reservation is susceptible to hazardous materials events. Most hazardous materials incidents that occur are contained and suppressed before destroying any property or threatening lives. However, they can have a significant negative impact. Such events can cause deaths or injuries, or result in the closing down of roadways, buildings, or facilities. In a hazardous materials incident, solid, liquid, and/or gaseous contaminants may be released from fixed or mobile containers. Weather conditions will directly affect how the hazard develops. Certain chemicals may travel through the air or water, affecting a much larger area than the point of the incidence itself. Failure to maintain existing fire and containment features, can substantially increase the damage from a hazardous materials release. The duration of a hazardous materials incident can range from hours to days. Warning time is minimal to none.

BUILT ENVIRONMENT IMPACTS

Most hazardous material releases do not usually have a direct effect on critical facilities and infrastructure. Some critical infrastructure uses hazardous materials to operate such as chlorine for water treatment and PCB's for electric transformers. Similarly, the contamination of the water supply may be treated like a hazardous material release. Propane, oil, and natural gas, necessary fuels for heating, can also be hazardous if released during their delivery due to their explosive potential. Transportation may be limited if a key roadway is blocked by an incident.

A hazardous material release can bring possible losses to structure due to inaccessibility, contamination, and structural and contents losses if an explosion is present; and possible economic losses caused by business closures and associated business disruption losses.

In order to conduct the vulnerability assessment for this hazard, GIS analysis was used for fixed and mobile areas. In both scenarios, two sizes of buffers—500 and 2,500 meters—were used. These areas are assumed to respect the different levels of effect: immediate (primary) and secondary. Primary and secondary impact sites were selected based on guidance from FEMA 426, Reference Manual to Mitigate Potential Terrorist Attacks Against Buildings and engineering judgment.

For the fixed-site analysis, geo-referenced TRI sites near the Reservation, along with buffers, were used for analysis as shown in Figure 73. As shown, Reservation lands do not fall within either the primary or secondary impact areas for the nearby TRI sites.

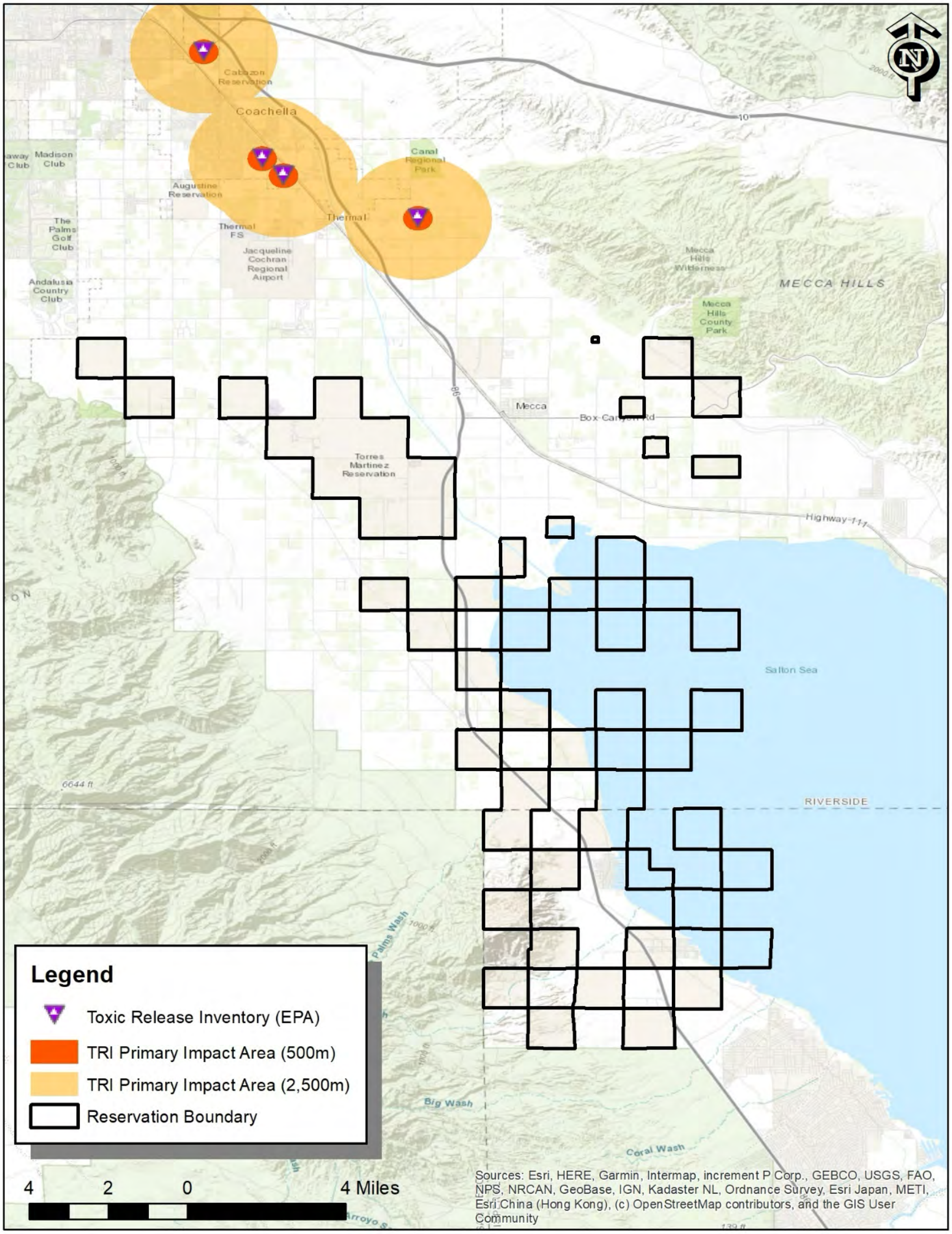


Figure 73. Toxic Release Inventory Site Buffers Near the Torres Martinez Reservation.

For the mobile analysis, the major roads (state highways 86 and 111) and railroads, where hazardous materials are primarily transported that could adversely impact people and buildings, were used for the GIS buffer analysis. The only known rail transportation adjacent to the Reservation runs adjacent to Highway 111. Therefore, a separate buffer analysis for railways was not conducted. Figure 74 shows the areas with high concentrations of Tribal assets exposed to transportation HAZMAT incidents. The results, as shown in Table 54, indicate Tribal assets and their associated values within transportation buffer areas. Almost all the Tribe's vulnerable structures are located in the impact areas associated with Highway 86. Buildings included in the 500-meter buffer are also included in the 2,500-meter buffer.

Table 54. Exposure of Tribal Assets to HAZMAT Incidents (Transportation).

ASSET NAME	APPROXIMATE REPLACEMENT VALUE	APPROXIMATE CONTENT VALUE	APPROXIMATE TOTAL VALUE	CRITICAL FACILITY?	CULTURAL RESOURCE?
PRIMARY IMPACT AREA (500M BUFFER)					
CELL TOWER	N/A	N/A	N/A	YES	NO
RED EARTH CASINO	$1,540,550	$1,540,550	3,081,100	YES	NO
TRAVEL CENTER	$4,278,566	$4,278,566	$8,557,132	YES	NO
TOTAL VALUE AT RISK	**$5,819,116**	**$5,819,116**	**$11,638,232**	--	--
SECONDARY IMPACT AREA (2,500M BUFFER)					
CULTURAL LANDMARK	N/A	N/A	N/A	NO	YES
LA CHICANITA MARKET AND GAS STATION	$962,219	$962,219	$1,924,438	YES	NO
OASIS COMMUNITY PARK	N/A	N/A	N/A	NO	YES
OASIS MOBILE HOME PARK (88 MOBILE HOMES)	$3,729,419	$1,864,710	$5,594,129	YES	NO
OTHER BUILDINGS (HOUSING-235)	$15,814,674	7,907,337	$23,722,011	NO	NO
RED EARTH CASINO	$1,540,550	$1,540,550	3,081,100	YES	NO
TRAVEL CENTER	$4,278,566	$4,278,566	$8,557,132	YES	NO
TRIBAL HOUSING (9 TOTAL)	$1,671,626	$835,813	$1,010,003	YES	NO

TOTAL VALUE AT RISK	**$27,997,054**	**$17,389,195**	**$43,888,813**	**--**	**--**

Critical Facilities

As noted in the table above, several of the Tribe's critical facilities are located in the transportation HAZMAT impact areas, including the Casino/Travel Center and cell tower in the 500-meter buffer, as well as the market/gas station and Tribal housing in the 2,500-meter buffer. Figure 75 shows the location of the Tribe's critical facilities in relation to transportation HAZMAT impact areas.

Cultural Resources

Several cultural resources are located within the transportation analysis buffer areas. Travertine Point is located in the 500-meter buffer, and the Oasis Community Park, along with an unnamed cultural landmark, are located within the 2,500-meter buffer area. Figure 76 shows the location of the Tribe's cultural resources in relation to transportation HAZMAT impact areas.

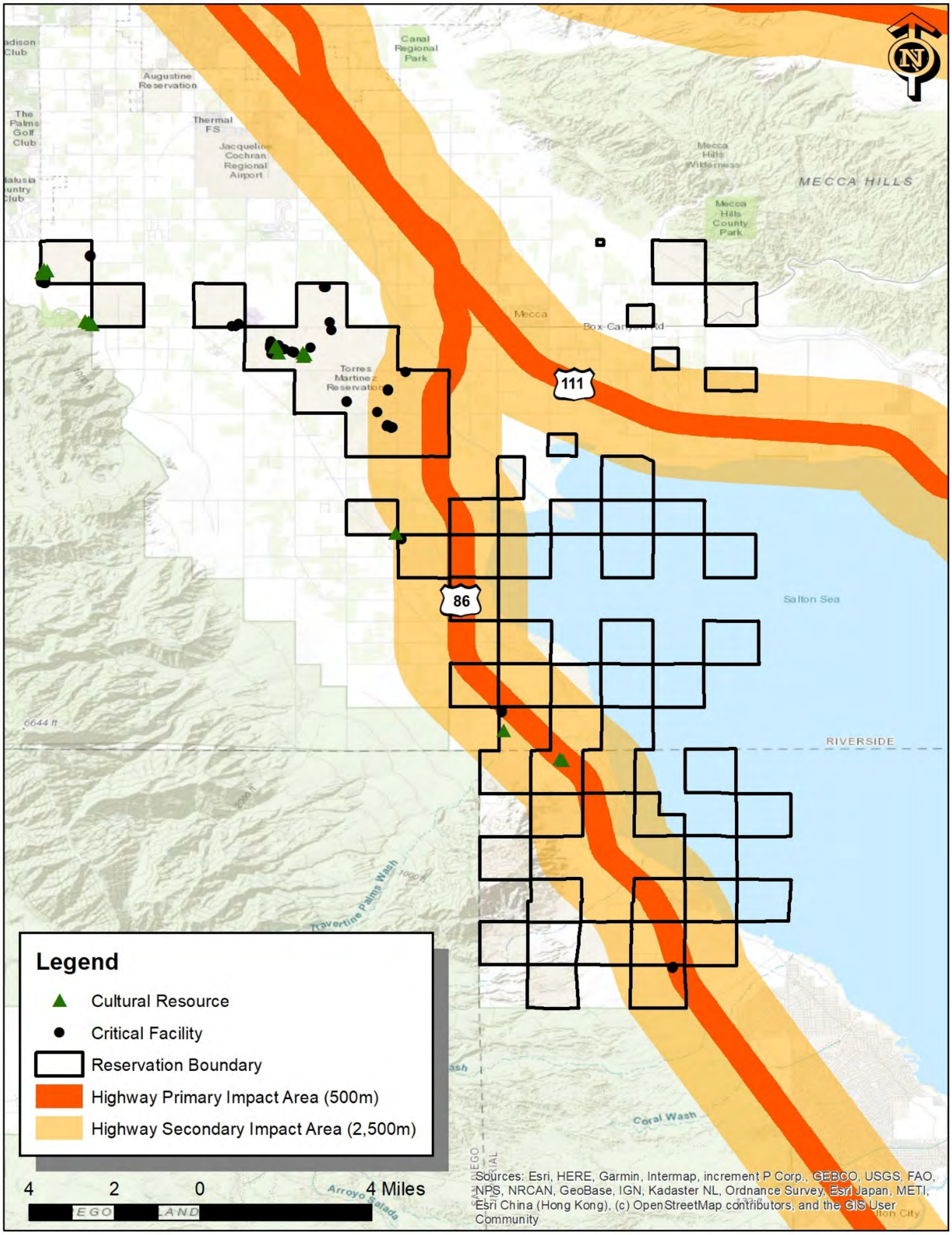


Figure 74. Torres Martinez Tribal Assets Potentially at Risk to Transportation HAZMAT Incidents.

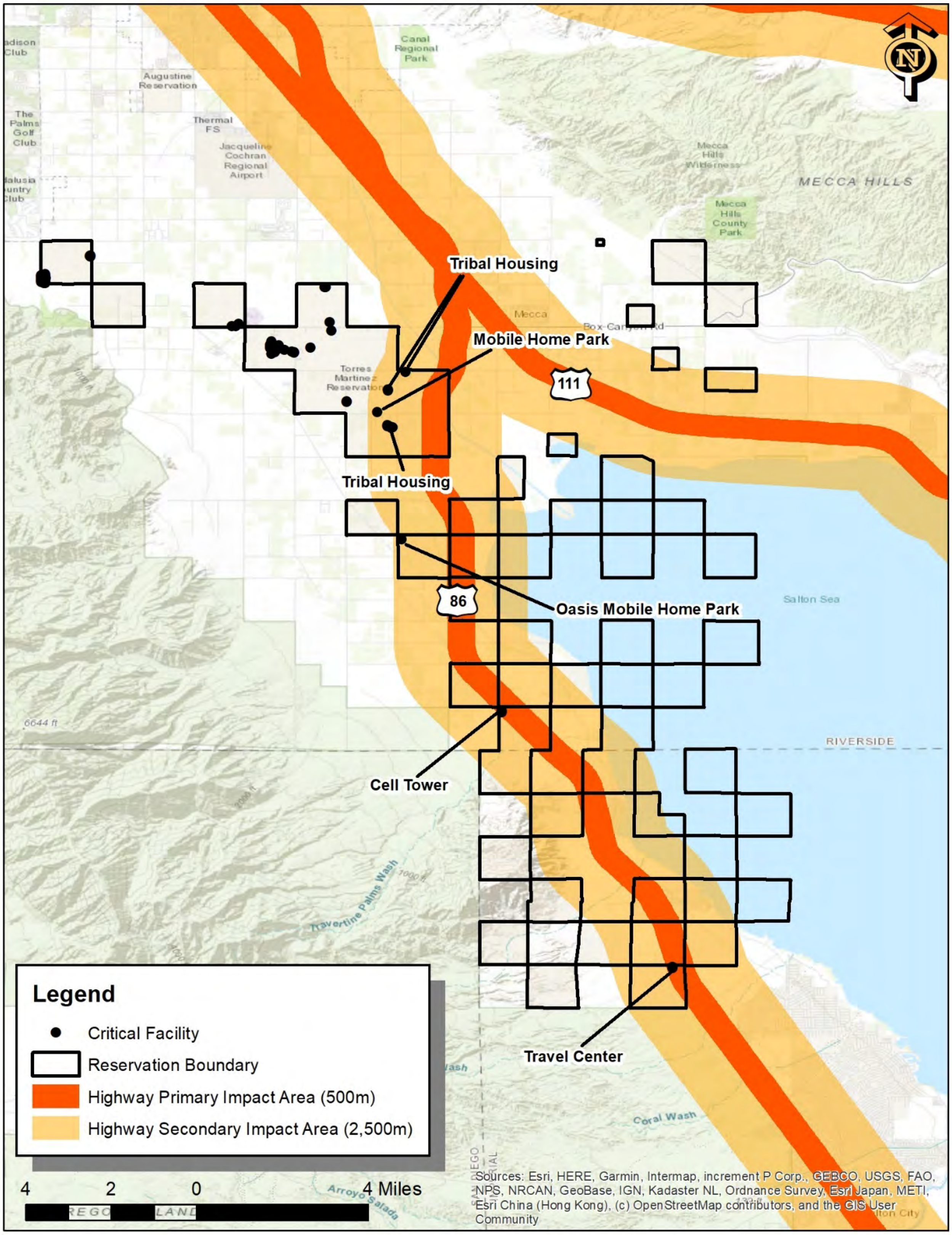


Figure 75. Torres Martinez Critical Facilities Potentially at Risk to Transportation HAZMAT Incidents.

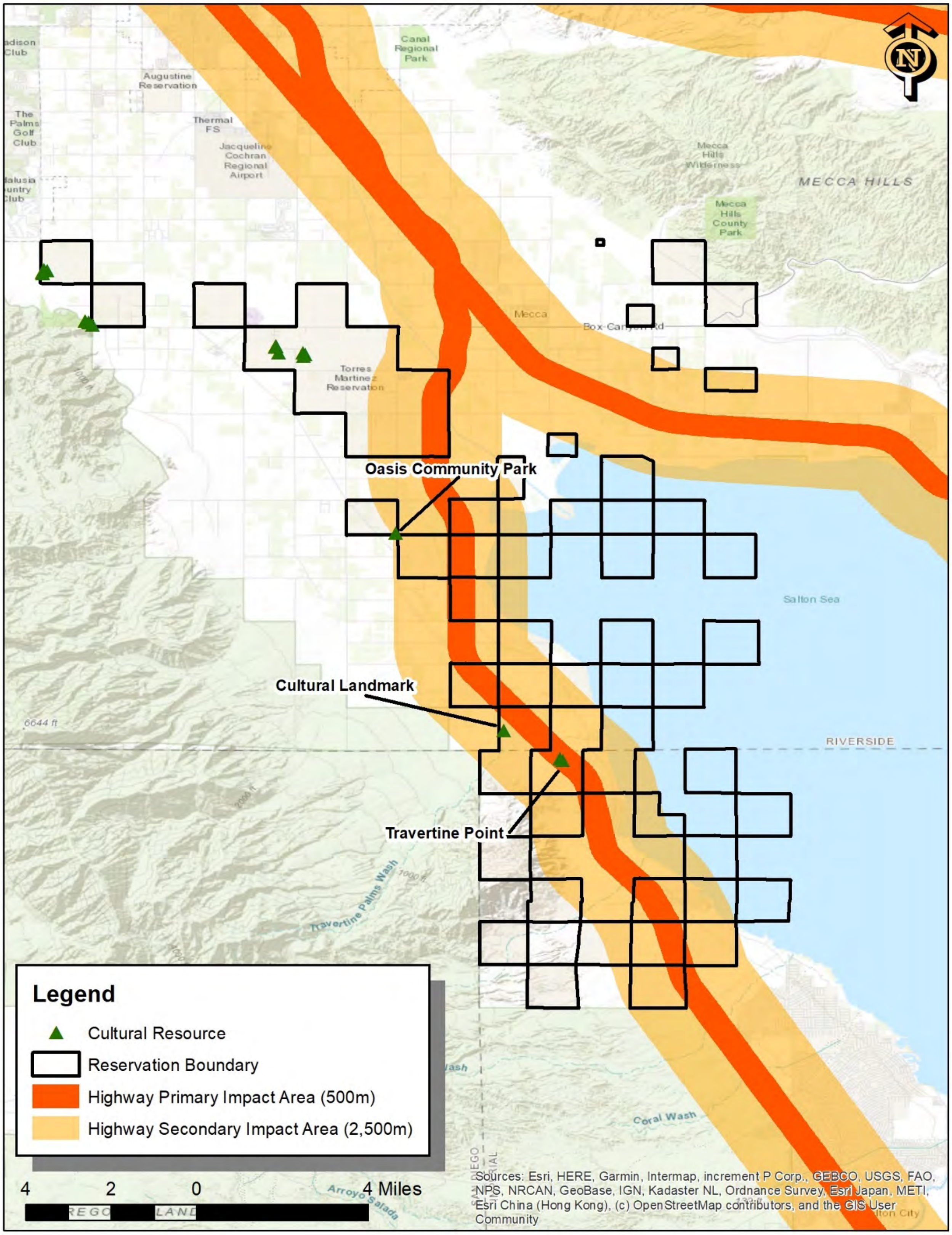


Figure 76. Torres Martinez Cultural Resources Potentially at Risk to Transportation HAZMAT Incidents.

Although historical evidence indicates that the Reservation is susceptible to hazardous materials events, there are few reports of damage. The only reported damage was from the 2008 rail incident in Mecca. Based on this one incident, potential annualized loss for the Reservation is $73,712.

POPULATION IMPACTS

Populations considered most vulnerable to hazardous material spills impacts are identified based on a number of factors including their physical and financial ability to react or respond during a hazard.

ENVIRONMENTAL IMPACTS

Intentional dumping of hazardous materials, such as agricultural chemicals and fertilizers, is a known issue on and near the Reservation. After being dumped without the proper precautions, these chemicals can spontaneously combust and start fires, as occurred during the 2011 incident. They can also leach into soil and groundwater, runoff into water bodies (such as the Whitewater River and the Salton Sea) and disburse into the air. Leached chemicals present a public health hazard as exposure can result in immediate or long-term health effects.

A hazardous material release can also include significant environmental impacts, which are listed below.

- Hydrologic effects
    - Surface and groundwater contamination
    - Other effects on water quality such as changes in water temperature
    - Damage to streams, lakes, ponds, estuaries, and wetland ecosystems
- Air and soil quality effects
    - Pollutants, smoke, and dust
    - Loss of Quality in Landscape and Soil Quality
- Damage to plant communities
    - Loss of biodiversity
    - Damage to vegetation
- Damage to animal species
    - Animal fatalities
    - Degradation of wildlife and aquatic habitat
    - Pollution of drinking water for wildlife
    - Loss of biodiversity
    - Disease

PROBLEM STATEMENTS FOR HAZARDOUS MATERIALS INCIDENT

Table 55. Problem Statements for Hazardous Materials Incident.

Assets	Problems Associated with Hazardous Materials Incidents
People (including underserved communities and socially vulnerable populations)	• Older residents, children, disabled, and those with respiratory issues may have difficulty evacuating during a hazmat spill.

Assets	Problems Associated with Hazardous Materials Incidents
Structures (including facilities, lifelines, and critical infrastructure)	• Some residential, Tribal, and cultural assets are found near sites with hazardous materials.
Systems (including networks and capabilities)	• Hazmat spills may cause roads to be closed requiring detours.
Natural, historic, and cultural resources	• Hazardous materials may be released on Reservation.
Activities that have value to the community	• Recreational activities may be adversely impacted by hazardous materials spills.

4.3 HAZARD RANKING

Ranking hazards helps the Tribe set goals and mitigation priorities. To compare the risk of different hazards, and prioritize which are more significant, requires a scoring system for equalizing the units of analysis. As not all hazards assessed in this plan have precisely quantifiable probability or impact data, a scoring system based on multi-criteria decision analysis (MCDA) methodology was developed to rank all the hazards. This multi-criteria ranking analysis approach prioritizes hazard risk based on a blend of quantitative factors from the available data, such as historical data, local knowledge, public survey, and Hazus assessment. This hazard ranking analysis assigns varying degrees of risk to five categories for each of the hazards, including: probability (how often it can occur), impact (economic, social, and environmental loss), spatial extent (the size of the area affected), warning time (how long does a community have to prepare for the event), and duration. Each degree of risk was assigned a value ranging from 1 to 4. The weighting factor derived from a review of best practice plans. Some of these hazard characteristics, like probability and impact, are more important than others and are weighted more heavily.

To calculate a rank score value for a given hazard, the assigned risk value for each category was multiplied by the weighting factor. The sum of all five categories represents the final rank score, as demonstrated in the following equation:

Hazard Score Value = [(Probability x 30%) + (Impact x 30%) + (Spatial Extent x 20%) + (Warning Time x 10%) + (Duration x 10%)]

Table 56 provides the hazard characteristic, level description, level criteria, level index value, and weighting value.

Table 56. Hazard Ranking Criteria.

Hazard Characteristic	Degree of Risk			Assigned Weighting Factor
	Level	Criteria	Index Value	
Probability	Unlikely	Less than 1% annual probability	1	30%
	Possible	Between 1 and 10% annual probability	2	
	Likely	Between 10 and 100% annual probability	3	
	Highly Likely	100% annual probability	4	
Impact	Minor	Very few injuries, if any. Only minor property damage and minimal disruption to quality of life. Temporary shutdown of critical facilities.	1	30%
	Limited	Minor injuries only. More than 10% of property in affected area damaged or destroyed. Complete shutdown of critical facilities for more than one day.	2	
	Critical	Multiple deaths/injuries possible. More than 25% of property in affected area damaged or destroyed. Complete shutdown of critical facilities for more than one week.	3	
	Catastrophic	High number of deaths/injuries possible. More than 50% of property in affected area damaged or destroyed. Complete shutdown of critical facilities for 30 days or more.	4	
Spatial Extent	Negligible	Less than 1% of area affected	1	20%
	Small	Between 1 and 10% of area affected	2	
	Moderate	Between 10 and 50% of area affected	3	
	Large	Between 50 and 100% of area affected	4	

Hazard Characteristic	Degree of Risk			Assigned Weighting Factor
	Level	Criteria	Index Value	
Warning Time	Long	More than 24 hours	1	10%
	Moderate	12 to 24 hours	2	
	Short	6 to 12 hours	3	
	Very short or no warning	less than 6 hours	4	
Duration	Very short	Less than 6 hours	1	10%
	Short	Less than 24 hours	2	
	Moderate	Less than one week	3	
	Long	More than one week	4	

Table 57 provides the final hazard ranking for the Tribe. Each hazard characteristic is assigned a value between 1 (lowest value) and 4 (highest value). When the risk values were calculated, if the value was 3 or greater, it was assigned as a high risk hazard. If the value was greater than 2 and less than 3, it was assigned as a moderate risk. If the value was less than 2, it was assigned as a low risk hazard. The earthquake, extreme heat, wildfire, and dust and wind erosion were ranked highest. The drought, flooding and levee failure, severe storm, infectious disease, extreme cold, tornado, invasive species, and hazardous material incident are all ranked as moderate. The subsidence hazard is ranked as low.

Table 57. Final Hazard Ranking of Hazards for Torres Martinez.

Hazards	Probability	Impact	Spatial Extent	Warning Time	Duration	Value	Rank
Earthquake	3	4	4	4	2	3.5	High
Extreme Heat	4	2	4	2	3	3.1	High
Wildfire	3	3	3	3	3	3	High
Dust Storm and Wind Erosion	4	2	4	2	2	3	High
Drought	3	2	4	1	4	2.8	Moderate
Flooding and Levee Failure	3	3	2	4	2	2.8	Moderate
Severe Storm	4	1	4	2	2	2.7	Moderate
Infectious Disease	2	2	4	1	3	2.4	Moderate
Extreme Cold	2	2	4	1	2	2.3	Moderate

Hazards	Probability	Impact	Spatial Extent	Warning Time	Duration	Value	Rank
Tornado	2	4	1	2	1	2.3	Moderate
Agricultural Pests and Diseases	4	1	2	1	2	2.2	Moderate
Hazardous Material Incident	2	2	1	4	2	2	Moderate
Subsidence	1	1	1	4	1	1.3	Low

4.4 PROBLEM STATEMENTS SUMMARY

The following problem statements reflect a summary of the problem statements included at the end of each hazard profile. They were designed to briefly summarize the key hazard risks and vulnerabilities to the community based on potential impacts and losses from future events. They are among the issues of greatest concern and were used to assist in the identification and analysis of potential mitigation actions for Chapter 6 (Mitigation Strategy). These problem statements will be reviewed and revised as needed during plan updates to reflect the most current information resulting from the risk assessment.

Table 58. Problem Statements Summary.

Hazard	Problem Summary
Earthquake	• Vulnerable populations in unreinforced masonry and mobile homes/tiny homes may need response. • Unreinforced masonry and utility lifelines impacted.
Extreme Heat	• The electric grid may become stressed and fail during extreme heat events. • Extreme heat mitigation and adaptation has not been fully integrated into existing local plans and regulations for new development, though progress is being made.
Wildfire	• Some residential structures are found in the higher probability burn areas. Structures without defensible zones are more susceptible to wildfires and brush fires.
Dust Storm and Wind Erosion	• Populations with asthma are particularly vulnerable to dust storms and those exposed could develop respiratory infections. • Structures including critical facilities may be adversely impacted by dust storms and erosion.
Drought	• Vulnerable communities may have difficulty accessing potable water during an emergency drought event.
Flooding and Levee Failure	• May encounter issues getting services to populations if roads are flooded. • Vulnerable populations in homes in floodplain and levee breach areas may have difficulty evacuating.

Hazard	Problem Summary
	• Some of the water supply infrastructure is located in the levee-protected areas and could be impacted during a breach. • Homes may be impacted during a flood event. In larger flood events (>100-year), more than 70 homes could be impacted.
Severe Storm	• Downed trees can cause damage to structures, utilities (especially electric), and critical infrastructure.
Infectious Disease	• May impact medical and response services. • Large scale closures/shutdowns due to pandemic response can negatively impact the Tribe's ability to deliver routine operations and services. • Future flu pandemics may adversely impact all residents and present additional complications to the elderly and those with pre-existing conditions.
Extreme Cold	• Older homes without insulation and single-pane glass are difficult to heat and cool and may not provide safe living conditions. • Water lines may break during extreme cold events causing flooding.
Tornadoes	• Vulnerable populations may need support seeking protected shelter. Those without cell phones may not get weather alerts.
Invasive Species	• Invasives have been identified in the region and have damaged the natural environment.
Hazardous Material Spill	• Truck accidents may release toxic materials in and around the Reservation. • HAZMAT incidents at TRI sites north of the Reservation may flow into waterways towards the Salton Sea.
Subsidence	• Signs of subsidence may be difficult to identify and monitor.

CHAPTER 5. CAPABILITY ASSESSMENT

A4. Does the plan describe the review and incorporation of existing plans, studies, and reports? [44 CFR § 201.7(c)(1)(iii)]

5.1 CAPABILITY ASSESSMENT PURPOSE

The purpose of conducting a capability assessment for the TMDCI is to determine the ability of the Tribe to mitigate hazard risks and to identify potential opportunities for establishing or enhancing specific mitigation policies, programs, projects, or other activities. Coupled with the risk assessment, the capability assessment serves as the foundation for designing an actionable and effective hazard mitigation strategy.

As in any planning process, it is important to establish which goals or actions are feasible based on the organizational capacity of those agencies or departments tasked with their implementation. A capability assessment helps to determine which types of mitigation actions are practical and likely to be implemented over time based on the existing authorities, policies, programs, and resources available to support such implementation. It also helps to identify any critical capability gaps or limitations for the Tribe to address through corrective actions, as well the key strengths or positive measures in place that should continue to be supported and/or expanded upon to improve local mitigation capabilities.

This capability assessment was completed to not only help establish the goals and actions for the TMDCI's Hazard Mitigation Plan, but to also help ensure that those goals and actions are realistically achievable under current local conditions. As highlighted in FEMA's 2022 Local Mitigation Planning Policy Guide, *"describing the current capabilities provides a rationale for which mitigation projects can be undertaken to address the vulnerabilities identified in the Risk Assessment."* [146]

Every Tribe has a unique set of capabilities to accomplish mitigation. The capability assessment for the TMDCI included a comprehensive examination of several components as summarized in Table 59. This assessment helped to identify and address the challenges, as well as opportunities, related to the Tribe's existing capabilities for hazard risk reduction in terms of both pre- and post-disaster mitigation activities.

Table 59. Capability Assessment Components.

Components	Description
Planning and Regulatory Capabilities	The plans, laws, policies, codes, or regulations related to hazard mitigation, land use, and development.
Administrative and Technical Capabilities	The Tribal government's staff, skills, and tools that can be used to support mitigation activities.

[146] Local Mitigation Planning Policy Guide. FEMA. April 2022. P. 25.

Components	Description
Financial Capabilities	The fiscal resources the Tribe has access to for helping to fund hazard mitigation actions or projects.
Education and Outreach Capabilities	The Tribal programs and methods already in place that can be used to support mitigation activities.

5.2 REVIEW AND INCORPORATION OF EXISTING PLANS, STUDIES, AND REPORTS

A4. Does the plan describe the review and incorporation of existing plans, studies, and reports? [44 CFR § 201.7(c)(1)(iii)]

The first step in completing the updated capability assessment was to gather and review any relevant local plans, studies, or reports completed by or for the Tribe in recent years. This information was used to help gain a current understanding of the Tribe's current ability to mitigate risk, how local capabilities may be evolving over time, and where opportunities for plan integration may exist. In addition, the California State Hazard Mitigation Plan was reviewed along with the Multi-Jurisdictional Hazard Mitigation Plans for Imperial and Riverside Counties were reviewed for informational purposes. The goal of this review was to support updates to this plan that align with and possibly incorporate key aspects of other relevant plans at the state, county, and Tribal level.

The TMDCI does not have many plans in place that directly relate to mitigating risk. However, they do have a history of successfully securing grants for mitigation projects. Numerous documents were reviewed during the initial development and update of this hazard mitigation plan. Table 60 provides a summary of the relevant plans, studies, reports, or sources of other technical information consulted as part of this process and how they were incorporated into the plan.

Table 60. Relevant Plans, Studies, and Reports for Incorporation.

Plan / Study / Report	Summary Description	How this Plan or Regulation Relates to the Tribe's Ability to Mitigate Risk Pre- and Post-Disaster	How Relevant Information was Incorporated
Tribal Goals	The four (4) overarching goals as listed on TMDCI's website.	The Tribal Goals are considered generally complementary to and supportive of the TMDCI's ability to	The Tribal Goals were reviewed and incorporated into the development of the Mitigation Strategy to

Plan / Study / Report	Summary Description	How this Plan or Regulation Relates to the Tribe's Ability to Mitigate Risk Pre- and Post-Disaster	How Relevant Information was Incorporated
		reduce risk to natural hazards.	help ensure consistency and alignment with mitigation actions.
Emergency Operations Plan (EOP)	The EOP identifies emergency activation and response procedures and actions to be followed during a hazard event. It identifies emergency contacts and disaster personnel responsibilities, emergency equipment, and other resources.	The EOP is focused on emergency preparedness and response to an imminent hazard threat, however some identified procedures and actions will help mitigate risks as events are unfolding.	Brief descriptions of identified hazard threats were reviewed and incorporated into the risk assessment as appropriate.
Natural Resources Department Top Priorities	Identified the TMDCI's environmental priorities as approved by Tribal Council in 2017.	This document clearly details some of the hazard risks to the Reservation with numerous solutions.	This document was reviewed carefully and the mitigation actions in the following chapter coincide closely with these priorities.
Land Use, Zoning & Development Plan (Ordinance #TMORD-001-99)	Last adopted in 1999, this plan and ordinance is outdated and in need of a comprehensive update.	The plan mentions the need to regulate land use development, establishes a goal to retain open space areas subject to natural hazards, and identifies policies for 6 major land use categories for a Land Use/Zoning Map.	This plan was reviewed but did not significantly inform the mitigation plan, other than to confirm the expressed need for the TMDCI to prepare an update to the 1999 version based on updated information and existing capabilities.

Plan / Study / Report	Summary Description	How this Plan or Regulation Relates to the Tribe's Ability to Mitigate Risk Pre- and Post-Disaster	How Relevant Information was Incorporated
SoCal Tribal Emergency Managers Group One-Call-Now Procedures	The One-Call-Now system us used to notify tribes of an active event and to dispatch resources based on need.	The Tribe's participation indicates a level of readiness.	The Tribe's participation in One-Call-Now and the So Cal Tribal Emergency Managers Group indicates a level of pre- and post-disaster ability.
Southern CA Tribal Emergency Managers Multi-Year Training and Exercise Plan, 2017-2020	This plan documents the group's training and exercise priorities.	The plan includes a list of priorities and associated strategies for the priorities.	This plan informed the development of mitigation actions and the values and goals of the Tribe.
Toolkit: Cross-Jurisdictional Sharing Between Tribes and Counties for Emergency Management 2017	The Toolkit includes resources to aid tribes in emergency management.	The Toolkit is general in scope but does include several great resources.	The Toolkit was a good source for potential mitigation actions such as trainings and possible land use policies.
Initial Study for Habitat Enhancement and Creation: Geotube Technology and Solar PV on the Salton Sea Playa at Torres Martinez Wetlands	This report details a plan for the Tribe to collaborate with the Salton Sea Authority to protect wetlands along the Salton Sea.	The Reservation includes land under and along the Salton Sea. As the Sea recedes it creates a number of hazards to the Reservation.	The study was reviewed for a deeper understanding of the wetlands along the Salton Sea and for solutions to the problems created by the Sea receding.
Torres Martinez Solid Waste Collaborative, August 2006 Status Report	This report was developed for the purpose of combating illegal dumping on the Reservation.	Growth on the Reservation and in the region has increased the amount of illegal dumping.	This report was reviewed to understand the problem and its depth.
Coachella Valley Waste Operator Ordered to Pay Millions for Torres Martinez Open Dumping	This refers to an EPA news article.	The article details how Lawson Enterprises were ordered to pay $42.8 million in cleanup	Illegal dumping creates a large risk to the Reservation and this article articulates the

Plan / Study / Report	Summary Description	How this Plan or Regulation Relates to the Tribe's Ability to Mitigate Risk Pre- and Post-Disaster	How Relevant Information was Incorporated
		costs to the Reservation for illegal dumping.	value of cleaning up the Reservation.

5.3 EVALUATION OF PRE- AND POST-DISASTER CAPABILITIES

C1. Does the plan include a discussion of the Tribal government's pre-and post-disaster hazard management policies, programs, and capabilities to mitigate the hazards in the area, including an evaluation of Tribal laws and regulations related to hazard mitigation as well as to development in hazard-prone areas? [44 CFR §§ 201.7(c)(3) and 201.7(c)(3)(iv)]

The TMDCI works closely with multiple planning and response agencies in Riverside County and the State of California. They also work closely with a variety of federal agencies including the US Bureau of Indian Affairs and Environmental Protection Agency. They utilize the expertise of these agencies when developing their land in potentially hazard prone areas. The Tribe does not have laws or regulations specific to land use or development within known hazard areas, but as described below it does adhere to sound building practices for new construction. The following sections detail the Tribe's capabilities in the areas of planning and regulation, administration and technical, education and outreach, and financial capacity. The Tribe does not participate in the National Flood Insurance Program (NFIP) but a brief section on NFIP participation and compliance has been incorporated into this plan update.

5.3.1 PLANNING AND REGULATORY CAPABILITIES

In terms of planning and regulatory capabilities, the TMDCI does not have specific laws or regulations regarding hazards and land use development, but it does generally apply the California Building Standards Code (Cal. Code Regs., Title 24) as standard practice when building homes or other facilities. The Tribe does not have a written regulation mandating that these codes be adhered to but does use a consultant for advising on permitting and building construction. The Tribe lacks up-to-date plans and ordinances governing land use and development standards, as the last update to its Land Use Plan was completed in 1999 and is in need of a comprehensive update (identified as a current Tribal priority). However, as mentioned previously, they do have strong departments including their Natural Resources Department and their Planning Department.

5.3.2 ADMINISTRATIVE AND TECHNICAL CAPABILITIES

Administrative and technical capabilities include staff positions and committees as well as technical expertise. The TMDCI has an extensive department structure with many skilled employees. Table 61 details the administrative and technical capabilities of the Tribe.

Table 61. Administration and Technical Capabilities

Administrative / Technical Capability	Description of Capability / Effectiveness for Hazard Risk Reduction
Tribal Council	The TMDCI Tribal Council is the Tribe's governing body and includes a chairman, vice chairman, secretary, treasurer, and two members at large with an additional proxy. The Council actively participated in and supported the initial mitigation plan's development as with this update, ultimately reviewing and adopting the final plan. Very effective in terms of plan oversight and implementation as the Council is empowered to authorize funding for mitigation projects.
Tribal Administration	Tribal Administration includes a Tribal Administrator who is supported by an Administrator Specialist. The Tribal Administrator oversees all 4,500 TMDCI staff (across 7 locations) and is the direct supervisor of the Natural Resources Director, who has an excellent understanding of hazard mitigation and the needs of the Tribe. The Tribal Administrator participated in plan update meetings to provide input and help ensure specific tasks were delegated and completed as appropriate.
Economic Development	The TMDCI's Economic Development Director is focused on rebuilding the nation through diversifying Tribal revenue streams that are not overly reliant on the casino. He has a good understanding of the interdependence between economic development and stability and long-term community resilience, and effectively seeks to achieve similar goals in terms of risk reduction. This includes working with developers and other builders to address existing and future risks through mitigation strategies, and in promoting economic and environmental sustainability through green jobs and related industrial opportunities. Economic Development capabilities suffer from a lack of funding and staff resources to implement needed strategies and larger scale projects.
Emergency Management	New department staffed by full-time Emergency Response Manager with an assistant. This is a capability improvement since the last plan with increasing funding and expertise dedicated to emergency preparedness and response activities. Effective coordination with other Tribal departments and outside agencies but staff turnover in the past has impacted capabilities and program development.
Mitigation Planning Committee	The Tribal Pre-Disaster Mitigation Planning Team (TPMPT) was established for developing and updating this hazard mitigation plan. Comprised of most department heads representing Tribal

Administrative / Technical Capability	Description of Capability / Effectiveness for Hazard Risk Reduction
	government and very effective in terms of supporting plan monitoring and implementation.
Natural Resources Department	The Natural Resources Department has a Natural Resources Manager, environmental technicians for air and water, an environmental specialist (broad work duties), and a Wetlands technician. The Department collaborates with many outside agencies and is involved with multiple projects to mitigate risk. One example is the Tribal Air Program. This program is currently participating in the Salton Sea Air Quality Monitoring Network and is establishing another air quality station at the Torres Martinez Wetlands to be a part of the network to monitor the air quality changes resulting from the recession of the Salton Sea. The Tribal General Assistance Program (GAP) officer, funded through the US Environmental Protection Agency, knows the locations of dumping grounds on the Reservation and has worked to prevent dumping. For example, the Department reports illegal dumping to appropriate organizations, hosts community cleanup events, and pursues grant funding to help clean up and restore illegal dump sites.
Planning Department	The Planning Department plans, organizes, and implements long and short-term programs and activities designed to develop assigned programs and services. It receives, evaluates, and processes public and organization-initiated applications; and provides input and recommendations concerning the approval of applications. It also provides a variety of environmental services for the community, including preparing environmental analyses and making recommendations concerning the resolution of environmental issues and conflicts as required. The Planning Department also manage the preparation and maintenance of a variety of reports and files related to state and federal applications and documents, including the preparation and design of maps, charts, models, sketches and other graphic presentations, direct demographic, housing, and land use research and analyses. The Planning Department is involved with multiple projects to mitigate risk and is very effective at supporting at supporting hazard mitigation and resilience initiatives across the Reservation. The Department is managed by a professional, certified planner (AICP) who is also LEED (Leadership in Energy and Environmental Design)

Administrative / Technical Capability	Description of Capability / Effectiveness for Hazard Risk Reduction
	certified. LEED is the most popular green building rating and credentialing system in the world.
Grants Administration	The Tribe has a 3-person team including a Grants Administrator, Grants Writer and Grants Specialist who currently oversee 70 grants, including many that are recurring funding streams. They oversee a proven system of writing and receiving grants from many sources and in coordination with many partners. More information regarding these sources and specific grant awards can be found under the Financial Capabilities section of this chapter.
Facilities Director	The Facilities Director is tasked with maintaining and caring for Tribal facilities and grounds across the Reservation including before, during and following hazard events (emergency preparedness, response, and repair/recovery). These efforts are complicated due to the age of many structures, but in general the Reservation is kept secure. The Director does not have responsibility for personal property but has expertise and information regarding flooding locations throughout the Reservation.
Natural Resources Director	The Natural Resources Director leads the Natural Resources Department and works closely on projects for the Reservation that are related to and supportive of natural hazards mitigation.
Water Operator	The Water Operator maintains all water systems on the Reservation. Responsible for ensuring that water infrastructure, such as pipelines, and storage tanks, can withstand natural hazards such as droughts, floods, earthquakes, and storms. This includes implementation of protective measures and design improvements to prevent damage and maintain service continuity. It also includes continuously monitoring water quality and responding quickly to contamination incidents by adjusting treatment processes or other actions, such as issuing boil-water advisories. Very effective in terms of reducing or eliminating risks to community members from natural hazards and human health threats. For example, they have had to deal with naturally occurring high levels of arsenic. They also have perchlorate in the wells and have tried multiple types of filters to clear the water. One of the biggest issues is the artesian effect in wells where water bubbles to the surface. The Water Operator is also concerned with the impact of future droughts and extreme temperatures which can increase evaporation rates, water shortages, and water demand, affecting both water supply levels

Administrative / Technical Capability	Description of Capability / Effectiveness for Hazard Risk Reduction
	and infrastructure efficiency. Severe flooding events is an ongoing threat which can overwhelm water systems, damage infrastructure, and lead to the contamination of water supplies.
Tribal Cultural Coordinator	The Tribal Cultural Coordinator works to identify culturally sensitive areas and assist with land use decisions.
Most Likely Descendant (MLD)	The MLD is aware of culturally significant areas on the Reservation which may be helpful in future land use decisions.
Senior Center	The Tribe has an extensive seniors' program that includes lunch during the week, monthly events (e.g., birthday bashes, movie day, potluck dinner), and numerous social outings. The Senior Center Coordinator helps to increase risk awareness for senior community members as it relates to health and safety issues, including natural hazards and the impacts of climate change (extreme heat, air quality, etc.). The Senior Center uses a bulletin board to communicate important information, including emergency preparedness and safety topics, and provides support and resources during disasters and other hazard events (e.g., power outages). It also assists with evacuation and sheltering operations for seniors and intends to offer additional education programs including disaster preparedness in the future.
IT	The IT Department is responsible for phones, cell phones, computers, and data storage for the Tribe. They have a computer lab with approximately 30 computers, and they hope to offer training in the future. Their biggest concerns relate to electrical power. They could run on generator power for about 48 hours. IT is also responsible for mass communication during emergencies, and they are also planning to rebuild the Tribe's website. Several mitigation actions emphasize education and posting information to the Tribe's website, so this would be a great resource in the future.
Geographic Information Systems (GIS)	The Tribe recently hired a full-time GIS staff member who reports to the Planning Director. This is considered a critical capability for the Tribe and must continue to be supported through continuous funding and training. Can be very effective in terms of mapping and assessing natural hazard risks and mitigation opportunities.
Mutual Aid Agreements	An official MOU exists for fire response and the Tribe does not have a fire department or firefighting resources. However, Riverside County Fire does respond and collaborate with the Tribe for hazard mitigation purposes.

Administrative / Technical Capability	Description of Capability / Effectiveness for Hazard Risk Reduction
Maintenance programs to reduce risk (e.g., tree trimming, clearing drainage systems)	The Water Department maintains the wells and drainage systems. The Tribe has done weed abatement in the past around homes and roads supported by grant funding from the BIA. The Tribe needs heavy equipment to facilitate this clearing in the past they have done everything by hand.
Temporary Assistance for Needy Families (TANF)	The Torres Martinez Tribal TANF Program, established in May of 2001, is a social services provider for Native American Indian families throughout Los Angeles and Riverside County. The program is a consortium of 5 tribes which operate Tribal TANF programs for the Indian communities. This program is extensive and while it doesn't relate directly to hazard mitigation it does provide multiple opportunities for the Tribe to coordinate with Tribal members.
Community Emergency Response Team (CERT)	The Tribe has a CERT Team Lead and, in the past, has received funding and technical assistance for training team members though it is not as active today. It is estimated that approximately 20 people have been trained across various Tribal departments but many more need training and/or refresher courses. The Tribe has some equipment but is short on much of what would be needed for a large community response (including radios). The CERT Lead is pursuing additional equipment to meet current needs and intends to re-establish and expand CERT training to employees, seniors, and children on the Reservation. The program is especially valuable to the community since local first responders are currently 20-30 minutes away.

5.3.3 FINANCIAL CAPABILITIES

Financial capabilities include the TMDCI's fiscal resources to fund hazard mitigation activities, including its eligibility and access to funding sources that can be used to support the implementation of projects. The Tribe receives revenue from the Casino and gas station, but also significant amounts of financial assistance through federal grants and other sources of external funding. With approximately 90 percent of the Tribe's funding being grant-funded, the TMDCI relies heavily on non-Tribal sources for their sustainability and has therefore implemented a sophisticated system for applying and managing grant funding. As such the Tribe has an extensive history of pursuing, capturing, and administering a wide range of grants as further described below, many of which may be used to support hazard mitigation and other resilience building activities.

C2. Does the plan include a discussion of Tribal funding sources for hazard mitigation projects and identify current and potential sources of Federal, Tribal, or private funding to implement mitigation activities? [44 CFR §§ 201.7(c)(3)(iv) and 201.7(c)(3)(v)]

Table 62. Financial Capabilities

Financial Tool/Source	Description of Capability / Effectiveness for Hazard Risk Reduction
Tribal operating budget	The Tribe's General Fund Budget includes revenue generated by the casino and gas station operations. Each year, two months before the fiscal year ends, the Finance Director sends reminders to Department Directors to work on their new fiscal year budget, with assistance that includes a 3-quarter report of expenditures for the current year. The Tribal Treasurer works with all the Tribal Committees to work on their budget and then provides the approved budgets to Finance. However, the TMDCI is heavily reliant on external sources of funding, primarily through federal grants and financial assistance but also by state and local agencies. It has extremely limited Tribal-based funding that can be used directly for hazard mitigation purposes.
Capital improvement programming	Capital projects are funded based on Tribal Council approval and the priorities established within department-level requests or grant budgets and programs. The Tribe does not have a formal long-term CIP process.
Special purpose taxes	N/A
Fees for utility services (water, sewer, gas, or electric services)	Fees for water service are collected by the Coachella Valley Water District (CVWD) and may be used to support projects that help to protect and conserve local water sources.
Debt Financing (general obligation bonds, special tax bonds, etc.)	Tribal Council has authority to file for these finances if desired but does not currently do so.
Partnering or intergovernmental arrangements	The Tribe maintains the capability to contract and/or sign memorandums of agreements with a variety of partners to support the implementation of mitigation projects.
FEMA Hazard Mitigation Assistance (HMA) Grant Programs	The TMDCI is an eligible applicant for FEMA's HMA programs and will continue to apply for assistance, including the Building Resilient Infrastructure and Communities (BRIC) and Hazard Mitigation Grant Program (HMGP) as opportunities become available. These programs have been identified and prioritized as among the most effective and supportive financial sources available for the Tribe's hazard risk reduction efforts.

Financial Tool/Source	Description of Capability / Effectiveness for Hazard Risk Reduction
Other Federal Funding	The TMDCI receives a large amount of federal funding through various departments and grant programs and is heavily reliant on these external funds to complement the Tribe's General Fund Budget. This includes a mix of recurring and competitive grant awards from FEMA, the Bureau of Indian Affairs (BIA), the Environmental Protection Agency (EPA), and more as listed below in Table 63. In addition, a more comprehensive list of possible funding sources for mitigation projects is included in the next chapter (Mitigation Strategy). These external sources of funding can be quite effective in supporting risk reduction when leveraged and combined with the TMDCI's other efforts to protect and care for the social, environmental, cultural, and economic resilience of the Tribe.
State Funding	The TMDCI is eligible to receive support through funds administered by the California Office of Emergency Services to support emergency preparedness and mitigation activities.
Private donations and non-profit grants	The Tribe may collaborate with private and non-profit organizations for financial assistance. Examples include the Coachella Valley Mountains Conservancy (CVMC) on habitat restoration projects.

As noted above, the TMDCI has a sophisticated system of writing and receiving grants with a proven track record. More details on this system, including a grant application flow chart and worksheet, are included in Appendix B: Capability Assessment Supporting Materials. The Tribe has received and continues to receive numerous grants related to emergency management, hazard mitigation, environmental protection, infrastructure improvement and other related programs as listed in Table 63. It has also received weed abatement grants every two to three years.

Table 63. Relevant Grant Funding Received by TMDCI

Funding Source	Grant Title
Federal Emergency Management Agency (FEMA)	• The National Threat and Hazard Identification & Risk Assessment (THIRA) • Youth Community Emergency Response Team (CERT) • Pre-Disaster Mitigation (PDM)
Environmental Protection Agency (EPA)	• Clean Water Act 106 • Clean Water Act 319 • General Assistance Program (GAP) • Clean Air Act 103 • Performance Partnership Grants (PPG)

Funding Source	Grant Title
Bureau of Indian Affairs (BIA)	• Hazardous Fuels Reduction Management • Invasive Species Removal Project • Fish Hatchery Program • Tribal Forestry Summer Youth Program
Bureau of Reclamation (BOR)	• Salton Sea Program Support
Department of Transportation (DOT)	• Fixing America's Surface Transportation Act ("FAST Act")
California Governor's Office of Emergency Services (Cal OES)	• Community Emergency Response Team (CERT) Equipment Purchase
Coachella Valley Mountains Conservancy (CVMC)	• Phase 1 & 2 Habitat Restoration

5.3.4 EDUCATION AND OUTREACH CAPABILITIES

The Tribe is a very close-knit community and information travels fast among community members, which is helpful in terms of mass communication and outreach. There are also numerous events and gatherings throughout the year, which provide specific opportunities for conducting targeted educational programming on emergency preparedness, hazard mitigation, climate resilience, and other topics in support of long-term risk reduction. The Emergency Response Manager has cited bringing community members together in-person as a key opportunity for future outreach initiatives.

Several TMDCI departments conduct their own education and outreach initiatives on the Reservation which could be expanded upon to address such topics. This is evident in the mitigation goals and actions developed by the TPMPT. For example, this includes providing disaster information pamphlets to all homes on the Reservation, using the Tribal website and Facebook account for promoting hazard mitigation and emergency management education, more targeted educational programming for youth and seniors, distributing education materials and conducting public meetings/workshops to address safety issues and prepare for hazards, and further educating TMDCI staff on their roles and responsibilities during disasters. The Tribe would also like to re-establish and expand disaster training to TMDCI employees along with seniors and children on the Reservation through its Community Emergency Response Team (CERT) program.

The Tribe’s RAVE emergency notification system is an effective method for mass communication across the Reservation, especially as it relates to imminent hazard threats and other emergencies. The system can be used to notify community members on specific preparedness or mitigation actions they can take in advance of, during, or following disaster events.

5.4 NATIONAL FLOOD INSURANCE PROGRAM (NFIP) PARTICIPATION AND COMPLIANCE

The National Flood Insurance Program (NFIP) is a program created by the United States Congress in 1968. The NFIP has two purposes: to share the risk of flood losses through flood insurance and to reduce flood damages by restricting floodplain development. The program enables property owners in participating communities to purchase insurance protection, administered by the government, against losses from flooding, and requires flood insurance for all federally backed loans or lines of credit that are secured by existing buildings, manufactured homes, or buildings under construction, that are in FEMA-mapped special flood hazard areas. The availability of NFIP policy coverage is limited however to communities that adopt adequate land use and control measures with effective enforcement provisions to reduce flood damages by restricting development in areas exposed to flooding. Today there are more than 20,000 communities across the United States and its territories participating in the NFIP. However, few federally recognized Tribal communities participate due to complexities briefly described below. The TMDCI does not participate in the NFIP. As with most other federally recognized tribes, unique jurisdictional issues for sovereign governments make NFIP participation difficult for the Tribe. NFIP participation is even more challenging when considering the complexities of Tribal land ownership patterns which affect TMDCI's ability and authority to adopt and enforce floodplain management regulations for the entire Reservation as required by the minimum standards of the NFIP. Fortunately, despite not participating in the NFIP, Tribal members may still be able to purchase flood insurance through the private market which is becoming a growing trend throughout the United States.

5.5 SUMMARY AND CONCLUSIONS

The Torres Martinez Reservation is prone to a wide range of natural hazards including floods, wildfires, earthquakes, high winds, and drought. All TMDCI employees and Tribal community members are distinctly aware and have experienced these hazards, and their collective ability to work together as a team is among the Tribe's greatest strengths. This awareness and collaborative spirit has created a culture of preparedness and resilience which helps them to proactively mitigating known hazard risks through a variety of Tribal government programs and services.

The Tribal Council, Tribal Administrator, and the TPMPT are acutely aware of the natural hazard risks that may impact their Reservation. They are dedicated to mitigating that risk. In the future they intend to implement as many of the identified mitigation actions as possible and expand the culture of preparedness and resilience on the Reservation. Fortunately, the Tribe has a wide range of administrative and technical capabilities across numerous departments and has also proven their ability to secure and manage grant funds to mitigate risk on the Reservation and to protect historical, cultural, and environmental resources.

The primary hazard mitigation capabilities for the TMDCI are its planning and regulatory framework for Tribal-owned lands, buildings, and infrastructure, in addition to the expertise and depth of Tribal government staff who support the administration and delivery of numerous programs and services across multiple departments. Collaboration across these departments and between TMDCI's professional, trained workforce is another key strength for its ability to prepare for and mitigate against known hazard threats. The Tribe's history of strategic planning for improved governance, coupled with its capacity for sustainable revenue generation and federal funding support, only strengthen these core capabilities and resources for implementing effective hazard mitigation activities. Furthermore, the implementation of this plan should significantly improve their capabilities and resources to protect community members and reduce hazard risks to these resources in both the pre- and post-disaster environment.

This capability assessment resulted in the determination that the TMDCI has moderate to high capabilities to implement hazard mitigation actions. While its planning and regulatory capabilities are somewhat limited over non-Tribal owned lands, it is well positioned to plan for and regulate development for those lands and facilities owned and operated by the Tribe. It has very strong administrative and technical capabilities for implementing mitigation projects and programs, in addition to many resources that can support education and outreach initiatives. It also has a high degree of financial capability when it comes to funding hazard mitigation actions, through both local/internal funding sources but especially external sources of funding through grants and federal programs that routinely support the Tribe.

Although the TMDCI has relatively strong capabilities and is well-positioned to mitigate the natural hazard risks faced across the Reservation, the Tribe can improve or expand on the capabilities described in this chapter. Some general and specific opportunities to address existing gaps or limitations on Tribal capabilities to reduce risk have been identified for each capability type and are further described below. Each of these opportunities were considered by the TPMPT during the mitigation planning process as potential new mitigation actions for the Mitigation Strategy.

5.5.1 OPPORTUNITIES TO IMPROVE OR EXPAND ON CAPABILITIES TO REDUCE RISK

Planning and Regulatory Capabilities

- Prepare a new Master Plan (or comprehensive update to TMDCI's existing Land Use, Zoning & Development Plan (Ordinance #TMORD- 001-99) that incorporates long-term resilience to natural hazards and climate change as a core theme, with cross references to this Hazard Mitigation Plan.
- Conduct regulatory reviews and updates to Tribal ordinances and/or permitting procedures to require or promote hazard resistant, climate-adaptive standards for new development. Explore the use of existing methods, tools, and best practices for incorporating green infrastructure and other nature-based solutions for long-term risk reduction.
- Determine if non-regulatory incentives or other Tribal policies are feasible and could become effective in guiding more resilient land use and economic development, with careful consideration of potential impacts to the privacy and autonomy of landowners, developers, and

other community members. Such incentive or regulatory policies could be designed to reduce risk in known high-risk hazard areas.

- Coordinate with the BIA, Riverside County, CAL FIRE and other partners on the development, maintenance, and implementation of a Hazardous Fuels Management Plan to mitigate wildfire hazards. Explore the need for a more robust Community Wildfire Protection Plan (CWPP) for specific areas of concern.
- Integrate low impact development, nature-based solutions, and other BMPs into stormwater management plans and drainage requirements for new/improved development.
- Integrate hazard mitigation and climate resiliency into the TMDCI's existing capital planning and project lists. Examples include (1) making resilience a key objective for the Tribe's strategic, operational, and fiscal policies; and (2) developing methods to limit the Tribe's expenditures on capital projects or infrastructure improvements that increase hazard risks.

Administrative and Technical Capabilities

- Continue to build and maintain in-house GIS capabilities to support hazard mitigation and other critical Tribal planning and project initiatives. This includes maintaining GIS hardware, software licenses, and data in addition to staff training and professional development.
- Develop systems or practices to minimize but also better cope with staff turnover or other disruptions to Tribal functions and duties that support risk reduction, and especially for the Emergency Manager position. This could include salary/benefit increases along with the creation of information/knowledge management systems to (1) help maintain coordination between departments on resilience-themed activities, and (2) capture and store information critical to succession and continuity planning by reducing the loss of historical and institutional knowledge.
- Encourage/provide more training and professional development opportunities for Tribal staff who are engaged in resilience planning and project implementation.
- Explore opportunities to strengthen the monitoring and enforcement procedures for illegal dumping and mulch piles that exacerbates wildfire hazard threats across the Reservation.
- Conduct regularly scheduled briefings/presentations for Tribal Council on the implementation status of the Hazard Mitigation Plan, resource needs, etc.

Financial Capabilities

- Continue to build and support the capacity of Tribal staff to identify and pursue external funding for hazard mitigation / infrastructure / resilience-building projects, especially those routinely made available through recurring federal grant programs (i.e., FEMA, EPA, NOAA, DOI, BIA, DOT, HUD, etc.). This includes but is not limited to increased training/professional development opportunities and the ability to invest more time on grant writing, grants management, and related administrative tasks.

- Develop administrative plans and procedures to maintain focus on leveraging the FEMA Building Resilient Infrastructure and Communities (BRIC) program. Maximize funding and non-financial BRIC Direct Technical Assistance (DTA) to develop and implement priority mitigation projects. BRIC DTA can provide tailored support for enhancing TMDCI's capability and capacity for solutions that advance Tribal-driven objectives as stated in this plan.
- Coordinate with the State of California and Riverside County on positioning the TMDCI to pursue and capture future grant funding for regional hazard risk reduction projects. This is particularly true for federal mitigation grants available through FEMA's HMA grant programs (BRIC, HMGP, FMA) and BIA's fire management and hazardous fuels reduction management programs.
- Partner with the Coachella Valley Water District (CVWD) to identify and pursue larger grants to protect and conserve local water sources, including but not limited to projects that will provide stormwater protection, water conservation, and other climate resilience solutions.
- Incorporate hazard/climate resilience considerations into the Tribe's financial planning and budget process (potential set-aside funding for both pre and post-disaster funding, especially as it relates to local/Tribal matching funds for external grant programs).
- Integrate specific, long-term mitigation/adaptation measures into all capital projects / infrastructure improvements (i.e., new construction, facility maintenance/renovations, road/bridge work, water/sewer upgrades/extensions, etc.).
- Explore and expand opportunities for public/private partnerships that can support investments in hazard and climate resilience for long-term economic growth and sustainability.

Education and Outreach Capabilities

- Expand existing education and outreach programs on the Reservation to include risk communication/awareness campaigns that promote building community resilience to hazards as well as individual emergency preparedness and mitigation actions for community members.
- Identify and expand opportunities to deliver educational programming to Tribal members during community gatherings or regularly scheduled events, especially those that draw in people who want to help (i.e., community clean-up events). This could include providing relevant handout materials, guest speakers/presentations, etc. that focus on building community resilience to natural hazards and changing climate conditions (increasing extreme temperatures/heatwaves, heavy precipitation events, droughts, etc.).
- Increase disaster risk reduction and emergency response training to Tribal employees in addition to workshops specifically geared toward seniors, children, or other vulnerable populations.
- Re-establish and grow the TMDCI's Community Emergency Response Team (CERT).
- Post emergency preparedness and disaster mitigation outreach flyers, fact sheets, etc. to the bulletin board at the Senior Center as appropriate for hazard seasons or anticipated hazard events/conditions.

- Develop a dedicated, central page on TMDCI's website for all material related to climate, hazards, resilience, etc. Advertise updates on social media including through TMDCI's Facebook account.
- Explore possible participation in hazard awareness campaigns such as the National Fire Protection Association's (NFPA's) Firewise USA® program, National Weather Service's (NWS's) StormReady® program, and national or state Severe Weather Awareness Weeks.
- Increase and track the enrollment in the Rave Alert mass communication system. Conduct outreach to address gaps in enrollment, especially for the Tribe's more vulnerable community members to ensure they are properly notified of imminent hazard threats and the preparedness/response actions they may need to take (evacuation, sheltering, cooling/warming center options, etc.).

CHAPTER 6. MITIGATION STRATEGY

The hazard mitigation strategy is the culmination of work presented in the planning area profile, risk assessment and capability assessment. It is also the result of multiple meetings and thorough public outreach. The work of the Tribal Pre-Disaster Mitigation Team (TPMPT) was essential in developing the mitigation goals and actions included in this chapter. As described in Chapter 3: Planning Process, the TPMPT worked in a consistent, coordinated manner to identify and prioritize the goals and mitigation actions for this Plan. The public was engaged throughout the development of the mitigation actions.

6.1 MITIGATION GOALS AND OBJECTIVES

C3. Does the Mitigation Strategy include goals to reduce or avoid long-term vulnerabilities to the identified hazards? [44 CFR § 201.7(c)(3)(i)]

> ***GOALS** are broad, long-term policy and vision statements that explain what is to be achieved by implementing the mitigation strategy.*

Mitigation goals represent broad statements that are achieved through the implementation of more specific mitigation actions. These actions include both hazard mitigation policies (such as land use regulations) and hazard mitigation projects (such as structure or infrastructure projects). To develop goals for this Tribal Multi-Hazard Mitigation Plan the TPMPT reviewed goal statements from the County and State Hazard Mitigation Plans, as well as the goals from the Tribe's previous Multi-Hazard Mitigation Plan. The TPMPT worked to identify the six goal statements included below. These statements are meant to serve as broad policy statements that explain what the Tribe intends to achieve. These goal statements are consistent with the goals in the California State Hazard Mitigation Plan (draft 2018). These goals satisfy the Tribe's primary concerns for the safety of their citizens and the protection of their land and culture. When achieved by way of implementing the mitigation actions identified in this plan, the Tribe will mitigate risk posed by all identified hazards.

Cultural Assets	• Identify and protect cultural assets from natural hazards and a changing climate.
Wildfires	• Protect people and the Reservation land and buildings from wildfires.
Drought, Flood, and other Natural Hazards	• Protect people and the reservation from the impact of drought, flood and other natural hazards.
Education and Preparedness	• Implement education and preparedness programs on the reservation to increase Tribal resilience to natural hazards and impacts of climate change.
Regulatory Actions	• Enact administrative or regulatory actions to reduce hazard losses.
Regional Collaboration	• Build capacity for hazard mitigation through regional collaboration.

Figure 77. Hazard Mitigation Plan Goals.

6.2 MITIGATION ACTIONS

> ***A MITIGATION ACTION*** *is a measure, project, plan or activity proposed to reduce current and future vulnerabilities described in the risk assessment.*

The mitigation goals and objectives as established for this plan are broad in scope. Mitigation *actions*, on the other hand, are more specific and identify a specific activity or process intended to reduce or eliminate risk to natural hazards in alignment with the goals. In general, mitigation actions can be categorized into four categories: Plans and Regulations, Structure and Infrastructure Projects, Natural Systems Protection, and Education and Awareness Programs. These are shown in some detail in the table below. The TPMPT identified mitigation actions with the help of the public. The consulting team used these category definitions as way to educate and guide the TPMPT.

D2. Was the plan revised to reflect progress in Tribal mitigation efforts? [44 CFR §§ 201.7(d)(3) and 201.7(c)(4)(iii)]

The Tribe's previous Multi-Hazard Mitigation Plan included forty-seven mitigation actions. For the purposes of this plan, all the actions were reviewed for their status and relevance. The following table shows the previous plan's actions and the status of each. In addition to their status, if an action was moved forward to this plan the final column of the table below indicates the title of the new action. Many of the actions were not implemented due to the Covid-19 Pandemic and staff turnover. The Tribe has begun building a more robust staff and anticipates more capacity in the future to implement mitigation actions.

Table 64. Status of Previous Mitigation Actions.

Action #	Action Title	Current Status	Current Status Description/Explanation	Keep for Updated Plan?	Updated Action Title/Description (if applicable)
1.01	Develop plans to protect cultural assets.	Completed + To Be Continued	Mitigation plan completed for all new projects as standard practice. This is a cultural obligation.	NO - explanation provided at left	
1.02	Identify cultural sites.	Completed + To Be Continued	Cultural Committee does this work with support of consultants. They continue to identify new areas.	NO - explanation provided at left	
1.03	Archive Tribal files and sensitive documents in an off-site location.	Completed + To Be Continued	IT is saving documents to the Cloud. Planning Department has mapping software instead of putting documents in a vulnerable location.	NO - explanation provided at left	
2.01	Repair the well at Tribal Headquarters and install a hand pump.	Completed	Working on CVWD water lines but can use Tribal well in an emergency if necessary. Can hook-up to a back-up well with a generator in a disaster situation.	NO - explanation provided at left	
2.02	Develop a hazard response plan.	Completed	This plan was recently completed and approved by Tribal Council.	NO - explanation provided at left	
2.03	Develop a fuel reduction program that includes an assessment of current Tribal properties and a plan to maintain defensible space annually.	Partially Completed / In Progress	Have a Community Fire Prevention Grant and the Public Works Department maintains the Tribal roads.	NO - explanation provided at left	
2.04	Develop a system to mitigate wildfire risk that includes a fully staffed	Partially Completed	A refurbished engine was donated. Training has occurred. Tribe may have people enter a training program. The	NO - explanation provided at left	

Action #	Action Title	Current Status	Current Status Description/Explanation	Keep for Updated Plan?	Updated Action Title/Description (if applicable)
	fire house, a wildfire attack vehicle and fire hydrants in densely populated areas.	/ In Progress	Tribe would like to have a Fire Department but the ability for the Tribe to have a fully funded and trained department is a question.		
2.05	Develop evacuation plans for Senior Center and the Child Care Center.	Completed	Completed as part of the Emergency Operations Plan.	NO - explanation provided at left	
2.06	Increase capacity for emergency response and mitigation on the Reservation by establishing a fire department, CERT team and a Mobile Health Clinic.	Partially Completed / In Progress	CERT team is organized, and the state has given the Tribe a grant to develop this team. Indian Health Services is present on the Reservation.	YES - updated/revised description provided at right, if applicable	Increase capacity for all phases of emergency management on the Reservation by strengthening the CERT.
2.07	Install a gas pump with a back-up generator at Tribal Headquarters for Tribal vehicles.	Completed	Tribe installed a 100 gallon tank on a mobile truck.	NO - explanation provided at left	
2.08	Prevent illegal dumping on the Reservation and expand areas of defensible space. Clean up around homes.	Partially Completed / In Progress	Monitor the Reservation with trail cameras and do in-person checks. The number of boundaries and acres is prohibitive due to the checkerboard of the Reservation.	YES - updated/revised description provided at right, if applicable	Prevent illegal dumping on the Reservation and expand areas of defensible space. Clean up around homes.
2.09	Purchase vehicles with large capacity to assist with evacuations.	Completed + To Be Continued	Tribe has purchased a short bus. They also have several F250 trucks. The Senior Center has some transportation capacity.	NO - explanation provided at left	
2.101	Develop a program to remove brush and debris	Completed + To Be Continued	Community Fire Grant Program has funded this, and it will continue. The BIA	YES - updated/revised description	Develop a program to remove brush and debris

Action #	Action Title	Current Status	Current Status Description/Explanation	Keep for Updated Plan?	Updated Action Title/Description (if applicable)
	from around senior homes.		funds the Hazardous Fuel Reduction Program.	provided at right, if applicable	from around senior homes.
2.11	Assess safety and vulnerability of each building.	Completed + To Be Continued	Facility Team has been checking building by building and it will keep going.	NO - explanation provided at left	
2.12	Drone Acquisition	Partially Completed / In Progress	Tribe has purchased drones and is working toward licensure.	NO - explanation provided at left	
3.01	Establish a Tribal law enforcement department trained in mitigating natural hazard risk.	Canceled	The Tribe has decided not to create a Tribal Law Enforcement Department/Tribal Ranger Program.	NO - explanation provided at left	
3.02	Purchase tents or portable homes for use during disasters.	Delayed	The Tribe provides hotel rooms as necessary. The Tribe would like to mimic the system that Morongo has. This is not considered a mitigation action and will be included in a response planning plan.	NO - explanation provided at left	
3.03	Establish the Casino as a meeting area and respite area during power outages, high heat and other natural hazard events.	Delayed	To date the Casino does not have this official designation. The Casino may be a little far for use as a meeting area.	YES - updated/revised description provided at right, if applicable	Establish the Casino as a meeting area and respite area during power outages, high heat and other natural hazard events.
3.04	Purchase generators for the Gym, Tribal Hall and Church at Avenue 64.	Completed	Generators have been installed.	NO - explanation provided at left	
3.05	Protect electrical and HVAC equipment from wind-blown dust and	Completed + To Be Continued	The Facilities Department routinely clears debris from HVAC equipment.	NO - explanation provided at left	

Action #	Action Title	Current Status	Current Status Description/Explanation	Keep for Updated Plan?	Updated Action Title/Description (if applicable)
	debris by sealing all areas with potential for debris damage.				
3.06	Raise buildings in the floodplain to comply with FEMA flood maps.	Canceled	Not realistic for the Tribe.	NO - explanation provided at left	
3.07	Check air quality conditions inside all homes and buildings on the Reservation.	Partially Completed / In Progress	Natural Resources handles all air quality. An indoor air quality program is starting in the next fiscal year. Tribe did receive a grant that they used to purchase filters and air purifiers for seniors and children with asthma and health issues.	YES - updated/revised description provided at right, if applicable	Establish and Indoor Air Quality Program on the Reservation.
3.08	Determine the feasibility of a Mobile Health Clinic that could be used pre- and post-disaster.	Canceled		NO - explanation provided at left	
4.01	Develop a natural hazards mitigation awareness training program that includes education for seniors and Tribal members. Include preparedness and risk reduction materials and posters in all Tribal buildings.	Partially Completed / In Progress	Natural Resources has presented to the seniors on water bottle safety. Air quality information and training exists on a regular basis.	YES - updated/revised description provided at right, if applicable	Develop a natural hazards mitigation awareness training program that includes education specifically for seniors and Tribal members.
4.02	Develop a list of bug out bag supplies and post it to the Tribal website. Make bug out bag	Delayed	The website does not include this information due to staff turnover and Covid 19.	YES - updated/revised description provided at	Develop a natural hazards mitigation awareness training program that includes education specifically for

Action #	Action Title	Current Status	Current Status Description/Explanation	Keep for Updated Plan?	Updated Action Title/Description (if applicable)
	supplies available to Tribal members.			right, if applicable	seniors and Tribal members.
4.03	Purchase additional equipment for the Community Emergency Response Team (CERT).	Partially Completed / In Progress	Tribe has distributed Red Bags to each department.	YES - updated/revised description provided at right, if applicable	Increase capacity for all phases of emergency management on the Reservation by strengthening the CERT.
4.04	Distribute safety kits to Tribal residents.	Delayed	This has not occurred due to time constraints and funding.	YES - updated/revised description provided at right, if applicable	Develop a natural hazards mitigation awareness training program that includes education specifically for seniors and Tribal members.
4.05	Develop a bug out bag list of supplies and post it on the Tribal website.	Delayed	The website does not include this information due to staff turnover and Covid 19.	YES - updated/revised description provided at right, if applicable	Develop a natural hazards mitigation awareness training program that includes education specifically for seniors and Tribal members.
4.06	Educate Tribal staff about their responsibility to Tribal members and residents during a disaster.	Delayed	This has not occurred due to time constraints and funding.	YES - updated/revised description provided at right, if applicable	Develop a natural hazards mitigation awareness training program that includes education specifically for seniors and Tribal members.

Action #	Action Title	Current Status	Current Status Description/Explanation	Keep for Updated Plan?	Updated Action Title/Description (if applicable)
4.07	Start household hazardous waste education and removal program for residents.	Delayed	This has not occurred due to time constraints and funding. Focus to date has been on illegal dumping.	YES - updated/revised description provided at right, if applicable	Start household hazardous waste education and removal program for residents.
4.08	Provide disaster information pamphlets to all homes on the Reservation.	Partially Completed / In Progress	Distribution of emergency preparedness is given out through social media.	YES - updated/revised description provided at right, if applicable	Develop a natural hazards mitigation awareness training program that includes education specifically for seniors and Tribal members.
4.09	Create community outreach campaign to educate residents about water conservation and water safety.	Completed + To Be Continued	Flyers, social media, and meetings at pre-established events do occur.	NO - explanation provided at left	
4.101	Use the Tribal website for promoting hazard mitigation, and emergency management education.	Partially Completed / In Progress	Unfortunately, no proper information is posted on our official website; most information regarding disasters goes through Facebook.	YES - updated/revised description provided at right, if applicable	Use the Tribal website for promoting hazard mitigation, and emergency management education.
4.11	Increase capacity for Tribal council to understand hazard mitigation principles and practices by updating them on status of	Delayed	As of now there have been no updates of hazard mitigation to Tribal council.	YES - updated/revised description provided at right, if applicable	Increase capacity for Tribal council to understand hazard mitigation principles and practices by updating them on status of

Action #	Action Title	Current Status	Current Status Description/Explanation	Keep for Updated Plan?	Updated Action Title/Description (if applicable)
	mitigation actions quarterly.				mitigation actions quarterly.
4.12	Develop regular training program for CERT team.	Delayed	The CERT team has been delayed.	YES - updated/revised description provided at right, if applicable	Increase capacity for all phases of emergency management on the Reservation by strengthening the CERT.
4.13	Start Teen CERT training.	Delayed	The CERT team has been delayed.	YES - updated/revised description provided at right, if applicable	Increase capacity for all phases of emergency management on the Reservation by strengthening the CERT.
4.14	Emergency manager will receive training in Emergency Management Software, WebEOC and SALUS.	Partially Completed / In Progress	Some staff have attended trainings, but staff turn-over has occurred.	YES - updated/revised description provided at right, if applicable	Expand the expertise of the Emergency Response Manager through training.
4.15	Participate in SoCal Shakeout Drill.	Completed + To Be Continued	Tribe has not done this each year but is interested in continuing.	YES - updated/revised description provided at right, if applicable	Participate in SoCal Shakeout Drill and complete a full scale exercise.
5.01	Develop governance, a regulatory action, that requires areas around buildings to be free of brush and debris.	Completed	Tribe has a resolution passed by Tribal Council to prohibit storage of hazardous materials. The Mobile Home Ordinance defines keeping hazardous materials away from the home.	NO - explanation provided at left	

Action #	Action Title	Current Status	Current Status Description/Explanation	Keep for Updated Plan?	Updated Action Title/Description (if applicable)
5.02	Develop governance that Tribe will meet all California building codes. In addition, update sprinkler systems in all Tribally owned buildings.	Partially Completed / In Progress	Fire suppression system being installed in the kitchen of the Senior Center.	YES - updated/revised description provided at right, if applicable	The Tribe's building code policy must be formalized to mitigate multiple hazard risks including extreme cold, fire, high winds, and earthquakes.
5.03	Hire a PDM Coordinator to assist in implementing action goals, administrative assistance for mitigation process.	Completed	Tribe has created an Emergency Manager Position.	NO - explanation provided at left	
5.04	Expand capacity to make good land use decisions by increasing GIS capabilities of the Planning and Information Technology Departments.	Partially Completed / In Progress	Tribe has started training staff in GIS. They also hired a part-time GIS technician who is taking courses with BIA.	YES - updated/revised description provided at right, if applicable	Expand capacity to make good land use analysis by increasing GIS capabilities of the Planning Department.
5.05	Develop a protocol for evaluating and approving development in hazardous areas.	Partially Completed / In Progress	Environmental review is required for building.	NO - explanation provided at left	
6.01	Establish a system for emergency communication and install radio repeaters throughout the Reservation. Coordinate with other Tribes in the region.	Delayed	At this point in time, the Tribe does not have repeaters but they are setting brand new radios and will provide to staff who go out into the field.	YES - updated/revised description provided at right, if applicable	Establish a system for emergency communication and install radio repeaters throughout the Reservation. Coordinate with other Tribes in the region.

Action #	Action Title	Current Status	Current Status Description/Explanation	Keep for Updated Plan?	Updated Action Title/Description (if applicable)
6.02	The CERT team will participate in regional emergency management trainings and drills.	Partially Completed / In Progress	Currently enrolling in CERT Training	YES - updated/revised description provided at right, if applicable	Increase capacity for all phases of emergency management on the Reservation by strengthening the CERT.
6.03	Collaborate with other tribes to develop a system for Tribal insurance claims.	Completed	The Tribe works with Amerind for insurance claims.	NO - explanation provided at left	
6.04	Maintain Memorandums of Understanding with adjacent communities and first responders for disaster assistance.	Partially Completed / In Progress	At this moment in time, the Tribe meets with counter-parts to provide updates on where each Tribe stands and how we can benefit from helping each other.	YES - updated/revised description provided at right, if applicable	Maintain Memorandums of Understanding with adjacent communities and first responders for disaster assistance.

C4. Does the plan identify and analyze a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with emphasis on new and existing buildings and infrastructure? [44 CFR § 201.7(c)(3)(ii)]

Identifying and analyzing mitigation actions was the responsibility of the TPMPT. They considered three main questions related to historical hazards, new development and their goals when identifying mitigation actions. These questions are listed below.

1. Where has the community been negatively impacted by natural hazards in the past and where does the risk assessment indicate potential trouble exists?

2. What can the Tribe do to mitigate risk due to new development and climate change?

3. What mitigation actions can the Tribe identify to meet their identified goal statements?

Then the Steering Committee considered additional mitigation actions. Mitigation actions represent specific activities the Tribe intends to accomplish to reduce or eliminate risk to natural hazards in alignment with the four goals above. All the mitigation actions are classified into one of four categories: Plans and Regulations, Structure and Infrastructure Projects, Natural Systems Protection, and Education and Awareness Programs. These categories are shown in Table 65 below and are taken from FEMA's Tribal Mitigation Planning Handbook.[147] The consulting team shared these definitions with the Steering Committee to educate them about the different types of mitigation actions that are possible. The chosen mitigation actions are included below and in Appendix C with their associated Action Category.

Table 65. Mitigation Action Categories.

Mitigation Action Categories	
Plans and Regulations	Government authorities, policies, or codes that encourage risk reduction, such as building codes and State planning regulations. This may also include planning studies.
Structure and Infrastructure	Modifying existing structures and infrastructure or constructing new structures to reduce the impact of hazards.
Natural Systems Protection	Minimize losses while reserving or restoring the function of natural systems.
Education and Awareness	Long-term, sustained programs to inform and educate Tribal members and stakeholders about hazards and mitigation options. This category could also include training.

In addition to considering the four mitigation action categories, the Steering Committee considered hazards impacting the Tribe and referred to the problem statements in Chapter 4.

[147] Tribal Mitigation Planning Handbook, page 33.

6.3 MITIGATION ACTION PLAN

C5. Does the plan contain an action plan that describes how the actions identified will be prioritized, implemented, and administered by the Tribal government? [44 CFR § 201.7(c)(3)(iii)]

The TPMPT considered each of the types of mitigation actions for each identified problem. Mitigation actions that mitigated the risks of high risk hazards such as Earthquake, Extreme Heat, and Wildfire were specifically considered. They also focused on actions that support the elderly, the built environment and infrastructure. The resulting list of mitigation actions includes at a minimum one action for each hazard identified. In several instances, multiple actions address and identified hazard and problem.

The TPMPT had the job to create a cost-effective mitigation action plan that included projects to address all identified hazards, areas of risk and vulnerable assets. An online Mitigation Action Tracker was an online spreadsheet with separate cells showing each action's essential details. These column labels (essential details) listed below are included to facilitate the Tribe's ability to sort through the actions as well as to apply for grant funding.

Table 66. Essential Details for Mitigation Actions.

Essential Details	Detail Description
Action Title	Typically, a short description of the mitigation action.
Action Description	A detailed description of the action that includes the purpose or what natural hazard or problem may be mitigated by implementing the mitigation action.
Action Lead	A position in Tribal government responsible for implementing the action.
Supporting Organizations	A possible list of supporting partners, these may be Tribal departments, regional organizations, state agencies or adjacent communities.
Potential Funding Source(s)	A list of possible grant sources or the location in the Tribe's budget for the funding necessary to implement the mitigation action.
Implementation Schedule	A timeline within 5 years (the life of the plan) that the Tribe hopes to implement the action.
Estimated Cost	An estimated cost designated as high, medium, or low. The Tribe considered these cost "buckets" because it is impossible to identify an exact cost for each mitigation action.
Hazard(s) Addressed	All the natural hazards that the action may mitigate are listed.

6.3.1 PRIORITIZATION SYSTEM FOR MITIGATION ACTIONS

After developing the list of actions, the Steering Committee worked with the Consulting Team to classify the mitigation actions into high, medium, and low priorities. A point system was devised based on FEMA's Tribal Mitigation Planning Handbook and Mitigation Action Evaluation and Prioritization Worksheet. The point system used to prioritize the actions is different than the one used in the previous Hazard Mitigation Plan. This system more closely matches those used for local and state governments and includes more specific criteria such as equity, critical facilities, and natural resource protection. The following criteria and point system were considered. Based on the point system the most points an action could receive is 22 and the lowest number of points is 3. Actions with higher number were considered higher priority.

Table 67. Prioritization Criteria.

Criteria Category	Description	Detailed Ranking and Associated Points
Hazards Addressed	What level of hazards does the measure provide protection against?	High (Earthquake, Extreme Heat, Wildfire, Dust Storm and Wind Erosion) = 3 Medium (Drought, Flooding and Levee Failure, Severe Storm, Infectious Disease, Extreme Cold, Tornado, Invasive Species, Hazardous Material Incident) = 2 Low (Subsidence) = 1
Approximate Cost	How much will the measure cost to implement?	Low (Under $25k) = 3 Medium ($25k - $250k) = 2 High over $250k) = 1
Implementation Timeline	How long will it take for the measure to convey its benefits from the start of implementation efforts?	1-2 Years= 3 3-4 Years= 2 5 or More Years= 1
Equity Focus	Does the measure support seniors or other vulnerable populations?	Direct Support = 3 Indirect Support = 2 No Support = 0
Protection of Lives	How effective is the measure in protecting lives and mitigating injuries resulting from the targeted hazard(s)?	Direct Support = 3 Moderate Indirect Support = 2 Minor Indirect Support = 1 None = 0
Protection of Critical Facilities and Infrastructure	Does the measure provide protection of critical facilities and infrastructure?	Yes = 3 No = 0
Protection of Natural Resources	Does the measure provide protection of natural resources?	Yes = 2 No = 0
Alignment with Tribal Objectives	Does the measure align with the Tribe's objectives?	Yes =2 No =0

Using the point system, the TPMPT determined that high priority actions scored over 16, the medium actions had a score of 12-15, and low priority actions were under 11. The TPMPT reviewed the list of prioritized actions several times. Consistent with a planning process that included qualitative and quantitative analysis, actions were carefully discussed, and results amended to meet the needs of the Tribe. The results of the scoring are included in Appendix C. The scoring system clarified the benefit-cost ratio of the actions and emphasized actions that significantly impact public safety. The Tribe and the TPMPT recognize that actions will not necessarily be implemented in the exact order of priority, but in the order that they receive support and funding.

All the mitigation actions are listed in order of priority, in the table below, with their responsible department, partner departments, estimated cost, possible funding sources, timeline for implementation, hazards addressed, if critical facilities are protected, and what type of mitigation action is represented.

Implementing the mitigation actions is a priority for the Tribe. The Tribe will implement the mitigation actions that require funding as funding becomes available. They have worked closely with FEMA to understand and apply for grant funding.

Table 68. Mitigation Actions.

1	**Install a fence around Reservation property.**	
High	**Action Description**	A fence is a good way for the Tribe to prevent dumping and intruders. It is added security for the TMDCI Government.
	Lead Position	Facilities Director
	Supporting Agencies	Environmental Protection Agency, Department of Homeland Security: Center for Prevention Programs and Partnerships, FEMA BRIC
	Cost	High
	Potential Funding Sources	Environmental Protection Agency, FEMA BRIC, FEMA Nonprofit Security Grant Program, DHS: Targeted Violence and Terrorism Prevention, FEMA Homeland Security Grant Prog
	Hazards	Wildfire
	Implementation Schedule	2025-2028

2	**Protect water supply infrastructure from drought, contamination and other hazards. Implement water restrictions if necessary.**	
High	**Action Description**	Regularly test water quality from the drinking water wells and treat the water as necessary for contaminants. Develop back-up water supplies for periods of drought.
	Lead Position	Facilities Director
	Supporting Agencies	Natural Resources Department, Environmental Protection Agency
	Cost	Medium
	Potential Funding Sources	Environmental Protection Agency: Safe Drinking Water Act, Water Pollution Control (Section 106) Grants, Water Quality Management Planning Grants, CA Nonprofit Security Grant Program,
	Hazards	Drought
	Implementation Schedule	2027-2029

3	**Coordinate with the BIA, Riverside County, CAL FIRE and other partners on the development, maintenance, and implementation of a Hazardous Fuels Management Plan to mitigate wildfire hazards. Explore the need for a more robust Community Wildfire Protection Plan (CWPP) for specific areas of concern.**	
High	**Action Description**	A community wildfire protection plan (CWPP) is a means of bringing local solutions to wildland fire management. In developing and implementing CWPPs, communities assume a leadership role in reducing wildfire risk on federal and nonfederal land.
	Lead Position	Emergency Response Manager
	Supporting Agencies	Emergency Response Manager, Bureau of Indian Affairs
	Cost	Medium
	Potential Funding Sources	USDA: Wildfire Defense Grant
	Hazards	Wildfire
	Implementation Schedule	2026-2028

4	**Develop a formalized collaboration with the Bureau of Indian Affairs to mitigate risk of wildfires.**	
High	**Action Description**	The BIA has the resources to collaborate with TMDCI to mitigate the wildfire risk.
	Lead Position	Emergency Response Manager
	Supporting Agencies	Bureau of Indian Affairs, CAL FIRE
	Cost	Low
	Potential Funding Sources	Tribal Emergency Management Budget
	Hazards	Wildfire
	Implementation Schedule	2025-2030

5	**Participate in SoCal Shakeout Drill and complete a full scale exercise.**	
High	**Action Description**	Participate in SoCal Shakeout Drill in order to create awareness for employees to be prepared for an emergency, minimize chaos in the event of a disaster, earthquake, or flooding. Prepare each employee in the following areas: what to do in the event of a disaster, where to meet after an event, and have CERT team ready.

	Lead Position	Emergency Response Manager
	Supporting Agencies	Tribal Administrator
	Cost	Low
	Potential Funding Sources	Tribal Emergency Management Budget
	Hazards	Earthquake
	Implementation Schedule	2025-2026

6	**Develop an Extreme Heat Emergency Plan to protect residents and staff in times of extreme heat.**	
High	**Action Description**	Extreme heat is a public health risk to everyone especially the sick, elderly, and infants. An Extreme Heat Emergency Plan will include mitigation actions such as providing air conditioning, opening cooling centers and retrofitting buildings with proper insulation.
	Lead Position	Emergency Response Manager
	Supporting Agencies	Senior Center Coordinator, Indian Health Services
	Cost	Low
	Potential Funding Sources	FEMA BRIC
	Hazards	Extreme Heat
	Implementation Schedule	2025-2026

7	**Establish an Indoor Air Quality Program on the Reservation.**	
High	**Action Description**	Establish an Indoor Air Quality Program on the Reservation. Aim to prevent exposure to allergens within homes and Tribal buildings to decrease asthma and COPD symptoms.
	Lead Position	Natural Resources Manager
	Supporting Agencies	Indian Health Services, Environmental Protection Agency
	Cost	High
	Potential Funding Sources	Environmental Protection Agency: American Indian Air Quality Training Program
	Hazards	Dust and Wind
	Implementation Schedule	2027-2029

8	Develop a program to remove brush and debris from around senior homes.	
High	Action Description	Enact program to remove brush and debris from around senior homes to mitigate fire risk. Establish and enforce regulations to keep 100 feet clearance of brush, trash, and foliage from around homes.
	Lead Position	Facilities Director
	Supporting Agencies	Bureau of Indian Affairs, CAL FIRE
	Cost	Medium
	Potential Funding Sources	CAL FIRE Defensible Space Assistance Grant, U.S. Forest Service Cohesive Fire Strategy
	Hazards	Wildfire
	Implementation Schedule	2026-2027

9	Host annual vaccination clinics, remove areas of standing water, and educate the community about disease prevention.	
High	Action Description	Infectious disease can spread quickly through a small community. To prevent infectious disease the Tribe must closely monitor the region and national reports of spreading disease so they may respond quickly. Mitigating the risk also includes removing areas of standing water and offering vaccination clinics.
	Lead Position	Emergency Response Manager
	Supporting Agencies	Tribal Health Services
	Cost	Low
	Potential Funding Sources	Indian Health Services, National Indian Health Board
	Hazards	Infectious Disease
	Implementation Schedule	2025-2026

10	Expand the emergency alert system for all residents and include a program to educate residents about how to shelter-in-place or evacuate if necessary.	
High	Action Description	Many homes on the Reservation do not have basements for residents to retreat to during a tornado. Residents must become aware of the tornado risk and how receive and respond to warnings of the tornado threat.
	Lead Position	Emergency Response Manager

	Supporting Agencies	Tribal Administrator
	Cost	Medium
	Potential Funding Sources	FEMA BRIC
	Hazards	Tornado
	Implementation Schedule	2025-2026

11	**Clear properties of debris and remove dead trees.**	
Medium	**Action Description**	High winds and hail events have historically caused damage in the region. To prevent damage to critical facilities, cultural sites, and the built environment the Tribe will build to the California Building Code, clear properties of debris that may become airborne and remove dead trees.
	Lead Position	Facilities Director
	Supporting Agencies	Bureau of Indian Affairs, CAL FIRE
	Cost	Medium
	Potential Funding Sources	Bureau of Indian Affairs: Division of Wildland Fire Management
	Hazards	Severe Storm
	Implementation Schedule	2025-2028

12	**Develop a natural hazards mitigation awareness training program that includes education specifically for seniors and Tribal members.**	
Medium	**Action Description**	Expand the Tribal website to include hazard mitigation and emergency management education. Include preparedness and risk reduction materials and posters in all Tribal buildings. Distribute educational materials, conduct public meetings, and address safety at Tribal gatherings.
	Lead Position	Facilities Director
	Supporting Agencies	Natural Resources Department, Senior Center Coordinator, Facilities Department
	Cost	Low
	Potential Funding Sources	FEMA BRIC, Listos California CERT Support Grant (LC) Program
	Hazards	All Hazards

	Implementation Schedule	2025-2030

13	**Expand the expertise of the Emergency Response Manager through training.**	
Medium	**Action Description**	Consider requiring the Emergency Response Manager to take online and in-person classes through FEMA's Emergency Management Institute. Train should include Emergency Management Software such as WebEOC and SALUS.
	Lead Position	Emergency Response Manager
	Supporting Agencies	Emergency Management Institute
	Cost	Low
	Potential Funding Sources	CA Emergency Management Performance Grant (EMPG)
	Hazards	All Hazards
	Implementation Schedule	2025-2030

14	**Prevent illegal dumping on the Reservation and expand areas of defensible space. Clean up around homes.**	
Medium	**Action Description**	Enact plan to address debris removal and illegal dumping in residential areas and vacant Tribal land with the aim of reducing the risk of fire.
	Lead Position	Facilities Director
	Supporting Agencies	Bureau of Indian Affairs, CAL FIRE
	Cost	High
	Potential Funding Sources	CalRecycle: Illegal Disposal Site Abatement Grant Program, CAL FIRE Wildfire Prevention Grants, EPA Pollution Prevention Grant
	Hazards	Wildfire
	Implementation Schedule	2025-2030

15	**Mitigate risk to the built environment and groundwater wells from subsidence.**	
Medium	**Action Description**	Develop a plan to mitigate risk to structures and infrastructures in areas identified at risk to subsidence.
	Lead Position	Water Operator

	Supporting Agencies	Tribal Administration
	Cost	Medium
	Potential Funding Sources	Environmental Protection Agency
	Hazards	Subsidence
	Implementation Schedule	2028-2030

16	**Start household hazardous waste education and removal program for residents.**	
Medium	**Action Description**	Remove electronic waste and prevent illegal dumping on the Reservation. Provide household waste education and removal program for residents.
	Lead Position	Natural Resources Manager
	Supporting Agencies	Bureau of Indian Affairs, CAL FIRE
	Cost	Low
	Potential Funding Sources	Tribal Emergency Management Budget
	Hazards	Hazardous Materials and Radon Gas
	Implementation Schedule	2026-2028

17	**Increase capacity for Tribal Council to understand hazard mitigation principles and practices by updating them on status of mitigation actions quarterly.**	
Medium	**Action Description**	Meet with the Tribal Council on a quarterly basis to update them regarding the implementation of mitigation actions. These meetings will also create an opportunity to discuss hazard mitigation in general.
	Lead Position	Emergency Response Manager
	Supporting Agencies	Emergency Response Manager
	Cost	Low
	Potential Funding Sources	Tribal Administrator Budget
	Hazards	All Hazards
	Implementation Schedule	2025-2030

18	**The Tribe's building code ordinance must be updated to mitigate multiple hazard risks including extreme cold, fire, high winds, and earthquakes.**	
Medium	**Action Description**	Through updating the building code ordinance, the Tribe can install present-time sprinkler systems for all Tribally owned buildings and ensure those buildings upgrade insulation to protect from extreme heat and cold.
	Lead Position	Planning Director
	Supporting Agencies	Facilities Department
	Cost	High
	Potential Funding Sources	FEMA BRIC
	Hazards	Extreme Cold Building Codes
	Implementation Schedule	2026-2030

19	**Create a microgrid for the Tribal Administration complex.**	
Medium	**Action Description**	Power loss is not uncommon on the Reservation due to rolling black outs and natural hazards. A microgrid will ensure the Tribe remains operational.
	Lead Position	Facilities Director
	Supporting Agencies	Tribal Administrator, Planning Department
	Cost	High
	Potential Funding Sources	FEMA BRIC
	Hazards	Power Outage
	Implementation Schedule	2026-2030

20	**Establish permanent back-up power on all critical facilities, starting with the Emergency Operations Center.**	
Medium	**Action Description**	Identify which critical facilities need generators and install these emergency backup systems to automatically function.
	Lead Position	Facilities Director
	Supporting Agencies	Tribal Administrator
	Cost	High

	Potential Funding Sources	FEMA BRIC
	Hazards	Power Outage
	Implementation Schedule	2025-2030

21	**Increase capacity for all phases of emergency management on the Reservation by strengthening the CERT.**	
Medium	**Action Description**	Fund and support the CERT with training and equipment. Expand the team with outreach. Utilize the CERT team for assisting with mitigation projects.
	Lead Position	Emergency Response Manager
	Supporting Agencies	CA State CERT Administrator, Tribal Emergency Management
	Cost	Medium
	Potential Funding Sources	FEMA BRIC, Listos California CERT Support Grant (LC) Program
	Hazards	All Hazards
	Implementation Schedule	2025-2030

22	**Mitigate the flash flooding risk through a program that tracks the adequacy of culverts and the Reservation and remedies those deemed inadequate.**	
Low	**Action Description**	The Reservation is prone to flash flooding and operational culverts mitigate risk to the built environment.
	Lead Position	Facilities Director
	Supporting Agencies	Planning Department, Roads Department
	Cost	High
	Potential Funding Sources	FEMA BRIC
	Hazards	Flooding
	Implementation Schedule	2027-2029

23	**Maintain Memorandums of Understanding with adjacent communities and first responders for disaster assistance.**

Low	Action Description	Formalize a system of assistance to help ensure responders can assist the Reservation in the event of a disaster. MOU's can help with getting expedient assistance to Tribal rural areas.
	Lead Position	Emergency Response Manager
	Supporting Agencies	Tribal Administrator
	Cost	Medium
	Potential Funding Sources	Tribal Emergency Management Budget
	Hazards	All Hazards
	Implementation Schedule	2025-2026

24	Identify areas of cultural significance that are at risk to natural hazards and implement mitigation measures.	
Low	Action Description	The Tribe values their heritage and cultural artifacts and seeks to protect these.
	Lead Position	Cultural Director
	Supporting Agencies	Tribal Council
	Cost	High
	Potential Funding Sources	National Park Service: Tribal Heritage Grants
	Hazards	All Hazards
	Implementation Schedule	2026-2030

25	Establish the Casino as a meeting area and respite area during power outages, high heat and other natural hazard events.	
Low	Action Description	Ensure that the Casino can serve as a safe zone, temporary housing facility during disasters. Purchase a few larger generators for the Casino for this purpose.
	Lead Position	Emergency Response Manager
	Supporting Agencies	Tribal Administrator
	Cost	Medium
	Potential Funding Sources	FEMA BRIC
	Hazards	Power Outage

	Implementation Schedule	2026-2028

26	**Establish a system for emergency communication and install radio repeaters throughout the Reservation. Coordinate with other Tribes in the region.**	
Low	**Action Description**	Minimizes time to alert the community/employees during a emergency. Alert proper authorities promptly and enable communication with all employee and Tribal members in the event of an emergency Place equipment at certain areas or at the Multipurpose building at the Hill on Ave 64.
	Lead Position	Emergency Response Manager
	Supporting Agencies	Information Technology Department
	Cost	High
	Potential Funding Sources	CA Emergency Management Performance Grant (EMPG)
	Hazards	All Hazards
	Implementation Schedule	2025-2028

27	**Remove invasive species/plants and replace with drought and fire-resistant species.**	
Low	**Action Description**	To mitigate the risk of wildfires, drought, and extreme heat the Tribe will actively remove invasive species and plant drought and fire resistant trees and shrubs.
	Lead Position	Natural Resources Manager
	Supporting Agencies	Environmental Protection Agency
	Cost	High
	Potential Funding Sources	Environmental Protection Agency
	Hazards	Invasive Species
	Implementation Schedule	2027-2030

28	**Expand capacity to make good land use analysis by increasing GIS capabilities of the Planning Department.**

Low	**Action Description**	Hire a full-time GIS Specialist to use GIS for all-hazard analysis to assist Tribal Community planning, prepare for and adapt to climate change and natural hazards.
	Lead Position	Planning Director
	Supporting Agencies	BIA, US Department of the Interior, Indian Affairs Geospatial Support, TMDCI IT Department
	Cost	High
	Potential Funding Sources	Tribal Planning Department Budget, Emergency Management Planning Grant, Tribal Homeland Security Grant Program
	Hazards	All Hazards
	Implementation Schedule	2025-2030

Beyond addressing all potential natural hazard threats, the TPMPT considered mitigating risk to new and existing buildings and infrastructure. The TPMPT developed the following mitigation actions to address the risk to critical facilities, infrastructure, and the built environment. These actions address current and future buildings and infrastructure.

Table 69. Mitigation Actions Related to Critical Facilities.

Action #	Action Title
1	Install a fence around Reservation property.
2	Protect water supply infrastructure from drought, contamination and other hazards. Implement water restrictions if necessary.
15	Mitigate risk to the built environment and groundwater wells from subsidence.
19	Create a microgrid for the Tribal Administration complex.
20	Establish permanent back-up power on all critical facilities, starting with the Emergency Operations Center.
22	Mitigate the flash flooding risk through a program that tracks the adequacy of culverts and the Reservation and remedies those deemed inadequate.
24	Identify areas of cultural significance that are at risk to natural hazards and implement mitigation measures.
26	Establish a system for emergency communication and install radio repeaters throughout the Reservation. Coordinate with other Tribes in the region.

Table 70. Mitigation Actions Specifically for Vulnerable Populations.

Action #	Action Title
5	Participate in SoCal Shakeout Drill and complete a full scale exercise.
6	Develop a Extreme Heat Emergency Plan to protect residents and staff in times of extreme heat.

Action #	Action Title
8	Develop a program to remove brush and debris from around senior homes.
9	Host annual vaccination clinics, remove areas of standing water, and educate the community about disease prevention.
10	Expand the emergency alert system for all residents and include a program to educate residents about how to shelter-in-place or evacuate if necessary.
12	Develop a natural hazards mitigation awareness training program that includes education specifically for seniors and Tribal members.

6.4 POTENTIAL FUNDING SOURCES

C2. Does the plan include a discussion of Tribal funding sources for hazard mitigation projects and identify current and potential sources of Federal, Tribal, or private funding to implement mitigation activities? [44 CFR §§ 201.7(c)(3)(iv) and 201.7(c)(3)(v)]

Each of the mitigation actions includes potential funding sources. In addition to the sources listed with the mitigation actions, the Consulting Team developed the following list of Federal grant sources, the majority of these were shared with the Steering Committee during one of their meetings. As part of this process the Consulting Team developed and shared an Excel-based Mitigation Funding Sources worksheet that included all applicable funding sources from FEMA's 2021 Mitigation Resource Guide, in addition to other sources as encouraged through FEMA Grants website (www.fema.gov/grants). It is impossible to identify all grant sources, and this list does not include state or private sources.

Table 71. Possible Grant Sources for Mitigation Actions.

ABBREVIATION	PROGRAM NAME	DEPARTMENT / ORGANIZATION	AGENCY / OFFICE
AFGP	Assistance to Firefighters Grants Program	DHS	Federal Emergency Management Agency
BIA	Multiple Grant Sources	BIA	Bureau of Indian Affairs
BLM	Multiple Grant Sources	BLM	Bureau of Land Management
BPGF	Brownfields Program Grant Funding	EPA	U.S. Environmental Protection Agency
BRIC	Building Resilient Infrastructure and Communities	DHS	Federal Emergency Management Agency
CAP	Continuing Authorities Program	DOD	U.S. Army Corps of Engineers
CDBG - DR	Community Development Block Grant (CDBG) - Disaster Recovery	HUD	U.S. Department of Housing and Urban Development Housing and Urban Development
CDBG - MIT	Community Development Block Grant (CDBG) - Mitigation	HUD	U.S. Department of Housing and Urban Development Housing and Urban Development
CMHRG	Coastal and Marine Habitat Restoration Grants	Commerce	National Oceanic and Atmospheric Administration
CPRG	Climate Pollution Reduction Grants	EPA	U.S. Environmental Protection Agency
CRG	Coastal Resilience Grants	Commerce	National Oceanic and Atmospheric Administration
CSP	Conservation Stewardship Program	USDA	Natural Resources Conservation Service
Culvert AOP Program	National Culvert Removal, Replacement, and Restoration Grant Program	DOT	Federal Highway Administration
CWDP	Community Wildfire Defense Program	USDA	Forest Service
CWSRLF	Clean Water State Revolving Loan Fund	EPA	U.S. Environmental Protection Agency
DAPs	USDA Disaster Assistance Programs	USDA	Farm Service Agency
DRGs	Disaster Recovery Grants	DOI	National Park Service
DSMRP	Dam Safety Maintenance and Repair Program	DOI	Bureau of Indian Affairs

ABBREVIATION	PROGRAM NAME	DEPARTMENT / ORGANIZATION	AGENCY / OFFICE
DWSRF	Drinking Water State Revolving Fund	EPA	U.S. Environmental Protection Agency
EDA-DR	Economic Development Administration Disaster Recovery	Commerce	U.S. Economic Development Administration
EDA-DSF	EDA Disaster Supplemental Funding	Commerce	U.S. Economic Development Administration
EFCs	Environmental Finance Centers	EPA	U.S. Environmental Protection Agency
EJGTA	Environmental Justice, Grants and Technical Assistance	EPA	U.S. Environmental Protection Agency
EMBAG	Emergency Management Baseline Assessment Grant Program	DHS	Federal Emergency Management Agency
EMPG	Emergency Management Performance Grant	DHS	Federal Emergency Management Agency
EO	Emergency Operations	DOD	U.S. Army Corps of Engineers
EOC	Emergency Operations Center Grant Program	DHS	Federal Emergency Management Agency
EQIP	Environmental Quality Incentives Program	USDA	Natural Resources Conservation Service
ERP	Ecosystem Restoration Program	DOD	U.S. Army Corps of Engineers
ERP	Emergency Relief Program	DOT	Federal Highway Administration
EWPP	Emergency Watershed Protection Program	USDA	Natural Resources Conservation Service
FMA	Flood Mitigation Assistance Program	DHS	Federal Emergency Management Agency
FP&S	Fire Prevention and Safety Grant Program	DHS	Federal Emergency Management Agency
FPMS	Floodplain Management Services Program	DOD	U.S. Army Corps of Engineers
FSUWRGP	Five Star and Urban Waters Restoration Grant Program	National Fish and Wildlife Foundation	
GAC	Greening America's Communities	EPA	U.S. Environmental Protection Agency
HIP	Housing Improvement Program	DOI	Bureau of Indian Affairs
HMGP	Hazard Mitigation Grant Program	DHS	Federal Emergency Management Agency

ABBREVIATION	PROGRAM NAME	DEPARTMENT / ORGANIZATION	AGENCY / OFFICE
HPG	Housing Preservation Grants	USDA	Rural Development
ICWP	Inspection of Completed Works Program	DOD	U.S. Army Corps of Engineers
NAWCF	North American Wetland Conservation Fund	DOI	Fish and Wildlife Service
NCRF	National Coastal Resilience Fund	National Fish and Wildlife Foundation	
NEHRP	National Earthquake Hazards Reduction Program (FEMA)	DHS	Federal Emergency Management Agency
NGWSGP	Next Generation Warning System Grant Program (FEMA)	DHS	Federal Emergency Management Agency
PA 404/406	Public Assistance 404 and 406 Program	DHS	Federal Emergency Management Agency
RCP	Resilient Communities Program	National Fish and Wildlife Foundation	
SAFER	Staffing For Adequate Fire And Emergency Response Documents	DHS	Federal Emergency Management Agency
Section 108	Section 108 Loan Guarantee Program	HUD	U.S. Department of Housing and Urban Development
Section 319 Grants	Nonpoint Source Water Quality (Section 319) Grants	EPA	U.S. Environmental Protection Agency
Section 404 CWA	Section 404 of the Clean Water Act - Compensatory Mitigation	EPA	U.S. Environmental Protection Agency
Section 406 PMPs	Section 406 Pest Management Programs	USDA	National Institute of Food and Agriculture
Section 7721 PPA	Section 7721 of Plant Protection Act	USDA	Animal & Plant Health Inspection Service
SFC	Small Flood Control	DOD	U.S. Army Corps of Engineers
SGS	Smart Growth Support	EPA	U.S. Environmental Protection Agency
Silver Jackets	Silver Jackets	DOD	U.S. Army Corps of Engineers
SIRG	State Indoor Radon Grant Program	EPA	U.S. Environmental Protection Agency
SWPP	Source Water Protection Program	USDA	Farm Service Agency
TCRP	Tribal Climate Resilience Program	DOI	Bureau of Indian Affairs

ABBREVIATION	PROGRAM NAME	DEPARTMENT / ORGANIZATION	AGENCY / OFFICE
THSGP	Tribal Homeland Security Grant Program	DHS	Federal Emergency Management Agency
UWSG	Urban Waters Small Grants	EPA	U.S. Environmental Protection Agency
WaterSMART	WaterSMART Programs	DOI	Bureau of Reclamation
WEP	Water and Environmental Programs	USDA	Rural Development
WIRFC	Water Infrastructure and Resiliency Finance Center	EPA	U.S. Environmental Protection Agency
WMBP	Wetland Mitigation Banking Program	USDA	Natural Resources Conservation Service
WPPDG	Wetlands Protection Program Development Grants	EPA	U.S. Environmental Protection Agency
WSPCBGP	Wildfire Smoke Preparedness in Community Buildings Grant Program	EPA	U.S. Environmental Protection Agency

6.4.1 FEMA FUNDING SOURCES

The Federal Emergency Management Agency (FEMA) makes grant funding available for a range of mitigation activities via several Hazard Mitigation Assistance (HMA) programs. FEMA recognizes a nation-to-nation relationship with Tribal governments, and these grant programs provide funding for eligible mitigation activities that reduce disaster losses and protect life and property from future disaster damages. They are not intended to fund repair, replacement, or deferred maintenance activities but are rather designed to assist in developing long-term, cost-effective improvements that will reduce risk to natural hazards.

- **Building Resilient Infrastructure and Communities (BRIC)**
  BRIC is a new FEMA hazard mitigation program designed to replace the agency's former HMA Pre-Disaster Mitigation (PDM) grant program, aiming to categorically shift the federal focus away from reactive disaster spending and toward research-supported, proactive investment in community resilience. It is a result of recent amendments made to Section 203 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act (Stafford Act) by Section 1234 of the Disaster Recovery Reform Act of 2018 (DRRA). BRIC will support states, local communities, tribes, and territories as they undertake hazard mitigation projects reducing the risks they face from natural hazards. The BRIC program's guiding principles are supporting communities through capability- and capacity-building; encouraging and enabling innovation; promoting partnerships; enabling large projects; maintaining flexibility; and providing consistency.
- **Hazard Mitigation Grant Program (HMGP)**
  The HMGP is authorized under Section 404 of the Stafford Act. The HMGP provides grants to states, tribes, and local governments to implement long-term hazard mitigation measures after a major disaster declaration. The purpose of the HMGP is to reduce the loss of life and property due to natural disasters and to enable mitigation measures to be implemented during the immediate recovery from a disaster. A key purpose of the HMGP is to ensure that any opportunities to take critical mitigation measures to protect life and property from future disasters are not lost during the recovery and reconstruction process following a disaster. HMGP is typically available only in the months after a federal disaster declaration, as funding amounts are determined based on a percentage of the funds spent on FEMA's Public and Individual Assistance programs.
- **Flood Mitigation Assistance (FMA) Program**
  The FMA program was created as part of the National Flood Insurance Reform Act (NFIRA) of 1994 (42 U.S.C. 4101) with the goal of reducing or eliminating claims under the NFIP. FEMA provides FMA funds to assist states and communities with implementing measures that reduce or eliminate the long-term risk of flood damage to buildings, manufactured homes, and other structures insurable under the NFIP. The long-term goal of FMA is to reduce or eliminate claims under the NFIP through mitigation activities. One limitation of the FMA program is that it is generally used to provide mitigation for structures that are insured or located in Special Flood Hazard Areas (SFHAs) as mapped by FEMA. Federal funding for this nationally competitive grant

program is generally an annual allocation (subject to Congressional appropriation) and eligibility is linked to a community's good standing in the NFIP.

CHAPTER 7. PLAN MAINTENANCE AND IMPLEMENTATION

The Plan Maintenance and Implementation chapter outlines two critical pieces of the mitigation plan:

- A system for maintaining the mitigation plan.
- A system for monitoring the implementation of mitigation actions and the mitigation strategy.

The Emergency Response Manager is responsible for leading all efforts to maintain and implement the mitigation plan. This position is supported by the Tribal Administrator and Tribal Council. It is the responsibility of the Emergency Response Manager to keep the Tribal Administrator and Tribal Council apprised of the status of plan implementation. The Torres Martinez Desert Cahuilla Indians' Tribal Council understands the value of this plan, the value of mitigation, and the relationship of the Tribe with FEMA. They intend to continue updating this plan and implementing the plan's strategies.

The Tribal Pre-Disaster Mitigation Team established to oversee the development of this plan is tasked with overseeing implementation of the specific mitigation actions outlined in the Mitigation Strategy (Chapter 6), and it will be responsible for updating and maintaining the plan according to the guidelines below. The Tribal Pre-Disaster Mitigation Team includes Tribal government staff and key stakeholders who will use the plan's goals, as well as continued analysis of TMDCI's hazard risks and capabilities, to weigh the available resources against the costs and benefits for each mitigation action. The Tribe understands the value of this plan as a living document and is committed to using it to achieve its goal of becoming a more resilient community.

7.1 LESSONS LEARNED

The previous Tribal Multi-Hazard Mitigation Plan included a similar chapter regarding plan implementation and maintenance. Unfortunately, due to staff turnover, the COVID 19 Pandemic, and lack of financial resources the plan was not maintained or implemented well. The Tribal Pre-Disaster Mitigation Team recognizes that lack of implementation was not due to the system prescribed but to other extenuating circumstances. Therefore, a similar system has been developed for this plan. However, an addition to the system of public involvement has been made and includes quarterly meetings with the Bureau of Indian Affairs regarding wildfire mitigation (details below).

7.2 CONTINUED PUBLIC INVOLVEMENT

A7. Does the plan include a discussion of how the Tribal government will continue public participation in the plan maintenance process? [44 CFR § 201.7(c)(4)(iv)]

The Torres Martinez Desert Cahuilla Indians involved Tribal members, Reservation residents, regional stakeholders and the surrounding Tribal communities in their planning process for development of this plan. The continuous participation of Tribal members and other public stakeholders is an integral component of the mitigation planning process and will continue to be essential as this plan is implemented over time. Tribal leadership is committed to involving the public in plan implementation as well.

As part of this plan's Mitigation Strategy, the Tribal Pre-Disaster Mitigation Team has included several education and outreach mitigation actions designed to engage the public in the Tribe's emergency preparedness and risk reduction activities. This includes actions focused on general awareness of hazard risks, mitigation opportunities, and improved communication methods for both pre-disaster mitigation outreach and real-time emergency notifications.

The Tribal Pre-Disaster Mitigation Team intends to involve Tribal members and key stakeholders throughout the five-year implementation of this plan and through the review and update processes described in this chapter. The Emergency Response Manager will take the lead in soliciting continued public participation. This participation will take multiple forms, including all of those outlined in Chapter 3 of this plan. Efforts to involve the public will include:

- Periodic presentations at Tribal Council meetings to report on the plan's implementation progress.
- Providing an overview and regular updates on the plan at community gatherings and meetings.
- Advertising on the Tribe's website and posting news and announcements through Tribal newsletters and social media pages.
- Copies of this plan will remain on the Tribe's website and a hard copy will be kept in the Emergency Response Manager's office. Plan updates will also be posted to the Tribe's website.
- The Tribe will continue to coordinate with other tribes in the region, the Bureau of Indian Affairs, and other local and regional agencies through plan implementation.
- A targeted effort to engage seniors and vulnerable community members by working with the Senior Center and having meetings specifically for seniors and sending mailings directly to seniors will be made.

The Emergency Response Manager will host biannual meetings as mentioned above with the Tribal Pre-Disaster Mitigation Team. In addition, the Emergency Response Manager will meet quarterly with the Bureau of Indian Affairs (BIA) regarding plan implementation and wildfire mitigation. Regular meetings should help keep the Tribe on track to implementing mitigation actions with support of the BIA.
The Emergency Response Manager will represent the Tribe at county-wide emergency management meetings and at the So Cal Tribal Emergency Management Group. The Tribe will also engage county leaders regarding issues such as earthquake, flooding and wildfire mitigation. The continued collaboration with these stakeholders will bring success to mitigating risks on the Reservation.

7.3 METHOD AND SCHEDULE TO KEEP THE PLAN CURRENT

A6. Does the plan include a description of the method and schedule for keeping the plan current (monitoring, evaluating and updating the mitigation plan within the plan update cycle)? [44 CFR § 201.7(c)(4)(i)]

According to FEMA regulations, the Torres Martinez Desert Cahuilla Indians is required to formally update and adopt this plan every five years. However, a five-year update is considered inadequate to maintain a current and realistic plan. The Tribal Multi-Hazard Mitigation Plan is considered a living document. A continual process of monitoring, evaluating, and updating the plan needs to be in place. During a five-year period, policies and procedures at the federal and Tribal levels may prompt changes to the plan in terms of priorities and/or funding. In addition, a major disaster would prompt review and possible modifications to this plan.

The Tribal Pre-Disaster Mitigation Team led by the Emergency Response Manager recognize the importance of keeping the mitigation plan up to date. Keeping the plan current includes monitoring, evaluating, and updating the plan over a five-year period. The overall responsibility for monitoring the implementation of the plan rests with the Tribal Pre-Disaster Mitigation Team, led by the Emergency Response Manager.

7.3.1 MONITORING MITIGATION ACTIONS

***MONITORING** means tracking the implementation of the plan over time.*

The specific mitigation actions included in this plan's Mitigation Strategy (Chapter 6) serve as the primary guide for plan implementation. Together the Emergency Response Manager and the Tribal Pre-Disaster Mitigation Team will maintain the Mitigation Action Tracker (a tool to help monitor and record the status of each mitigation action). They will send a reminder email with a link to the web-based Mitigation Action Tracker twice per year (in June and December, in advance of semi-annual Tribal Pre-Disaster Mitigation Team meetings described below), to all Tribal department directors or other staff who have been assigned responsibility for a mitigation action, in addition to other relevant Tribal committees. They may also distribute the Mitigation Action Progress Worksheet (included in Appendix D) for those lead departments who prefer a form document over a digital spreadsheet.

The Tribe intends to seek FEMA mitigation funding for several projects. The Tribe intends to adhere to all FEMA requirements regarding grant implementation, reporting, and project closeout. The Emergency Response Manager will review FEMA's Hazard Mitigation Assistance Grant Closeout Field Guide,[148] March 20022 and the appropriate FEMA grant monitoring and closeout guidance from the list below:

- Hazard Mitigation Assistance Grant Monitoring Field Guide

[148] https://www.fema.gov/sites/default/files/documents/fema_hma-closeout-field-guide.pdf

- Hazard Mitigation Assistance Grant Closeout Field Guide
- Acquisition/Demolition/Relocation Closeout Checklist
- Community/Residential Safe Room Closeout Checklist
- Flood Risk Reduction Closeout Checklist
- Generator Closeout Checklist
- Mitigation Reconstruction Closeout Checklist
- Non-Residential Floodproofing Closeout Checklist
- Planning Closeout Checklist
- Wind Retrofit Closeout Checklist
- Wildfire Closeout Checklist
- Warning System Closeout Checklist

7.3.2 EVALUATING EFFECTIVENESS OF THE PLAN

> ***EVALUATING*** *means assessing the effectiveness of the plan at achieving its stated purpose and goals.*

The Emergency Response Manager will convene a meeting with the Tribal Pre-Disaster Mitigation Team to evaluate the planning process and make recommendations for plan updates and enhancements. This meeting will take place within three months of FEMA's Approval-Pending-Adoption designation of the plan. The Team will use the Mitigation Plan Evaluation Worksheet included in Appendix D: Implementation Plan Supporting Materials. This completed worksheet will be used by the team when the Tribe formally updates the plan annually. The Tribal Pre-Disaster Mitigation Team will review the effectiveness of the public outreach strategy, particularly the number of meetings held (both team and public), the public preparedness survey, and the communication methods used for interacting with stakeholders. The Tribal Pre-Disaster Mitigation Team will review the system for gathering mitigation actions and ranking their priority level. The meeting will conclude with a review of the plan to monitor and update the plan in the coming years. The Tribal Pre-Disaster Mitigation Team will seek to answer the following questions to determine if the plan is effective at mitigating risk to Tribal members, the built environment, and the natural environment.

- Does the list of mitigation actions coincide with the Tribe's current priorities? Do additional actions need to be added?
- Are mitigation actions on track with assigned implementation timeframes?

- Are there any issues that have limited the implementation of mitigation actions?
- Has the implementation of identified mitigation actions resulted in expected outcomes?
- Have any specific hazard risks or vulnerabilities changed since the last plan review?

7.3.3 UPDATING THE PLAN

> ***UPDATING** means reviewing and revising the plan at least once every five years.*

The Emergency Response Manager, with assistance from the Tribal Pre-Disaster Mitigation Team, will take the lead to revise the plan every five years for FEMA approval. In addition, following any disaster, the Tribal Pre-Disaster Mitigation Team will review the plan to make sure that the goals, objectives, and mitigation actions continue to meet the needs of the Tribe. If necessary, the goal statements and mitigation actions may be revised to reflect current Tribal priorities.

In addition, the Tribal Pre-Disaster Mitigation Team will discuss methods for continuing to integrate the mitigation plan with other plans, processes, and projects in the Tribe. The Tribal Pre-Disaster Mitigation Team will prepare a one-page brief following each semi-annual meeting to share with the Tribal Council and to post to the Tribe's website. The Tribal Pre-Disaster Mitigation Team recognizes the value in keeping the community and key stakeholders informed about the implementation and status of the mitigation plan.

7.3.3.1 FIVE-YEAR PLAN REVIEW AND UPDATE

The Tribe will conduct a comprehensive plan review, update, and re-adoption process on a regular five-year basis. This update will include a complete plan review and update process like the one used to develop this mitigation plan update. It will include a thorough review and update for all chapters of the plan, assuring the Risk Assessment, Capability Assessment, and Mitigation Strategy are kept current based on current information and best available data. This includes a complete update to the list of mitigation actions included in the Mitigation Strategy, while also addressing any changes in development, current land use practices, or methods for engaging the public and key stakeholders. New development in identified hazard areas, an increased exposure to hazards, the increase or decrease in capability to address hazards, and changes to federal or state legislation are examples of factors that may affect changes in the content of the current plan.

During the five-year plan review process, the following questions will be considered as criteria for assessing the effectiveness of the plan and potential improvements:

- Do the plan's existing mitigation goals and actions address current Tribal priorities and expected future conditions? What types of additional actions are needed?
- Has the nature or potential magnitude of hazard risks changed? How have hazard vulnerabilities increased or decreased since the last plan update?

- Are Tribe's current capabilities and resources adequate to implement the plan?
- Are there any issues that have limited the current implementation schedule? For example, are there implementation problems or barriers, such as technical, political, legal, financial, or coordination issues with other agencies or organizations?
- Has the implementation of identified mitigation actions resulted in expected outcomes?
- Can the Tribal Pre-Disaster Mitigation Team identify success stories of losses avoided (i.e., saving lives or protecting property) due to the implementation of hazard mitigation actions?
- Have any completed mitigation actions achieved benefits beyond the cost of mitigation?
- Can the Tribal Pre-Disaster Mitigation Team identify physical, social, environmental, or economic successes that have improved the Tribe's hazard or climate resilience?

The five-year plan review and update process will follow FEMA guidelines in effect at the time. The Tribal Pre-Disaster Mitigation Team will seek funding for the development of the plan update **two years** before the plan expires. The plan update process gives the Tribe the chance to add and/or re-prioritize mitigation actions based on current risk, capabilities, and public/stakeholder suggestions. The Emergency Response Manager will serve as the Project Manager for the plan update process.
The Emergency Response Manager will develop bi-annual implementation reports combined with any post-disaster write-up, which will serve as the Plan's annual update. These annual reports will be referenced toward generation of the plan update.

The figure below illustrates the plan implementation and update schedule.

Year 1

- Seek grant funding for mitigation actions.
- Gather the Tribal Pre-Disaster Mitigation Team in June and December as well as post-disaster.
- Develop bi-annual implementation report.

Year 2

- Seek grant funding for mitigation actions.
- Gather the Tribal Pre-Disaster Mitigation Team in June and December as well as post-disaster.
- Develop bi-annual implementation report.

Year 3

- Apply for FEMA BRIC funding for plan update.
- Seek grant funding for mitigation actions.
- Gather the Tribal Pre-Disaster Mitigation Team in June and December as well as post-disaster.
- Develop bi-annual implementation report.

Year 4

- Begin the plan update process.
- Seek grant funding for mitigation actions.
- Gather the Tribal Pre-Disaster Mitigation Team in June and December as well as post-disaster.
- Develop bi-annual implementation report.

Year 5

- Complete the plan update and adopt the new plan.
- Seek grant funding for mitigation actions.
- Gather the Tribal Pre-Disaster Mitigation Team in June and December as well as post-disaster.
- Develop bi-annual implementation report.

Figure 78. Plan implementation and update schedule.

7.3.3.2 POST-DISASTER PLAN REVIEW AND UPDATE

The Tribal Pre-Disaster Mitigation Team will use any post-disaster recovery period as a critical time to review and update mitigation actions. Following a disaster there will often be a window of opportunity for addressing specific hazard vulnerabilities in combination with immediate or unmet recovery needs resulting from the event, and this is also a period when Tribal member support for investing in hazard mitigation may be at its highest. If the Tribe experiences a large-scale disaster, the Emergency Response Manager will assembler the Tribal Pre-Disaster Mitigation Team to update the list of mitigation actions and review their order based on current Tribal needs and priorities.

7.4 INCORPORATION INTO OTHER PLANNING MECHANISMS

A5. Does the plan include a discussion on how the planning process was integrated to the extent possible with other ongoing Tribal planning efforts as well as other FEMA programs and initiatives? [44 CFR § 201.7(c)(1)(iv)]

***INTEGRATE** means to include hazard mitigation principles, vulnerability information and mitigation actions into other existing community planning to leverage activities that have co-benefits, reduce risk, and increase resilience.*

The Tribal Multi-Hazard Mitigation Plan is TMDCI's primary resource and strategy for mitigating risk. It details the risks to and vulnerabilities of Tribal critical facilities, Tribal lands, and the region. The TMDCI also recognizes that maintaining this plan is a way to integrate with state and FEMA mitigation programs. This plan was completed in accordance with the FEMA Tribal Mitigation Planning Handbook (2019), and when this plan is routinely adopted and approved per federal requirements, the TMDCI understands they will be eligible for pre- and post-disaster hazard mitigation funding.

***PLANNING MECHANISMS** refers to the governance structures used to manage local land use development and community decision-making, such as budgets, comprehensive plans, capital improvement plans, economic development strategies, climate action plans or other long-range plans.*

For the TMDCI to succeed in reducing hazard risks over the long term, the information, ideas, conclusions, and strategic recommendations of this hazard mitigation plan should be integrated throughout Tribal government operations. Effective integration means to include mitigation principles, vulnerability information, and mitigation actions into other existing Tribal planning mechanisms to leverage activities that have co-benefits, reduce risk, and increase resilience. Other Tribal plans and processes will present opportunities to address hazard mitigation in a way that can support multiple Tribal objectives, so an important part of maintaining and implementing this hazard mitigation plan will be to identify and capitalize on these opportunities to leverage activities that have co-benefits (including but not limited to risk reduction).

The Tribal Pre-Disaster Mitigation Planning Team (TPMPT) will remain tasked with helping to ensure that all new or updated Tribal planning mechanisms are informed by and consistent with the goals and actions of this hazard mitigation plan and will not contribute to increased hazard vulnerability for the Reservation. Specifically, this includes but is not limited to the implementation or future updates to the following Tribal plans or other relevant documents as identified and further described in Chapter 5 (Capability Assessment):

- Land Use, Zoning, & Development Plan
- Emergency Operations Plan
- Tribal Goals

- Departmental goals, priorities, or other relevant planning mechanisms

Additional opportunities to integrate the requirements of this plan into other Tribal planning mechanisms shall continue to be identified through the TPMPT's semi-annual meetings and through the five-year review process described in this chapter. Other planning mechanisms may include Tribal regulation or code enforcement procedures, internal Tribal policies, special projects or initiatives, and other routine Tribal government or community decision-making activities such as capital improvement planning and the Tribe's annual budget process. Emphasis for identifying these integration opportunities will be placed on those governance structures used to manage Tribal planning and project implementation in both the pre-disaster and post-disaster environment. Also, as it relates to implementing specific mitigation actions identified in this plan, it will be the responsibility of each assigned lead department to determine additional measures that can support action completion or enhancement. This includes integrating mitigation actions from this plan into other Tribal planning documents, processes, or mechanisms as deemed appropriate and most effective.

While it is recognized that there are many possible benefits to integrating components of this plan into other Tribal planning mechanisms, the routine maintenance of this stand-alone plan is considered by the Tribe to be the most effective and appropriate method to identify, prioritize, and implement local hazard mitigation actions. In moving forward, however, the TMDCI will consider the incorporation of other plan documents into the hazard mitigation plan, such as future iterations of the Torres Martinez Reservation Land Use Plan, Emergency Operations Plan, or other related emergency preparedness and resilience building efforts. The TMDCI will also participate in future updates to the Multi-Jurisdictional Hazard Mitigation Plans for Imperial and Riverside Counties with emphasis on aligning and integrating the Tribe's interests and mitigation goals, strategies, and actions across plans as much as possible.
To further promote more integrated mitigation planning, the Tribe's 5th mitigation goal statement is, "enact administrative or regulatory actions to reduce hazard losses." Several mitigation actions relate directly to this goal. Tribal governments frequently recognize safe building practices while they may not regulate building practices. The lack of regulation is not a lack of commitment.

This plan includes several mitigation actions to expand the capacity of the TMDCI to make land use decisions that consider hazard risk. These mitigation actions include The Tribe's building code ordinance must be updated to mitigate multiple hazard risks including extreme cold, fire, high winds, and earthquakes, to mitigate multiple hazard risks, expanding the GIS capabilities of the Planning Department, and increasing the capacity of Tribal leadership to understand hazard mitigation principles and practices. As the Tribal government develops or updates additional plans such as the Emergency Operations Plan, Land Use Plan or economic development plans, Tribal leadership will incorporate risk mitigation concepts and the goals of this plan. The oversight for this integration process rests with the Planning Director and the Tribal Administrator.

In addition to supporting the implementation of this plan, the Emergency Response Manager will participate in regional emergency management meetings as well as the So Cal Tribal Emergency

Management Group. The Tribal Grants Administrator will monitor FEMA announcements for grant opportunities, legislation updates, and conferences, and make the Tribal Administrator and the Emergency Response Manager aware of these opportunities and regulations as they become available.

7.5 RESPONSIBLE FOR PLAN IMPLEMENTATION AND MAINTENANCE

Torres Martinez Desert Cahuilla Indians

Angel I Ortega, Emergency Response Manager
66-725 Martinez Road
Thermal, CA
Phone: 760-397-0300 ext. 12016
Email: AlOrtega@tmdci-nsn.gov
Website: https://torresmartinez.org

ACRONYMS

AAL	Average Annual Loss
ACF	Annual Chance Flood
ACP	Asian Citrus Psyllid
AMS	American Meteorological Society
ASCE	American Society of Civil Engineers
BFE	Base Flood Elevation
BIA	Bureau of Indian Affairs
BLM	Bureau of Land Management
BRIC	Building Resilient Infrastructure and Communities
CAL FIRE	California Department of Forestry and Fire Protection
CDC	Centers for Disease Control and Prevention
CDFA	California Department of Food and Agriculture
CDPH	California Department of Health
CERT	Community Emergency Response Team
CLM	Citrus Leafminer
CVMC	Coachella Valley Mountains Conservancy
CVWA	Coachella Valley Water Authority
CWPP	Community Wildfire Protection Plan
DDT	Dichloro-Diphenyl-Trichloroethane
DFIRM	Digital Flood Insurance Rate Map
DHS	Department of Homeland Security
DMA 2000	Disaster Mitigation Act of 2000
DOI	Department of Interior
EHS	Extremely Hazardous Substance
EMPG	Emergency Management Performance Grant
EMS	Emergency Medical Services
ENSO	El Niño-Southern Oscillation
EOC	Emergency Operations Center
EOP	Emergency Operations Plan
EPA	Environmental Protection Agency
EPCRA	Emergency Planning and Community Right to Know Act
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
FMA	Flood Mitigation Assistance
FPA	Fire Program Analysis
FSA	Farm Service Agency
Fsim	Large Fire Simulator
GAP	General Assistance Program
GHG	Greenhouse Gas

GIS Geographic Information Systems
GPS Global Positioning System
HAZMAT Hazardous Materials
HLB Huanglongbing
HMA Hazard Mitigation Assistance
HMGP Hazard Mitigation Grant Program
HMP Hazard Mitigation Plan
HSA Hydrologic Service Area
HUD Housing and Urban Development
LGA Liquid Gallons
MDCA Multi-Criteria Decision Analysis
MLD Most Likely Descendant
MMI Modified Mercalli Intensity
MOU Memorandum of Understanding
NASA National Aeronautics and Space Administration
NCEI National Centers for Environmental Information
NFIP National Flood Insurance Program
NFPA National Fire Protection Association
NOAA National Oceanic and Atmospheric Administration
NWS National Weather Service
PDM Pre-Disaster Mitigation
PGA Peak Ground Acceleration
PHM Pink Hibiscus Mealybug
PHMSA Pipeline and Hazardous Materials Safety Administration
PPG Performance Partnership Grant
RCP Representative Concentration Pathway
SA Spectral Acceleration
SCAG Southern California Association of Governments
SHMP State Hazard Mitigation Plan
SILVIS Spatial Analysis for Conservation and Sustainability
SPC Storm Prediction Center
TANF Temporary Assistance to Needy Families
TERO Tribal Employment Rights Ordinance
THIRA Threat Hazard Identification and Risk Assessment
TMDCI Torres Martinez Desert Cahuilla Indians
TORRO Tornado and Storm Research Organization
TPDMT Tribal Pre-Disaster Mitigation Team
TRI Toxic Release Inventory
USACE United States Army Corps of Engineers
USDA United States Department of Agriculture
USDOT United States Department of Transportation
USGS United States Geological Survey

WHO	World Health Organization
WHP	Wildfire Hazard Potential
WMO	World Meteorological Organization
WUI	Wildland Urban Interface

APPENDIX

APPENDIX A: PLANNING PROCESS SUPPORTING MATERIALS

FACT SHEET

HAZARD MITIGATION PLAN UPDATE

TORRES MARTINEZ DESERT CAHUILLA INDIANS

FACT SHEET

The Torres Martinez Desert Cahuilla Indians (TMDCI) are updating their Tribal Multi-Hazard Mitigation Plan to meet FEMA requirements. This plan is designed to reduce risks from natural hazards and enhance community emergency preparedness.

FEMA REQUIREMENTS MET

- Approval by FEMA will make the Tribe eligible for pre- and post-mitigation project grant funding through FEMA's Hazard Mitigation Assistance (HMA) programs.
- This eligibility is crucial for leveraging outside funding for implementing hazard mitigation measures.

OPPORTUNITIES FOR PUBLIC PARTICIPATION

Public Meetings

- Two Public Meetings (October 2024, February 2025): To gather local knowledge of hazard events, and ideas for activities to increase resilience and reduce risk.

Tribal Pre-Disaster Mitigation Team (TPMT)

- A project leadership team consisting of Tribal department heads, business leaders, first responders, and tribal leaders.
- TPMT meets four times during the planning process to provide input and plan direction.

HAZARD MITIGATION PLAN UPDATE

TORRES MARTINEZ DESERT CAHUILLA INDIANS

Stakeholder Meetings

- One-on-one meetings with Tribal leaders to solicit their input and gather their priorities.
- This process will provide insights into the needs and capabilities of the Tribe and encourage community investment in the project's success.

Wildfires may impact the Reservation.

MISSION STATEMENT

Reduce the impact of natural hazards and a changing climate on tribal lands, residents, businesses, facilities, and infrastructure through risk reduction strategies.

WHAT IS HAZARD MITIGATION?

- **Hazard Mitigation**: Any action taken to reduce or eliminate long-term risk to life and property from hazards.
- **Mitigation Actions:** Activities that reduce risk, such as strengthening buildings to withstand high winds, clearing brush and debris to reduce fire risk, and developing plans to care for vulnerable residents during extreme heat.

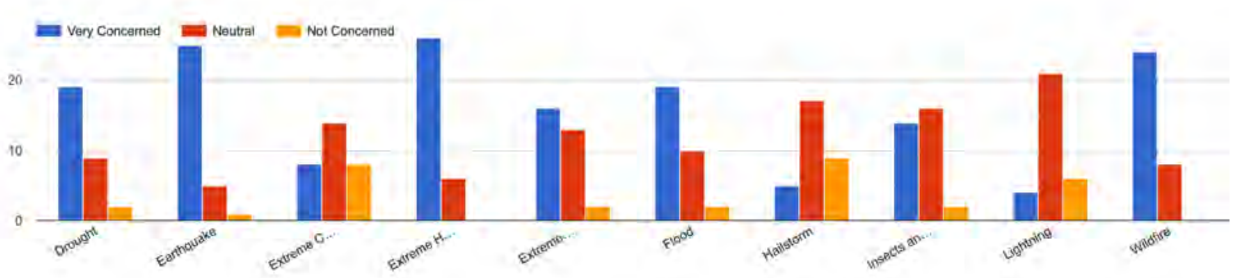
Cultural assets are recognized in the plan.

CONTACT INFORMATION

For more information:
Angel I. Ortega
Emergency Response Manager
760-442-2401
aiortega@tmtci-nsn.gov

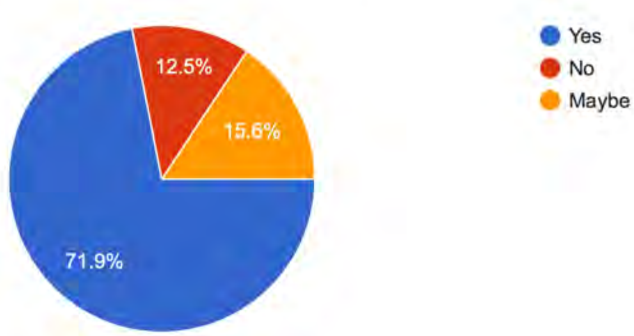
SURVEY RESULTS

How concerned are you about the following natural hazards?



Do you have working smoke alarms in your home?

32 responses

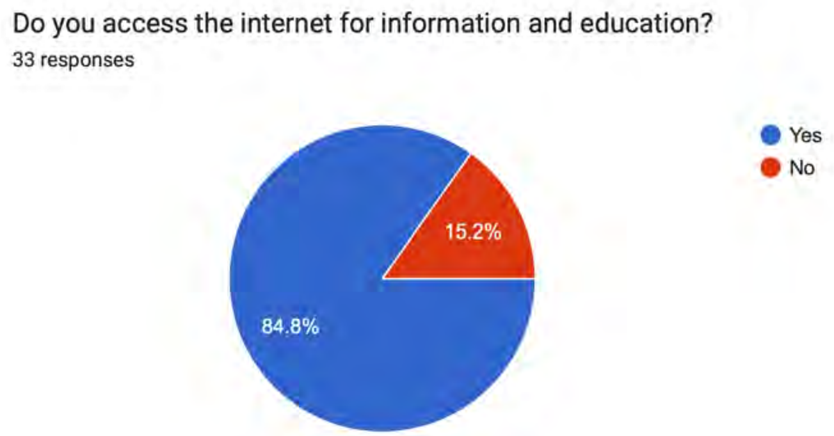


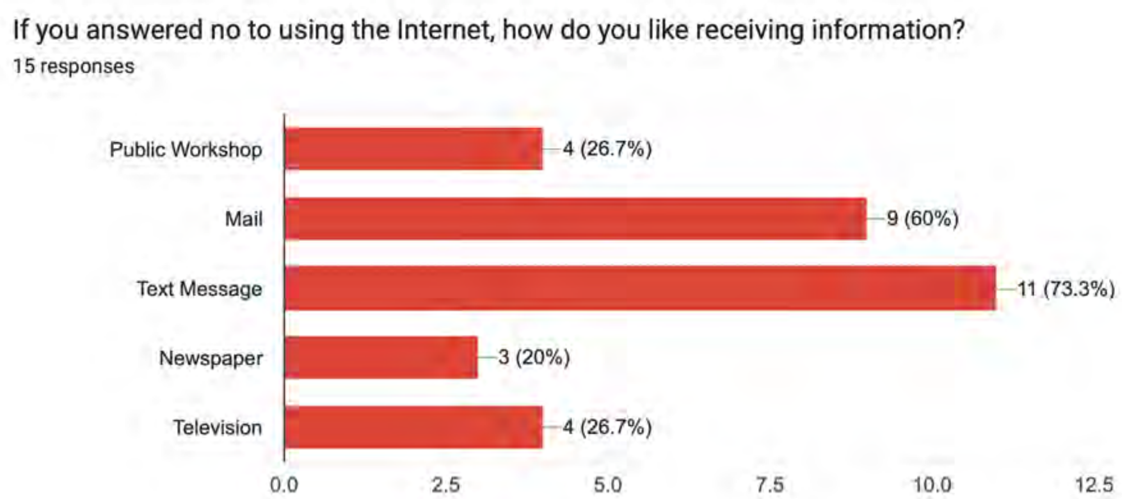
What can the Tribe do to reduce the risk of wildfires impacting the Reservation?

- clearing of dense brush, when weather permits --,> prescribed burns
- Education on fire safety , Community planning controlled burns collaboration with local state and fire department
- more weed abatement
- Water system
- Enforcement of Tribal ordinances; Tribal Rangers to monitor the Tribes expansive land base; limit firearms and off-roading on Tribal and adjacent lands; create cultural and natural resources programs for Tribal and community members to get involved with the stewardship of Tribal lands; create Tribal fire department and training program for Tribal members to become firefighters.
- clean around your home

- Help clean up and we have no green waste dumpsters and many residents burn at home.. so yes we need help on Wilma Jean trees un tried fron land owners,and in back of Landon lane lost of dry brush.. but Tribe only helps senior homes..but some don't have means to do it themselves
- Planned burnings and place more water access points and share info on the impact of wildfires to the family and community, using simple and clear images and very little text. images.
- invasive species removal, monitoring illegal dumping, enforcement against illegal dumping and other potentially dangerous activities
- Clear the brush and maintain the bushes in native communities and homes
- Weed abatement
- Educate the community, Minimize overgrown weeds, dead tree, glass debris etc., illegal dumping.
- WEED ABATEMENT
- Not sure
- Adopt and enforce ordinances
- Keep empty field with brush maintained
- Pick up trash
- Clear dead brush and other fire hazards.
- Continue trimming and removing all dried bushes and trash from surrounding areas.
- clear out dry brush use more of the lands for parks or do something with it so empty lots are are not over grown with wild bushes and trees
- We need to do a Cultural Resources Inventory of our lands to help determine what would be the best approach when it comes to Brush clearing foe example in heavy Cultural Sensitive area heavy equipment may do harm to Cultural Resources so hand tools will be needed.
- Clear out all the bushes that are very close to the Houses and yards.
- Start clearing the fields that the Tribe owns. cleaning up the debris, having more pick ups for major appliances, mattresses, couches, big items so things aren't piling up in peoples yards.
- meetings
- 1, Clear brush around home, 2, have a map available to xx display, 3. make sure roads are accessible for emergency transport
- Have a good water system in place when needed (i.e. cemeteries), Help residents keep their homes clear of brush and trash.
- Monitor illegal dumping. Compliance with allottees property (trash build up or burning of trash)
- Clean brush areas and trash.

- Advocate cleanliness.
- Bring awareness to the community through education and example. Clear overgrown areas.



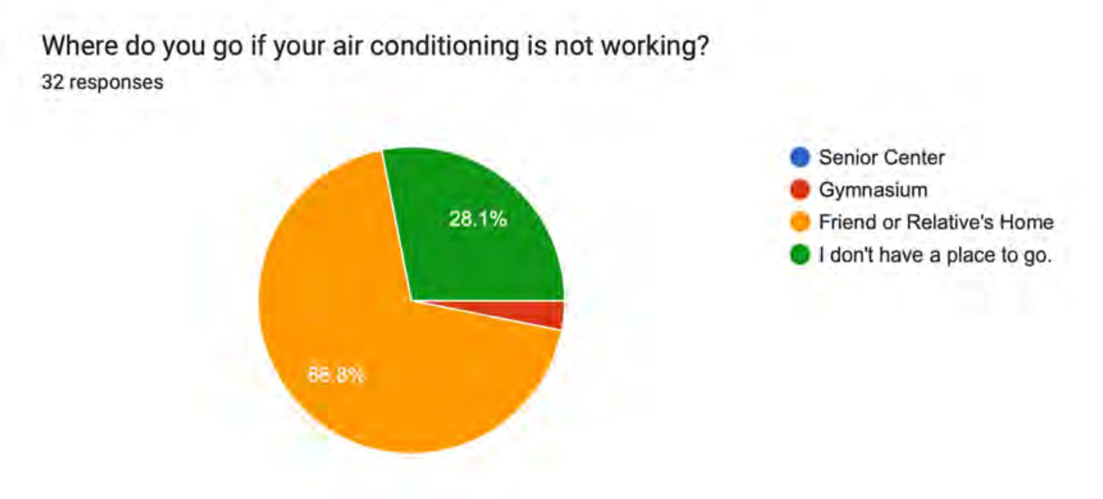


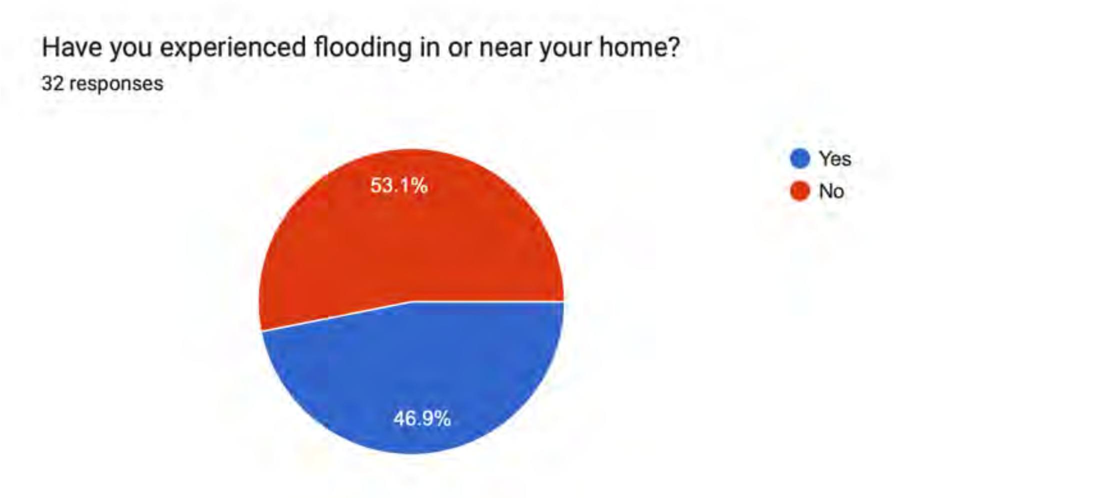
What can the Tribe do to protect seniors, children, and vulnerable residents from the impacts of natural hazards?

- pamphlets on specific dangers & how to lessen the impact of dangers that may arise
- Community education not just for local but off Reservation members Emergency preparedness plan Emergency shelters communication plan
- put an SOP together and stick with it
- Safety plans and preparedness education prevention

- Create educational programming and training so they can get involved with planning and preparation for natural hazards.
- more education
- Help all the same. Not just seniors.
- Be informed, be prepared and provide coaching and engage in exercises to demonstrate how the former can help the negative impacts of natural hazards.
- outreach, mapping the vulnerable, calling and making the vulnerable fist when emergencies happen
- Have safe zones for them or on call volunteers who can assist
- Have an fire evacuation plan. Educate the caregivers, or family of those to know, perhaps have a quarterly community meeting during fire season. Perhaps invest in their own Fire station.
- PROVIDE SHELTER FOR OUTAGES, COORDINATE WITH LOCAL AGENCIES FOR MEDICAL SUPPLIES, PROVIDE FOOD AND WATER
- Not sure
- Education
- Help with workshop of being aware
- N/a
- Have an emergency plan in place for vulnerable individuals.
- awareness, resources, tools, kits that we can use to help our selves
- A emergency plan for Natural Hazards would be great, the Tribe usually handles stuff as it pops up , but it would be great to have a plan
- To Help us prepare and be Ready to Help us for any disaster.
- educating people, show them how to make a plan & have teams in case of natural hazard occurs to do a sweep through.
- Tribal meeting
- 1, have a Rez-wide alert system (text, email, phone, internet), 2, Apply for broadband service to the community, 3, have a center for members to come to for temporary food and shelter
- Do a survey once a year about AC's, smoke alarms, and other alarms, and water hoses, fire extinguishers, help residents with clearing property, mail out instructions
- work on the community
- Pay their electrical bill and have generators available if needed
- Have plan and area for vulnerable members.

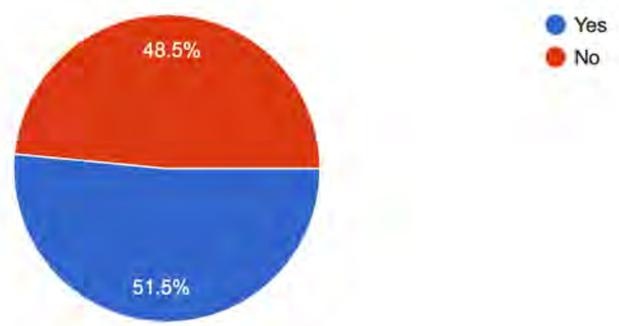
- Teach them things about evacuations and disasters.
- Educate them on disasters and evacuations.





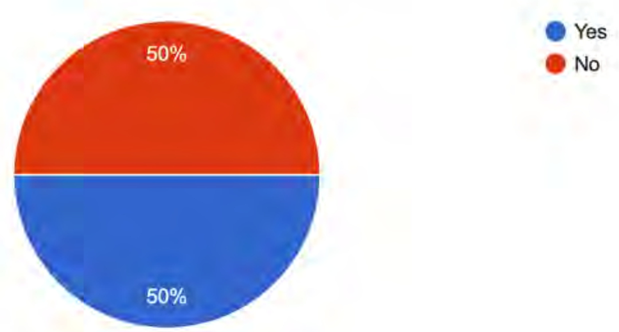
Do you keep 100' of space around your home clear of bushes and debris that could be considered a wildfire risk?

33 responses



If you answered no, would you like assistance cleaning up around your property?

20 responses

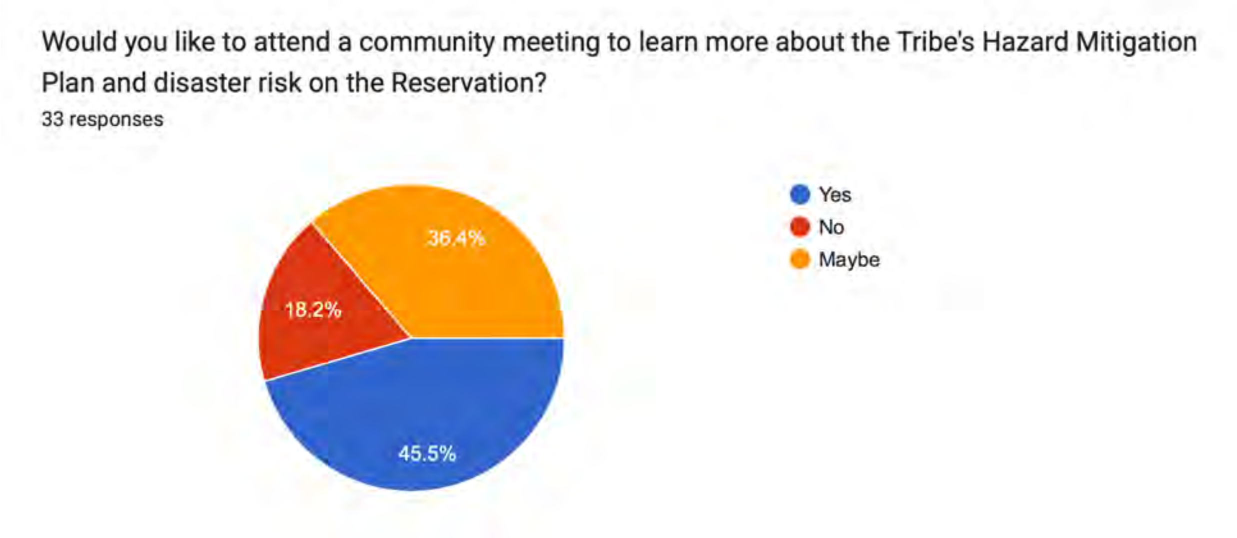


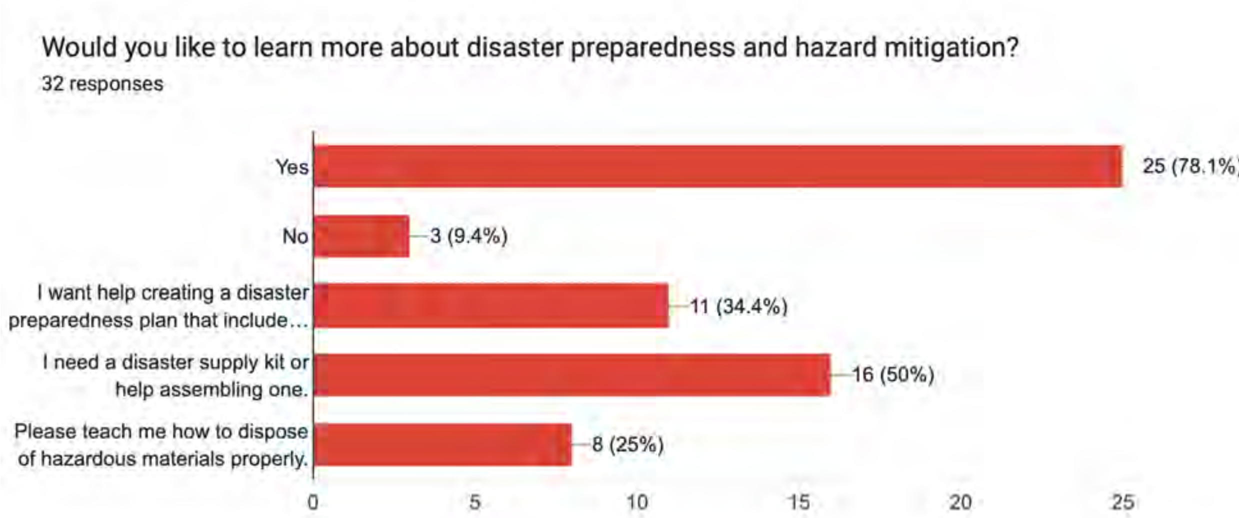
Illegal dumping is a concern on the TMDCI Reservation. What do you recommend the Tribe do to curb illegal dumping?

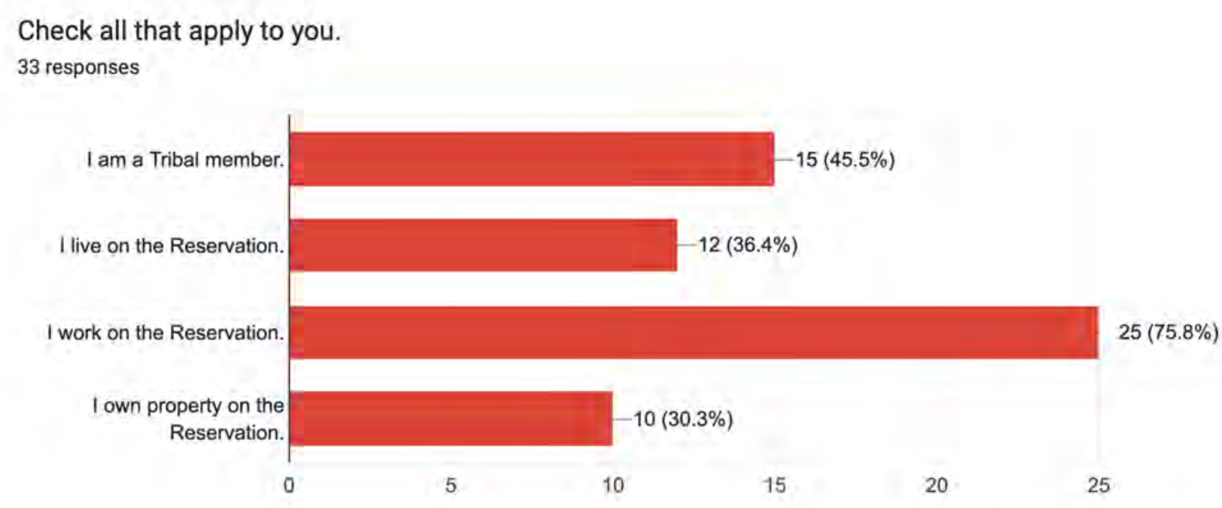
- policing of affected areas (Tribal police?). HEFTY fines if caught
- Enforcement, penalties educate the community On the impacts of your legal dumping Access to disposal Services surveillance restoration projects
- prosecute
- Free dump day or collection day
- Hire Tribal Rangers to actively monitor and enforce Tribal ordinances and laws. Outreach to surrounding communities and businesses. Rewards for turning in perpetrators of dumping. Hefty fines for illegal dumping.

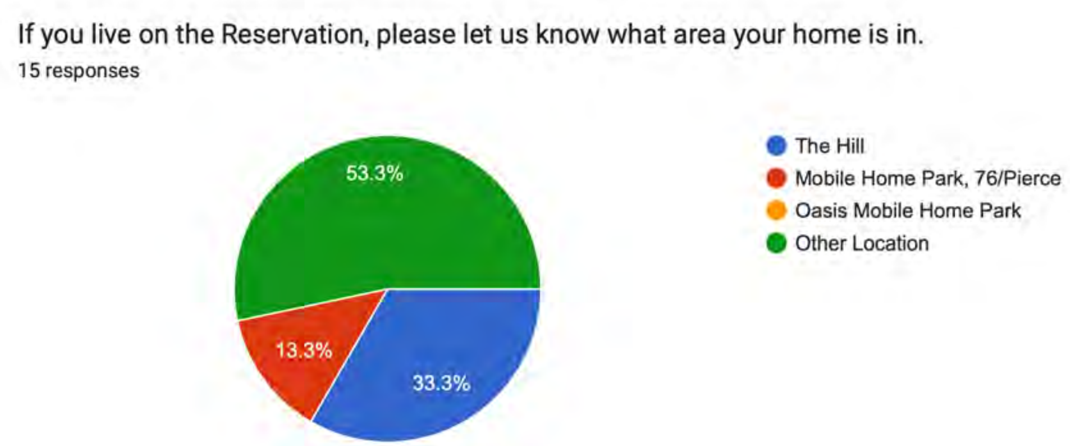
- help keep the res clean
- Street lighting...
- Do occasional and random drive byes at different times of the day including evening; hidden safety cameras with signs. Note: Signs do not seem to work!!!
- signage, fencing, monitoring, enforcing/ fines, cameras throughout Reservation, cleanups of existing sites
- Cameras or surveillance/ Tribal Public safety
- Install surveillance where possible & prosecute offenders
- Community Patrol, Tribal Police, Provide a Dumping station.
- ENFORCE AN ORDINANCE, COORDINATE WITH BIA FOR CLEANUP AND ENFORCEMENT OF CODES
- A reward for reporting illegal dumping
- Enforce its own ordinances.
- Yes
- Surveillance and enforcement
- Maybe provide a drop off area every other month.
- maybe Carma monitor or display signs that say NO DUMPING offer an award for ratt-ing (not sure if that worked before) signs that say were WATCHING YOU YOUR oN CAMRA
- Yes, we need to start Prosecuting illegal dumpers and Tribal members that allow them to dump on their property
- Have another Trash Dumpster week
- conduct more sweeps & have maybe signs to show that they are being recorded
- pick it up
- 1, I noticed the "no dumping" sign @62 and .. is gone, put it back, 2, I'd say most of the dumping (at my house) happens late at night, I'm not sure what the solution would be. I lock my gate but trash is just tossed over.
- put up more signs on Tribal land
- it is a concern
- Monitor Tribal lands more, maybe setup cameras
- Report and document illegal dumping. Add more signs.
- Add more signs, have more of a presence.

- The Tribe can work with the authorities or sheriff's department to enforce the laws.









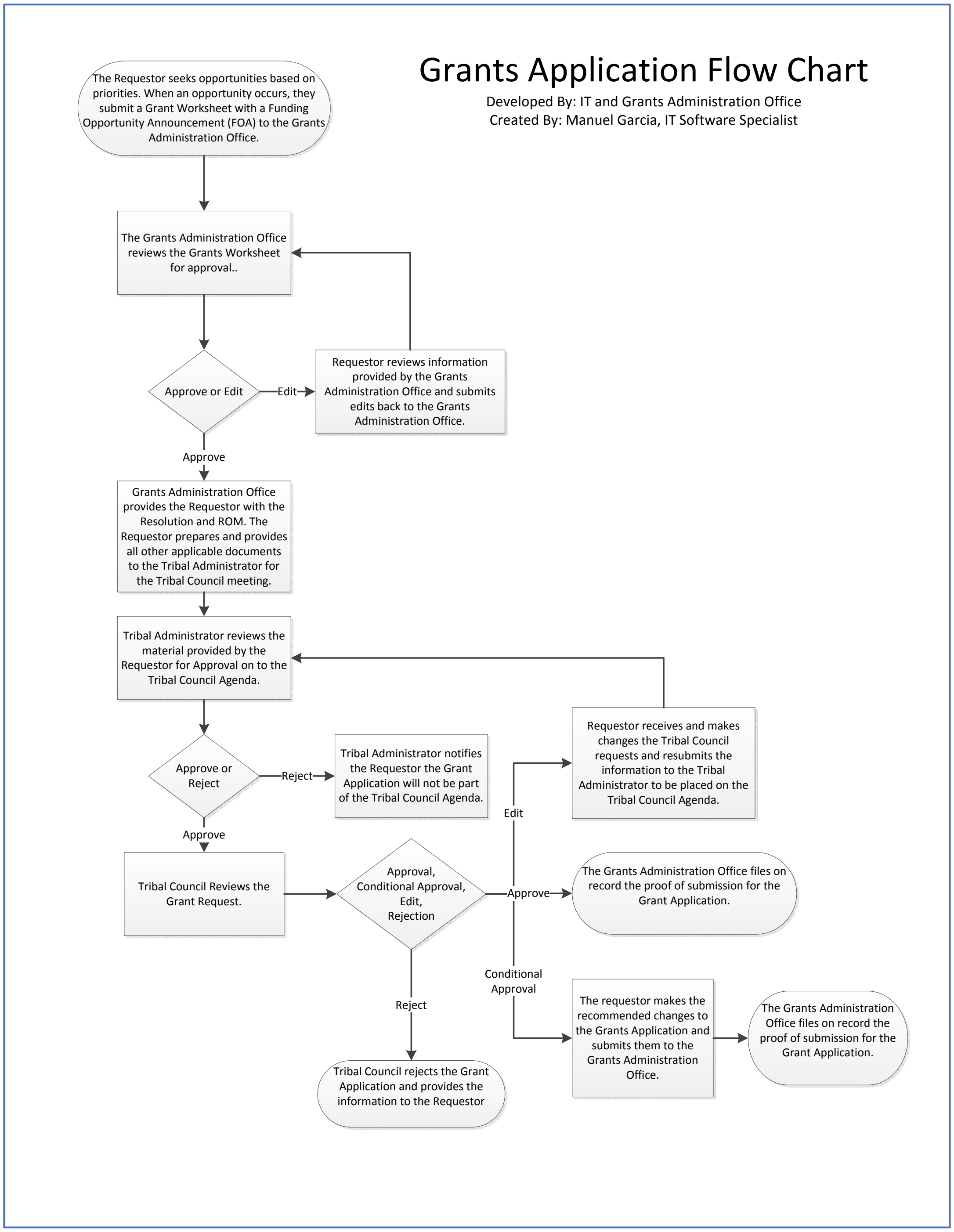
Please add any comments you would like to make regarding hazard mitigation or disaster preparedness.

- I appreciate your efforts In working on developing the mitigation plan to address these important issues
- offenders need to be prosecuted
- A safety plan and preparedness education and prevention on active shooting or similar
- none
- Camaras
- This is a good beginning to introduce and grow the culture of resilience!!!
- none at this time.
- MORE COMMUNITY INVOLVEMENT AND TRAININGS SUCH AS CPR

- Our Cultural Committee meets Every Thursday from 11:30-1pm any time after 1pm we are Available to meet
- Is there a Plan for any and all Disasters for up on the Hill.
- The hill is in much need of clearing & cleaning. Should do another weekend of trash dump day & also appliance pick-ups. Also, should possibly make ordinances on the yards, dogs, etc.
- Make a meeting
- Hope some things get done before one hit.
- Available transportation for disabled if evacuation is necessary. Emergency kits - flashlights, radios, can openers, containers for food, or packaged emergency food.
- I think its great that we are making a plan it will really help make a difference.
- We need more programs to bring awareness to our community.

APPENDIX B: CAPABILITY ASSESSMENT SUPPORTING MATERIALS

GRANT APPLICATION PROCESS



Grants Worksheet Process

The following is the process for submitting a Grant Worksheet. The Grant Worksheet Flow Chart is attached.

I. GRANT PROGRAM DIRECTOR INFORMATION
   a. Department Head (DH) or Committee Chair (CC) will fill out this section and include all contact information.
   b. Other Grant / Administrative Contact information

II. PROJECT INFORMATION
   a. Grant / Project Title
   b. Purpose of Grant / Project

III. FUNDING INFORMATION
   a. This information is found in the NOFA / NOFO and must be filled in by the DH or CC.
      i. Funding Agency
      ii. Agency Deadline for Submission
      iii. Application Type
      iv. Source of Funding
      v. Funding Required/ Amount Requested/ TMDCI Match Amount
      vi. Match Type: CASH / IN-KIND / BOTH
      vii. Limitation or Prohibition on Charging Indirect Cost
      viii. Grant Period: Start / End
      ix. CFDA #
      x. Multi-Year Project: YES or NO
      xi. Does the application provide for full project funding for all years: YES or NO

IV. PROPOSED BUDGET
   a. Department Head or Committee Chair will fill in Budget Amounts with the help of the Grant Writer and/or Grant Manager.
      i. Salaries
      ii. Fringe Benefits
      iii. Contractual
      iv. Travel/ Training
      v. Supplies
      vi. Expendable Equipment
      vii. Other Cost
      viii. Construction
      ix. Capital Outlay
      x. Total Direct
      xi. Modified Direct Cost
      xii. Indirect Costs
      xiii. Matching
      xiv. In-Kind

Created April 14, 2016

Grants Worksheet Process

xv. Total Budget

b. Modified Direct Cost: excludes Contractual, Construction, and Capital Outlay from the Direct Cost base and is used as the base to calculate Indirect Cost.
c. Fringe Benefits are calculated at 35.00% of the Salaries cost.
d. List source and amount for Matching Costs.
e. List source and amount for In-Kind Costs.

V. <u>PROJECT RESOURCES</u>

a. Department Head or Committee Chair will list all Project Resources that will be used. The Grant Writer can assist you with this section if necessary.
   i. Does the Project require use of existing and/or new staff indicate number of FTE's
   ii. List positions/ names
   iii. List Consultants
   iv. List Equipment
   v. List Vehicles
   vi. List Office / Other Space

VI. <u>ASSURANCES/ PREREQUISITES/ POST-GRANT OBLIGATIONS</u>

a. Department Head or Committee Chair will answer all yes or no questions in this section with the help of the Grant Writer and/or Grant Manager.

VII. <u>REVIEW AND APPROVALS</u>

a. Department Head or Committee Chair will sign and date
b. Reviewed:
   i. Department Head will submit the Grant Worksheet to the Tribal Administrator for Review and Approval.
   ii. If approved by Tribal Administrator the DH or CC will submit the signed Grant Worksheet to the Grants Manager for Review and Approval.
   iii. Once the Grants Manager approves and signs the Grants Worksheet the DH or CC will send to Tribal Council for Final Approval.
   iv. The DH or CC must complete a Staff Agenda Report and Record of Motion along with the Signed Grant Worksheet and submit to the TMDCI Tribal Council Clerk.
   v. The DH or CC must be available and prepared to present the Grant Worksheet to Tribal Council. The Grant Writer and/or Grant Manager will assist.
c. Approved:
   i. If approved by Tribal Council the Tribal Chairwoman will sign the Grant Worksheet and the process for submitting a Grant Application will begin.

Created April 14, 2016

Torres Martinez Desert Cahuilla Indians - Grant Application Worksheet (GR-001 Revised 9/05)

Grant Program Director Information

(Last Name) (First Name) Department

Phone FAX Number E-mail Address

Other Grant / Administrative Contact involved in this Application Contact Phone Contact E-mail Address

Project Information

Grant / Project Title

Purpose of Grant / Project

Funding Information

Funding Agency Agency Deadline for Submission

Application Type
- ☐ New Award
- ☐ Continuation/Renewal - Competitive
- ☐ Supplemental Funding
- ☐ Continuation/Renewal -NonCompetitive

Source of Funding
- ☐ Federal
- ☐ State
- ☐ Local (County/City)
- ☐ Private

If a Continuing Award, Grant # and TMDCI G/L Code

Funding Required Amount Requested TMDCI Match Amount

Match Type ☐ Cash ☐ In-Kind ☐ Both

Is funding provided on an Advance basis or a Reimbursement basis: ☐ Advance Funding ☐ Cost Reimbursement

Is there a limitation or prohibition on charging Indirect Costs to this program (*our current IDC Rate is*)? Yes ☐ No ☐

Limitation (list Percent): Prohibition - No IDC allowed ☐

Grant Period: Start: End: CFDA #:

Multi-Year Project: ☐ Yes ☐ No Does the application provide for full project funding for all years? ☐ Yes ☐ No

If "No", what is the source of funding to cover the shortfall in future years?

Page 1 of 4

Proposed Budget

	Year 1	Year 2	Year 3	TOTAL
1. Salaries	$ -	$ -	$ -	$ -
2. Fringe Benefits	$ -	$ -	$ -	$ -
3. Contractual	$ -	$ -	$ -	$ -
4. Travel / Training	$ -	$ -	$ -	$ -
5. Supplies	$ -	$ -	$ -	$ -
6. Expendable Equipment	$ -	$ -	$ -	$ -
7. Other Costs	$ -	$ -	$ -	$ -
8. Construction	$ -	$ -	$ -	$ -
9. Capital Outlay	$ -	$ -	$ -	$ -
10. Total Direct	$ -	$ -	$ -	$ -
10.a Modified Direct Costs	$ -	$ -	$ -	$ -
11. Indirect Costs	$ -	$ -	$ -	$ -
12. Matching	$ -	$ -	$ -	$ -
13. In-Kind	$ -	$ -	$ -	$ -
14. Total Budget	$ -	$ -	$ -	$ -

Modified Direct Costs excludes Contractual, Construction and Capital Outlay from the Direct Cost base and is used as the base to calculate Indirect Costs against. Indirect Costs are calculate at a rate.

Fringe Benefits are calculated at : 35.00% of the Salaries cost.

For Matching Costs, list the source and amount:

Source	*YR 1 Amount*	*YR 2 Amount*	*YR 3 Amount*	*Total*
	$ -	$ -	$ -	$ -
	$ -	$ -	$ -	$ -
	$ -	$ -	$ -	$ -
Total Matching	$ -	$ -	$ -	$ -

For In-Kind Costs, list the source and amount:

Source	*YR 1 Amount*	*YR 2 Amount*	*YR 3 Amount*	*Total*
	$ -	$ -	$ -	$ -
	$ -	$ -	$ -	$ -
	$ -	$ -	$ -	$ -
Total In-Kind	$ -	$ -	$ -	$ -

Project Resources

Project Requires Use of: *Existing* *New*

Staff (indicate # of FTE's)

List positions/names:

Consultants

Equipment

Vehicles

Office / Other Space

(Attach a continuation sheet if necessary)

Page 2 of 4

Assurances / Prerequisites / Post-Grant Obligations

	Yes	No
Is the grant-supported service a high priority for the Tribe?	☐	☐
Will the grant help the Tribe meet or maximize its goals and objectives?	☐	☐
Are there other funding sources that provide or could provide the same or similar services in a more efficient and cost-effective manner?	☐	☐
If matching funds are required, are there sufficient budget appropriations for this grant application?	☐	☐
Is the value of the grant sufficient to justify the time and direct and indirect costs involved in administering the grant?	☐	☐
Does the grant require any of the following studies as a pre-award condition or part of the grant activity:		
Environmental Study	☐	☐
If "Yes" what type of study:		
Archeological Study	☐	☐
If "Yes" what type of study:		
Cultural Study	☐	☐
If "Yes" what type of study:		
Formal Needs Assessment	☐	☐
If "Yes" what type of assessment:		
Does the grant require any permitting, either by the Tribe or an outside agency?	☐	☐
If "Yes" what type of permit:		
Does the grant activity require the involvement of the TERO office?	☐	☐
Does the grant require the Tribe to enter into any collaborative or Joint Powers Agreements?	☐	☐
If "Yes" what type & with who:		
Does the grant impose any additional insurance requirements on the Tribe?	☐	☐
If "Yes" type & estimated cost:		
Does the grant require formal approval by the Tribal Council or General Council prior to submission?	☐	☐
Are there any other special conditions imposed upon the Tribe by receiving this grant?	☐	☐
If Yes, list		
Are there any deliverables required by the grant that may pose an obstacle in the Tribe achieving successful completion?	☐	☐
If "Yes" what are they:		
Are there any after-the-grant recurring costs that the Tribe will be committed to make on an on-going basis?	☐	☐
If "Yes', list the type of costs and estimated amounts per year:		

	$ -
	$ -
	$ -
	$ -
	$ -

	Yes	No
Are there any other recurring obligations or long-term commitments that the Tribe will incur under this grant?	☐	☐
If Yes, list		

Other comments and disclosures:

Page 3 of 4

Review and Approvals

Assurances:
We certify that in applying for and receiving the proposed grant award described herein, we are familiar with and will adhere to all applicable tribal, federal, state and local regulations in the conduct of this grant. We also certify that we have reviewed all information contained herein and in the grant application package and affirm that all budgetary information is correct and all known disclosures have been made regarding any commitments that the Torres Martinez Desert Cahuilla Indians will assume in the acceptance of this grant.

Department Head or Committee Chair ____________ Date ____________

Reviewed:

Tribal Administrator ____________ Date ____________

Grants Administrator ____________ Date ____________

Approved:

Tribal Chairwoman ____________ Date ____________

Page 4 of 4

APPENDIX C: MITIGATION STRATEGY SUPPORTING MATERIALS

Table 72. Mitigation Actions Sorted by Goal Statement.

Goal	Action #	Action Title
Mitigate the risks of drought, flooding, and other natural hazards to protect the community and environment.	1	Install a fence around Reservation property.
	2	Protect water supply infrastructure from drought, contamination and other hazards. Implement water restrictions if necessary.
	7	Establish and Indoor Air Quality Program on the Reservation.
	14	Prevent illegal dumping on the Reservation and expand areas of defensible space. Clean up around homes.
	15	Mitigate risk to the built environment and groundwater wells from subsidence.
	19	Create a microgrid for the Tribal Administration complex.
	20	Establish permanent back-up power on all critical facilities, starting with the Emergency Operations Center.
	22	Mitigate the flash flooding risk through a program that tracks the adequacy of culverts and the Reservation and remedies those deemed inadequate.
	27	Remove invasive species/plants and replace with drought and fire-resistant species.
Enhance wildfire protection for people, land, and buildings on the Reservation.	3	Coordinate with the BIA, Riverside County, CAL FIRE and other partners on the development, maintenance, and implementation of a Hazardous Fuels Management Plan to mitigate wildfire hazards. Explore the need for a more robust Community Wildfire Protection
	6	Develop a Extreme Heat Emergency Plan to protect residents and staff in times of extreme heat.
	8	Develop a program to remove brush and debris from around senior homes.
	11	Clear properties of debris and remove dead trees.
Strengthen hazard mitigation efforts through regional partnerships and collaboration.	4	Develop a formalized collaboration with the Bureau of Indian Affairs to mitigate risk of wildfires.
	23	Maintain Memorandums of Understanding with adjacent communities and first responders for disaster assistance.
	26	Establish a system for emergency communication and install radio repeaters throughout the Reservation. Coordinate with other Tribes in the region.

Goal	Action #	Action Title
Promote community resilience through education and preparedness programs focused on natural hazards and climate adaptation.	5	Participate in SoCal Shakeout Drill and complete a full scale exercise.
	9	Host annual vaccination clinics, remove areas of standing water, and educate the community about disease prevention.
	10	Expand the emergency alert system for all residents and include a program to educate residents about how to shelter-in-place or evacuate if necessary.
	12	Develop a natural hazards mitigation awareness training program that includes education specifically for seniors and Tribal members.
	13	Expand the expertise of the Emergency Response Manager through training.
	16	Start household hazardous waste education and removal program for residents.
	17	Increase capacity for Tribal Council to understand hazard mitigation principles and practices by updating them on status of mitigation actions quarterly.
	21	Increase capacity for all phases of emergency management on the Reservation by strengthening the CERT.
	28	Expand capacity to make good land use analysis by increasing GIS capabilities of the Planning Department.
Adopt policies and regulations to minimize hazard-related losses.	18	The Tribe's building code ordinance must be updated to mitigate multiple hazard risks including extreme cold, fire, high winds, and earthquakes.
	25	Establish the Casino as a meeting area and respite area during power outages, high heat and other natural hazard events.
Safeguard cultural assets from natural hazards and climate change impacts.	24	Identify areas of cultural significance that are at risk to natural hazards and implement mitigation measures.

Table 73. Mitigation Actions Sorted by Action Lead.

Action Lead	Action #	Action Title
Planning Director	**18**	The Tribe's building code ordinance must be updated to mitigate multiple hazard risks including extreme cold, fire, high winds, and earthquakes.
	28	Expand capacity to make good land use analysis by increasing GIS capabilities of the Planning Department.
Facilities Director	**1**	Install a fence around Reservation property.

Action Lead	Action #	Action Title
	2	Protect water supply infrastructure from drought, contamination and other hazards. Implement water restrictions if necessary.
	8	Develop a program to remove brush and debris from around senior homes.
	11	Clear properties of debris and remove dead trees.
	12	Develop a natural hazards mitigation awareness training program that includes education specifically for seniors and Tribal members.
	14	Prevent illegal dumping on the Reservation and expand areas of defensible space. Clean up around homes.
	19	Create a microgrid for the Tribal Administration complex.
	20	Establish permanent back-up power on all critical facilities, starting with the Emergency Operations Center.
	22	Mitigate the flash flooding risk through a program that tracks the adequacy of culverts and the Reservation and remedies those deemed inadequate.
Emergency Response Manager	**3**	Coordinate with the BIA, Riverside County, CAL FIRE and other partners on the development, maintenance, and implementation of a Hazardous Fuels Management Plan to mitigate wildfire hazards. Explore the need for a more robust Community Wildfire Protection Plan (CWPP) for specific areas of concern.
	4	Develop a formalized collaboration with the Bureau of Indian Affairs to mitigate risk of wildfires.
	5	Participate in SoCal Shakeout Drill and complete a full scale exercise.
	6	Develop a Extreme Heat Emergency Plan to protect residents and staff in times of extreme heat.
	9	Host annual vaccination clinics, remove areas of standing water, and educate the community about disease prevention.
	10	Expand the emergency alert system for all residents and include a program to educate residents about how to shelter-in-place or evacuate if necessary.
	13	Expand the expertise of the Emergency Response Manager through training.
	17	Increase capacity for Tribal Council to understand hazard mitigation principles and practices by updating them on status of mitigation actions quarterly.
	21	Increase capacity for all phases of emergency management on the Reservation by strengthening the CERT.
	23	Maintain Memorandums of Understanding with adjacent communities and first responders for disaster assistance.
	25	Establish the Casino as a meeting area and respite area during power outages, high heat and other natural hazard events.
	26	Establish a system for emergency communication and install radio repeaters throughout the Reservation. Coordinate with other Tribes in the region.

Action Lead	Action #	Action Title
Natural Resources Manager	**7**	Establish and Indoor Air Quality Program on the Reservation.
	16	Start household hazardous waste education and removal program for residents.
	27	Remove invasive species/plants and replace with drought and fire-resistant species.
Water Operator	**15**	Mitigate risk to the built environment and groundwater wells from subsidence.
Cultural Director	**24**	Identify areas of cultural significance that are at risk to natural hazards and implement mitigation measures.

Table 74. Mitigation Actions Sorted by Implementation Schedule.

Implementation Schedule	Action #	Action Title
2025-2026	5	Participate in SoCal Shakeout Drill and complete a full scale exercise.
	6	Develop a Extreme Heat Emergency Plan to protect residents and staff in times of extreme heat.
	9	Host annual vaccination clinics, remove areas of standing water, and educate the community about disease prevention.
	10	Expand the emergency alert system for all residents and include a program to educate residents about how to shelter-in-place or evacuate if necessary.
	23	Maintain Memorandums of Understanding with adjacent communities and first responders for disaster assistance.
2025-2028	1	Install a fence around Reservation property.
	11	Clear properties of debris and remove dead trees.
	26	Establish a system for emergency communication and install radio repeaters throughout the Reservation. Coordinate with other Tribes in the region.
2025-2030	4	Develop a formalized collaboration with the Bureau of Indian Affairs to mitigate risk of wildfires.
	12	Develop a natural hazards mitigation awareness training program that includes education specifically for seniors and Tribal members.
	13	Expand the expertise of the Emergency Response Manager through training.
	14	Prevent illegal dumping on the Reservation and expand areas of defensible space. Clean up around homes.
	17	Increase capacity for Tribal Council to understand hazard mitigation principles and practices by updating them on status of mitigation actions quarterly.
	20	Establish permanent back-up power on all critical facilities, starting with the Emergency Operations Center.

Implementation Schedule	Action #	Action Title
	21	Increase capacity for all phases of emergency management on the Reservation by strengthening the CERT.
	28	Expand capacity to make good land use analysis by increasing GIS capabilities of the Planning Department.
2026-2027	8	Develop a program to remove brush and debris from around senior homes.
2026-2028	3	Coordinate with the BIA, Riverside County, CAL FIRE and other partners on the development, maintenance, and implementation of a Hazardous Fuels Management Plan to mitigate wildfire hazards. Explore the need for a more robust Community Wildfire Protection
	16	Start household hazardous waste education and removal program for residents.
	25	Establish the Casino as a meeting area and respite area during power outages, high heat and other natural hazard events.
2026-2030	18	The Tribe's building code ordinance must be updated to mitigate multiple hazard risks including extreme cold, fire, high winds, and earthquakes.
	19	Create a microgrid for the Tribal Administration complex.
	24	Identify areas of cultural significance that are at risk to natural hazards and implement mitigation measures.
2027-2029	2	Protect water supply infrastructure from drought, contamination and other hazards. Implement water restrictions if necessary.
	7	Establish and Indoor Air Quality Program on the Reservation.
	22	Mitigate the flash flooding risk through a program that tracks the adequacy of culverts and the Reservation and remedies those deemed inadequate.
2027-2030	27	Remove invasive species/plants and replace with drought and fire-resistant species.
2028-2030	15	Mitigate risk to the built environment and groundwater wells from subsidence.

Table 75. Mitigation Actions Sorted by Type.

Mitigation Category	Action #	Action Title
Local Plans and Regulations	3	Coordinate with the BIA, Riverside County, CAL FIRE and other partners on the development, maintenance, and implementation of a Hazardous Fuels Management Plan to mitigate wildfire hazards. Explore the need for a more robust Community Wildfire Protection
	4	Develop a formalized collaboration with the Bureau of Indian Affairs to mitigate risk of wildfires.
	6	Develop a Extreme Heat Emergency Plan to protect residents and staff in times of extreme heat.

Mitigation Category	Action #	Action Title
	8	Develop a program to remove brush and debris from around senior homes.
	18	The Tribe's building code ordinance must be updated to mitigate multiple hazard risks including extreme cold, fire, high winds, and earthquakes.
	23	Maintain Memorandums of Understanding with adjacent communities and first responders for disaster assistance.
	25	Establish the Casino as a meeting area and respite area during power outages, high heat and other natural hazard events.
Structure & Infrastructure	1	Install a fence around Reservation property.
	2	Protect water supply infrastructure from drought, contamination and other hazards. Implement water restrictions if necessary.
	15	Mitigate risk to the built environment and groundwater wells from subsidence.
	19	Create a microgrid for the Tribal Administration complex.
	20	Establish permanent back-up power on all critical facilities, starting with the Emergency Operations Center.
	22	Mitigate the flash flooding risk through a program that tracks the adequacy of culverts and the Reservation and remedies those deemed inadequate.
	24	Identify areas of cultural significance that are at risk to natural hazards and implement mitigation measures.
	26	Establish a system for emergency communication and install radio repeaters throughout the Reservation. Coordinate with other Tribes in the region.
Education and Awareness	5	Participate in SoCal Shakeout Drill and complete a full scale exercise.
	9	Host annual vaccination clinics, remove areas of standing water, and educate the community about disease prevention.
	10	Expand the emergency alert system for all residents and include a program to educate residents about how to shelter-in-place or evacuate if necessary.
	12	Develop a natural hazards mitigation awareness training program that includes education specifically for seniors and Tribal members.
	13	Expand the expertise of the Emergency Response Manager through training.
	17	Increase capacity for Tribal Council to understand hazard mitigation principles and practices by updating them on status of mitigation actions quarterly.
	21	Increase capacity for all phases of emergency management on the Reservation by strengthening the CERT.

Mitigation Category	Action #	Action Title
	28	Expand capacity to make good land use analysis by increasing GIS capabilities of the Planning Department.
Natural Systems Protection	7	Establish and Indoor Air Quality Program on the Reservation.
	11	Clear properties of debris and remove dead trees.
	14	Prevent illegal dumping on the Reservation and expand areas of defensible space. Clean up around homes.
	16	Start household hazardous waste education and removal program for residents.
	27	Remove invasive species/plants and replace with drought and fire-resistant species.

All Hazards Addressed	Action #	Action Title
All Hazards	1	Install a fence around Reservation property.
	10	Expand the emergency alert system for all residents and include a program to educate residents about how to shelter-in-place or evacuate if necessary.
	12	Develop a natural hazards mitigation awareness training program that includes education specifically for seniors and Tribal members.
	13	Expand the expertise of the Emergency Response Manager through training.
	17	Increase capacity for Tribal Council to understand hazard mitigation principles and practices by updating them on status of mitigation actions quarterly.
	18	The Tribe's building code ordinance must be updated to mitigate multiple hazard risks including extreme cold, fire, high winds, and earthquakes.
	21	Increase capacity for all phases of emergency management on the Reservation by strengthening the CERT.
	23	Maintain Memorandums of Understanding with adjacent communities and first responders for disaster assistance.
	24	Identify areas of cultural significance that are at risk to natural hazards and implement mitigation measures.
	26	Establish a system for emergency communication and install radio repeaters throughout the Reservation. Coordinate with other Tribes in the region.
	28	Expand capacity to make good land use analysis by increasing GIS capabilities of the Planning Department.
Drought	2	Protect water supply infrastructure from drought, contamination and other hazards. Implement water restrictions if necessary.
Dust Storm and Wind Erosion	7	Establish and Indoor Air Quality Program on the Reservation.

All Hazards Addressed	Action #	Action Title
Earthquake	5	Participate in SoCal Shakeout Drill and complete a full scale exercise.
Earthquake, Extreme Heat, Wildfire, Dust Storm and Wind Erosion, Severe Storm, Tornado	19	Create a microgrid for the Tribal Administration complex.
	20	Establish permanent back-up power on all critical facilities, starting with the Emergency Operations Center.
	25	Establish the Casino as a meeting area and respite area during power outages, high heat and other natural hazard events.
Extreme Heat, Wildfire, Dust Storm and Wind Erosion, Drought, Severe Storm, Tornado	3	Coordinate with the BIA, Riverside County, CAL FIRE and other partners on the development, maintenance, and implementation of a Hazardous Fuels Management Plan to mitigate wildfire hazards. Explore the need for a more robust Community Wildfire Protection
	4	Develop a formalized collaboration with the Bureau of Indian Affairs to mitigate risk of wildfires.
	6	Develop a Extreme Heat Emergency Plan to protect residents and staff in times of extreme heat.
	8	Develop a program to remove brush and debris from around senior homes.
	11	Clear properties of debris and remove dead trees.
	14	Prevent illegal dumping on the Reservation and expand areas of defensible space. Clean up around homes.
Extreme Heat, Wildfire, Tornado, Hazardous Materials	16	Start household hazardous waste education and removal program for residents.
Flooding and Levee Failure	22	Mitigate the flash flooding risk through a program that tracks the adequacy of culverts and the Reservation and remedies those deemed inadequate.
Infectious Disease	9	Host annual vaccination clinics, remove areas of standing water, and educate the community about disease prevention.
Invasive Species	27	Remove invasive species/plants and replace with drought and fire-resistant species.
Subsidence	15	Mitigate risk to the built environment and groundwater wells from subsidence.

Table 76. Mitigation Actions Sorted by Hazard Addressed.

APPENDIX D: IMPLEMENTATION PLAN SUPPORTING MATERIALS

MITIGATION ACTION PROGRESS WORKSHEET EXAMPLE

Mitigation Action Progress Worksheet			1.01
Progress Report Period			
Project Goal			
Action Title	Develop plans to protect cultural assets.		
Action Description	Develop plans to protect culturally sensitive areas and cultural assets.		
Responsible Department	Council and Cultural Resources		
Project Cost	High		
Contact Name		**Contact Email/Phone**	
Project Status			
Date of Project Approval		Date of Project Start	
Anticipated Date of Completion		Project Cancelled	
Project Delayed		Explanation of Delay/Cost Overruns	
Project Report Summary			
What was accomplished?			
What obstacles were encountered?			
Plans for the next period			

APPENDIX E: HAZUS REPORTS

HAZUS™

FEMA

Direct Economic Losses for User Defined Facilities

RiskMAP
Increasing Resilience Together

Monday, November 11, 2024

	Capital Stock Exposure		Capital Stock Losses				Loss Ratio	
Specific Occupancy	**Building Exposure**	**Contents Exposure**	**Building Loss**	**Contents Loss**	**Inventory Loss**	**TOTAL Loss**	**Buildings %**	**Contents %**
RES2-Manuf. Housing	3,729,419	1,864,710	0	0	0	0	0.0	0.0
RES1-Single Family Dwelling	217,259	108,629	3,118	2,079	0	5,197	1.4	1.9
Scenario Total	**3,946,678**	**1,973,339**	**3,118**	**2,079**	**0**	**5,197.09**	**0.718**	**0.957**

Totals reflect User Defined Facilities (UDF) within the flood hazard scenario and will reflect the entire county/state only if all UDF for the study region were innundated.

Study Region: TMT_Flood
Scenario: 100year
Return Period: 100

Hazus: Earthquake Global Risk Report

Region Name: TMT_EQ2

Earthquake Scenario: M7.4-S_San_Andreas v13

Print Date: November 11, 2024

Disclaimer:
Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using Hazus loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social and economic losses following a specific earthquake. These results can be improved by using enhanced inventory, geotechnical, and observed ground motion data.

HAZUS™ FEMA

Table of Contents

General Description of the Region

Hazus-MH is a regional earthquake loss estimation model that was developed by the Federal Emergency Management Agency (FEMA) and the National Institute of Building Sciences. The primary purpose of Hazus is to provide a methodology and software application to develop multi-hazard losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from multi-hazards and to prepare for emergency response and recovery.

The earthquake loss estimates provided in this report was based on a region that includes 2 county(ies) from the following state(s):

California

Note:
Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is 1,333.56 square miles and contains 6 census tracts. There are over 6 thousand households in the region which has a total population of 24,777 peopleF. The distribution of population by Total Region and County is provided in Appendix B.

There are an estimated 7 thousand buildings in the region with a total building replacement value (excluding contents) of 4,680 (millions of dollars). Approximately 94.00 % of the buildings (and 49.00% of the building value) are associated with residential housing.

The replacement value of the transportation and utility lifeline systems is estimated to be 2,946 and 1,632 (millions of dollars) , respectively.

Building and Lifeline Inventory

Building Inventory

Hazus estimates that there are 7 thousand buildings in the region which have an aggregate total replacement value of 4,680 (millions of dollars) . Appendix B provides a general distribution of the building value by Total Region and County.

In terms of building construction types found in the region, wood frame construction makes up 58% of the building inventory. The remaining percentage is distributed between the other general building types.

Critical Facility Inventory

Hazus breaks critical facilities into two (2) groups: essential facilities and high potential loss facilities (HPL). Essential facilities include hospitals, medical clinics, schools, fire stations, police stations and emergency operations facilities. High potential loss facilities include dams, levees, military installations, nuclear power plants and hazardous material sites.

For essential facilities, there are 0 hospitals in the region with a total bed capacity of beds. There are 6 schools, 4 fire stations, 0 police stations and 0 emergency operation facilities. With respect to high potential loss facilities (HPL), there are no dams identified within the inventory. The inventory also includes no hazardous material sites, no military installations and no nuclear power plants.

Transportation and Utility Lifeline Inventory

Within Hazus, the lifeline inventory is divided between transportation and utility lifeline systems. There are seven (7) transportation systems that include highways, railways, light rail, bus, ports, ferry and airports. There are six (6) utility systems that include potable water, wastewater, natural gas, crude & refined oil, electric power and communications. The lifeline inventory data are provided in Tables 1 and 2.

The total value of the lifeline inventory is over 4,578.00 (millions of dollars). This inventory includes over 286.45 miles of highways, 207 bridges, 2,136.27 miles of pipes.

Table 1: Transportation System Lifeline Inventory

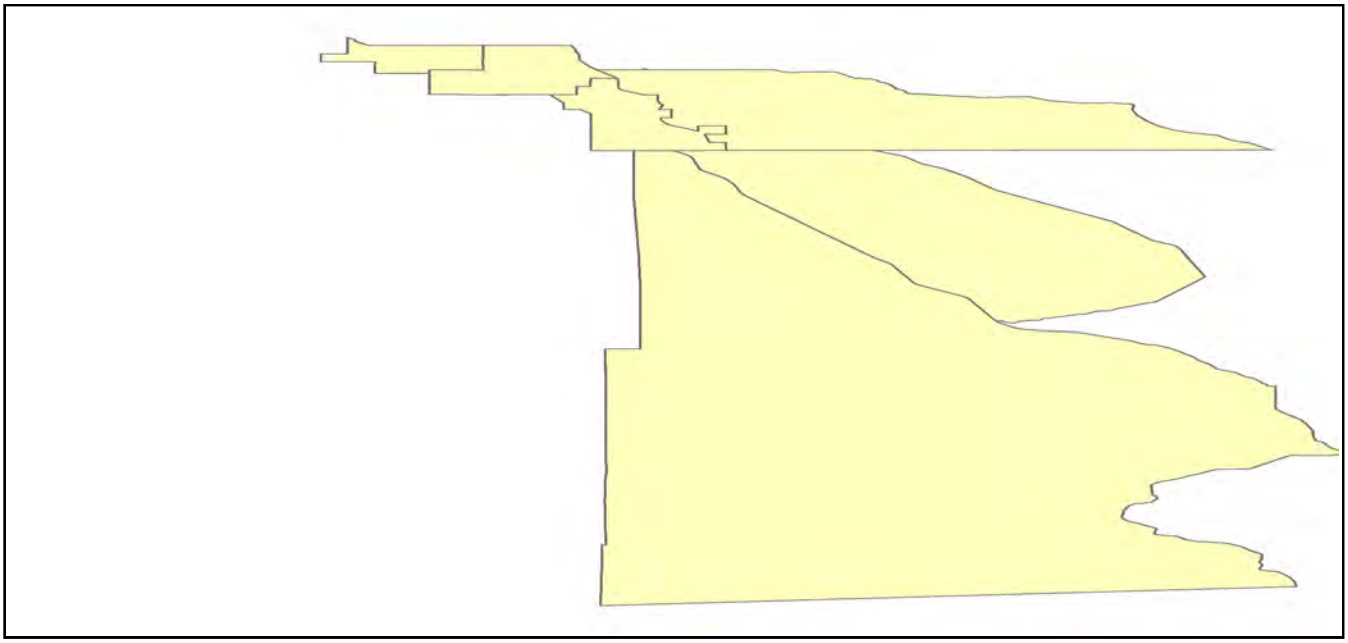
System	Component	# Locations/ # Segments	Replacement value (millions of dollars)
Highway	Bridges	207	297.8540
	Segments	64	2201.9774
	Tunnels	0	0.0000
		Subtotal	**2499.8314**
Railways	Bridges	26	147.9400
	Facilities	0	0.0000
	Segments	27	293.0732
	Tunnels	0	0.0000
		Subtotal	**441.0132**
Light Rail	Bridges	0	0.0000
	Facilities	0	0.0000
	Segments	0	0.0000
	Tunnels	0	0.0000
		Subtotal	**0.0000**
Bus	Facilities	0	0.0000
		Subtotal	**0.0000**
Ferry	Facilities	0	0.0000
		Subtotal	**0.0000**
Port	Facilities	0	0.0000
		Subtotal	**0.0000**
Airport	Facilities	0	0.0000
	Runways	1	5.6452
		Subtotal	**5.6452**
		Total	**2,946.50**

Table 2: Utility System Lifeline Inventory

System	Component	# Locations / Segments	Replacement value (millions of dollars)
Potable Water	Distribution Lines	NA	42.7258
	Facilities	0	0.0000
	Pipelines	0	0.0000
		Subtotal	**42.7258**
Waste Water	Distribution Lines	NA	25.6355
	Facilities	1	171.9518
	Pipelines	0	0.0000
		Subtotal	**197.5873**
Natural Gas	Distribution Lines	NA	17.0903
	Facilities	0	0.0000
	Pipelines	1	72.7419
		Subtotal	**89.8322**
Oil Systems	Facilities	0	0.0000
	Pipelines	0	0.0000
		Subtotal	**0.0000**
Electrical Power	Facilities	6	1302.6783
		Subtotal	**1302.6783**
Communication	Facilities	0	0.0000
		Subtotal	**0.0000**
		Total	**1,632.80**

Earthquake Scenario

Hazus uses the following set of information to define the earthquake parameters used for the earthquake loss estimate provided in this report.



Scenario Name	M7.4-S_San_Andreas v13
Type of Earthquake	
Fault Name	NA
Historical Epicenter ID #	NA
Probabilistic Return Period	NA
Longitude of Epicenter	0.00
Latitude of Epicenter	0.00
Earthquake Magnitude	7.35
Depth (km)	0.00
Rupture Length (Km)	0.00
Rupture Orientation (degrees)	0.00
Attenuation Function	

Direct Earthquake Damage

Building Damage

Hazus estimates that about 763 buildings will be at least moderately damaged. This is over 10.00 % of the buildings in the region. There are an estimated 0 buildings that will be damaged beyond repair. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the Hazus technical manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 below summarizes the expected damage by general building type.

Damage Categories by General Occupancy Type

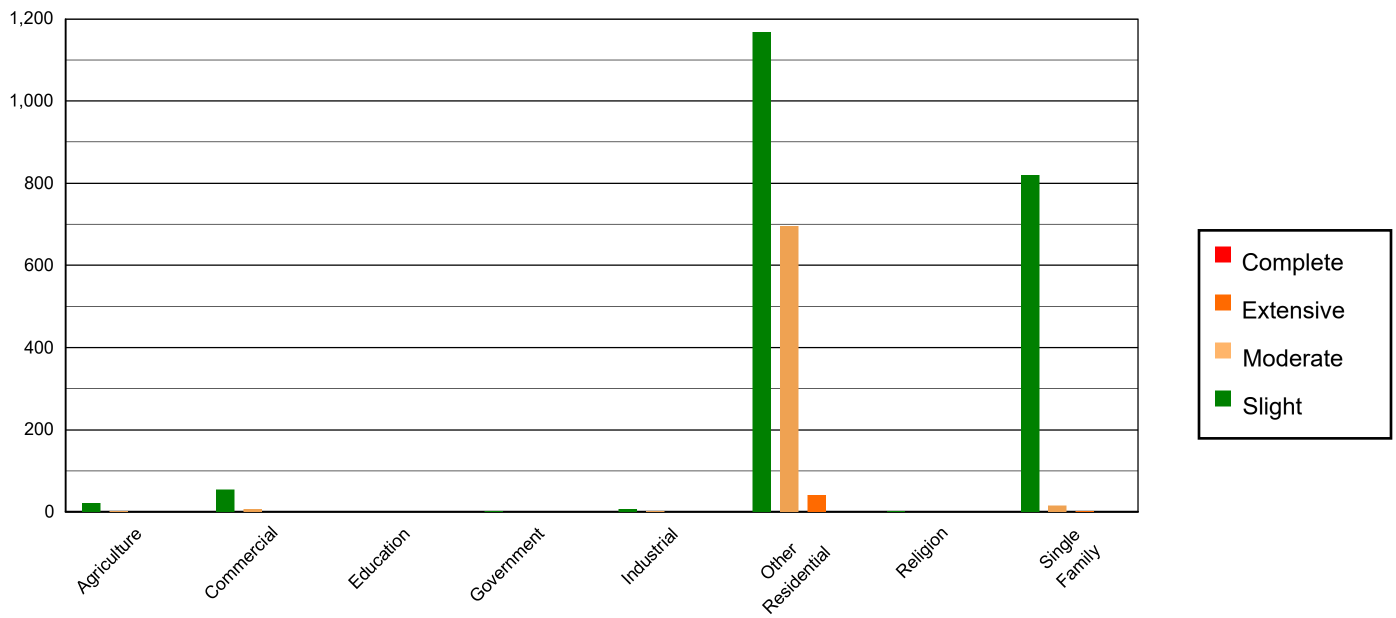


Table 3: Expected Building Damage by Occupancy

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	62.42	1.38	21.46	1.03	2.10	0.29	0.01	0.03	0.00	0.00
Commercial	229.79	5.07	54.89	2.64	6.26	0.87	0.06	0.15	0.00	0.06
Education	5.42	0.12	0.57	0.03	0.01	0.00	0.00	0.00	0.00	0.00
Government	6.13	0.14	1.70	0.08	0.17	0.02	0.00	0.00	0.00	0.00
Industrial	31.00	0.68	7.05	0.34	0.92	0.13	0.03	0.07	0.00	0.00
Other Residential	1162.47	25.66	1168.98	56.29	695.70	96.42	40.76	96.77	0.09	54.23
Religion	8.73	0.19	2.05	0.10	0.21	0.03	0.00	0.00	0.00	0.00
Single Family	3023.71	66.75	819.84	39.48	16.12	2.23	1.25	2.96	0.08	45.72
Total	**4,530**		**2,077**		**721**		**42**		**0**	

Table 4: Expected Building Damage by Building Type (All Design Levels)

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Wood	3359.97	74.18	919.36	44.27	13.09	1.81	0.01	0.02	0.00	0.06
Steel	174.74	3.86	184.33	8.88	72.40	10.04	1.21	2.87	0.00	0.00
Concrete	57.37	1.27	11.40	0.55	0.47	0.07	0.00	0.00	0.00	0.00
Precast	32.97	0.73	12.42	0.60	2.53	0.35	0.02	0.05	0.00	0.00
RM	106.65	2.35	18.48	0.89	2.72	0.38	0.03	0.07	0.00	0.00
URM	1.64	0.04	4.59	0.22	6.04	0.84	1.55	3.67	0.10	60.88
MH	796.33	17.58	925.95	44.59	624.25	86.52	39.30	93.31	0.07	39.06
Total	**4,530**		**2,077**		**721**		**42**		**0**	

*Note:

RM	Reinforced Masonry
URM	Unreinforced Masonry
MH	Manufactured Housing

Essential Facility Damage

Before the earthquake, the region had hospital beds available for use. On the day of the earthquake, the model estimates that only hospital beds (%) are available for use by patients already in the hospital and those injured by the earthquake. After one week, % of the beds will be back in service. By 30 days, % will be operational.

Table 5: Expected Damage to Essential Facilities

Classification	Total	# Facilities		
		At Least Moderate Damage > 50%	Complete Damage > 50%	With Functionality > 50% on day 1
Hospitals	0	0	0	0
Schools	6	0	0	6
EOCs	0	0	0	0
PoliceStations	0	0	0	0
FireStations	4	0	0	4

Transportation Lifeline Damage

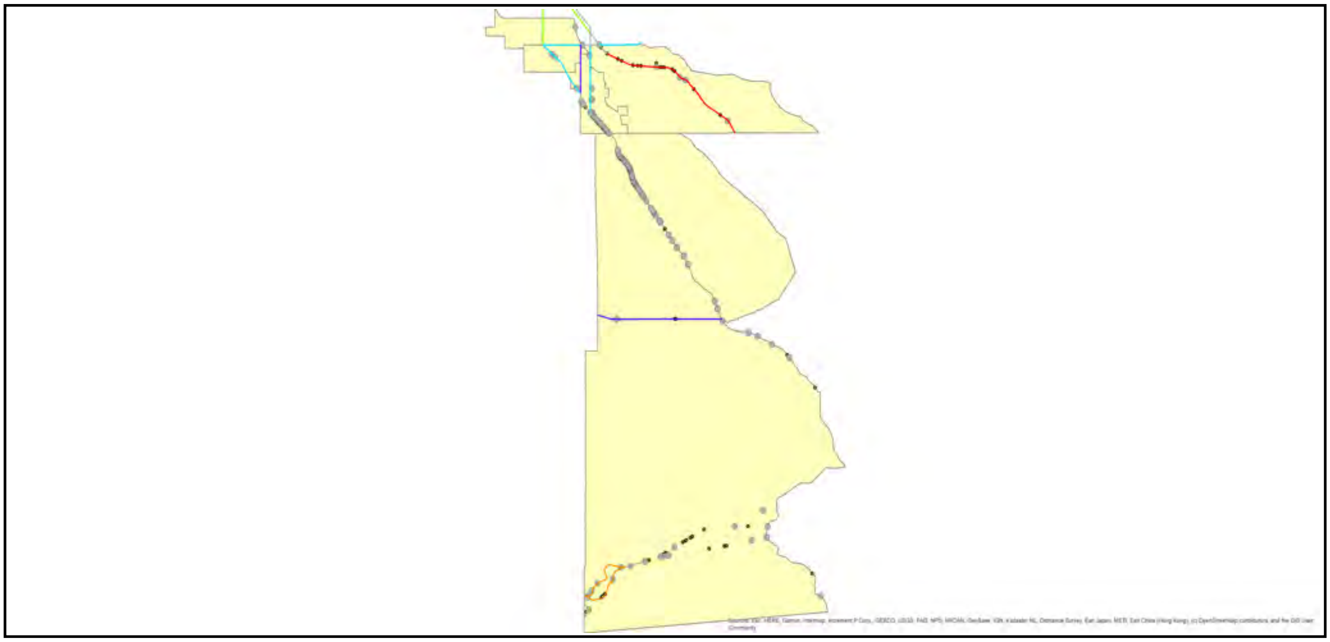


Table 6: Expected Damage to the Transportation Systems

System	Component	Number of Locations_				
		Locations/ Segments	With at Least Mod. Damage	With Complete Damage	With Functionality > 50 %	
					After Day 1	After Day 7
Highway	Segments	64	0	0	64	64
	Bridges	207	0	0	207	207
	Tunnels	0	0	0	0	0
Railways	Segments	27	0	0	27	27
	Bridges	26	0	0	26	26
	Tunnels	0	0	0	0	0
	Facilities	0	0	0	0	0
Light Rail	Segments	0	0	0	0	0
	Bridges	0	0	0	0	0
	Tunnels	0	0	0	0	0
	Facilities	0	0	0	0	0
Bus	Facilities	0	0	0	0	0
Ferry	Facilities	0	0	0	0	0
Port	Facilities	0	0	0	0	0
Airport	Facilities	0	0	0	0	0
	Runways	1	0	0	1	1

Table 6 provides damage estimates for the transportation system.

Note: Roadway segments, railroad tracks and light rail tracks are assumed to be damaged by ground failure only. If ground failure maps are not provided, damage estimates to these components will not be computed.

Tables 7-9 provide information on the damage to the utility lifeline systems. Table 7 provides damage to the utility system facilities. Table 8 provides estimates on the number of leaks and breaks by the pipelines of the utility systems. For electric power and potable water, Hazus performs a simplified system performance analysis. Table 9 provides a summary of the system performance information.

Table 7 : Expected Utility System Facility Damage

System	# of Locations				
	Total #	With at Least Moderate Damage	With Complete Damage	with Functionality > 50 %	
				After Day 1	After Day 7
Potable Water	0	0	0	0	0
Waste Water	1	0	0	1	1
Natural Gas	0	0	0	0	0
Oil Systems	0	0	0	0	0
Electrical Power	6	2	0	4	6
Communication	0	0	0	0	0

Table 8 : Expected Utility System Pipeline Damage (Site Specific)

System	Total Pipelines Length (miles)	Number of Leaks	Number of Breaks
Potable Water	1,327	0	0
Waste Water	796	0	0
Natural Gas	13	0	0
Oil	0	0	0

Table 9: Expected Potable Water and Electric Power System Performance

	Total # of Households	Number of Households without Service				
		At Day 1	At Day 3	At Day 7	At Day 30	At Day 90
Potable Water	6,063	0	0	0	0	0
Electric Power		0	0	0	0	0

Induced Earthquake Damage

Fire Following Earthquake

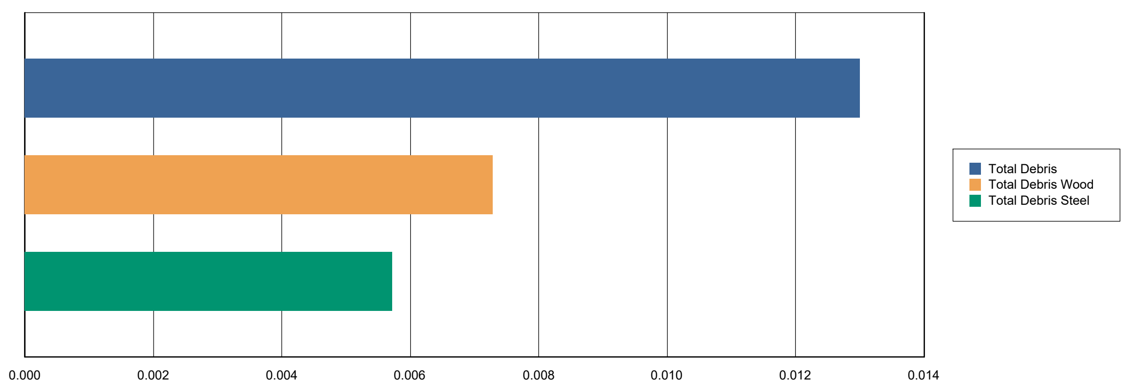
Fires often occur after an earthquake. Because of the number of fires and the lack of water to fight the fires, they can often burn out of control. Hazus uses a Monte Carlo simulation model to estimate the number of ignitions and the amount of burnt area. For this scenario, the model estimates that there will be 0 ignitions that will burn about 0.00 sq. mi 0.00 % of the region's total area.) The model also estimates that the fires will displace about 0 people and burn about 0 (millions of dollars) of building value.

Debris Generation

Hazus estimates the amount of debris that will be generated by the earthquake. The model breaks the debris into two general categories: a) Brick/Wood and b) Reinforced Concrete/Steel. This distinction is made because of the different types of material handling equipment required to handle the debris.

The model estimates that a total of 13,000 tons of debris will be generated. Of the total amount, Brick/Wood comprises 56.00% of the total, with the remainder being Reinforced Concrete/Steel. If the debris tonnage is converted to an estimated number of truckloads, it will require 520 truckloads (@25 tons/truck) to remove the debris generated by the earthquake.

Earthquake Debris (millions of tons)



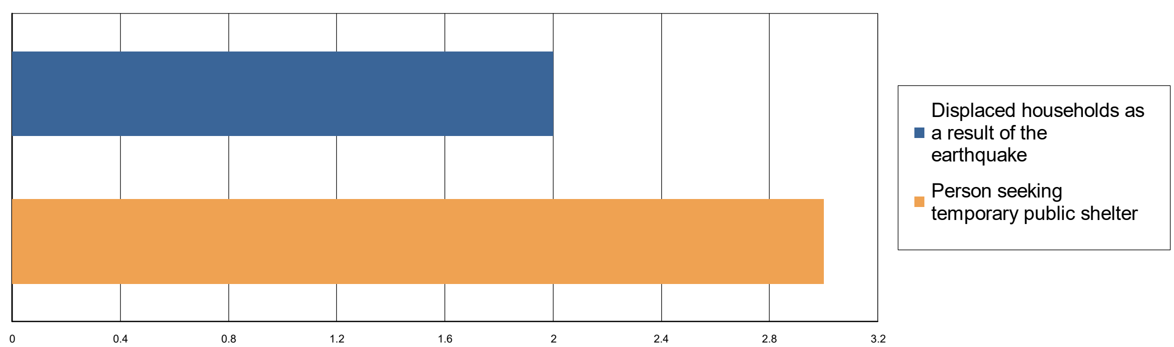
Brick/ Wood	Reinforced Concrete/Steel	Total Debris	Truck Load
0.01	0.01	0.01	520 (@25 tons/truck)

Social Impact

Shelter Requirement

Hazus estimates the number of households that are expected to be displaced from their homes due to the earthquake and the number of displaced people that will require accommodations in temporary public shelters. The model estimates 2 households to be displaced due to the earthquake. Of these, 3 people (out of a total population of 24,777) will seek temporary shelter in public shelters.

Displaced Households/ Persons Seeking Short Term Public Shelter



Displaced households as a result of the earthquake	Persons seeking temporary public shelter
2	3

Casualties

Hazus estimates the number of people that will be injured and killed by the earthquake. The casualties are broken down into four (4) severity levels that describe the extent of the injuries. The levels are described as follows;

- Severity Level 1: Injuries will require medical attention but hospitalization is not needed.
- Severity Level 2: Injuries will require hospitalization but are not considered life-threatening
- Severity Level 3: Injuries will require hospitalization and can become life threatening if not promptly treated.
- Severity Level 4: Victims are killed by the earthquake.

The casualty estimates are provided for three (3) times of day: 2:00 AM, 2:00 PM and 5:00 PM. These times represent the periods of the day that different sectors of the community are at their peak occupancy loads. The 2:00 AM estimate considers that the residential occupancy load is maximum, the 2:00 PM estimate considers that the educational, commercial and industrial sector loads are maximum and 5:00 PM represents peak commute time.

Table 10 provides a summary of the casualties estimated for this earthquake

Table 10: Casualty Estimates

		Level 1	Level 2	Level 3	Level 4
2 AM	Commercial	0.04	0.00	0.00	0.00
	Commuting	0.00	0.00	0.00	0.00
	Educational	0.00	0.00	0.00	0.00
	Hotels	0.00	0.00	0.00	0.00
	Industrial	0.01	0.00	0.00	0.00
	Other-Residential	11.66	1.10	0.00	0.01
	Single Family	1.89	0.09	0.01	0.01
	Total	**14**	**1**	**0**	**0**
2 PM	Commercial	2.96	0.14	0.00	0.00
	Commuting	0.01	0.01	0.02	0.00
	Educational	0.33	0.01	0.00	0.00
	Hotels	0.00	0.00	0.00	0.00
	Industrial	0.05	0.00	0.00	0.00
	Other-Residential	4.29	0.41	0.00	0.00
	Single Family	0.74	0.03	0.00	0.00
	Total	**8**	**1**	**0**	**0**
5 PM	Commercial	1.90	0.09	0.00	0.00
	Commuting	0.17	0.21	0.37	0.07
	Educational	0.00	0.00	0.00	0.00
	Hotels	0.00	0.00	0.00	0.00
	Industrial	0.03	0.00	0.00	0.00
	Other-Residential	4.13	0.39	0.00	0.00
	Single Family	0.70	0.03	0.00	0.00
	Total	**7**	**1**	**0**	**0**

Economic Loss

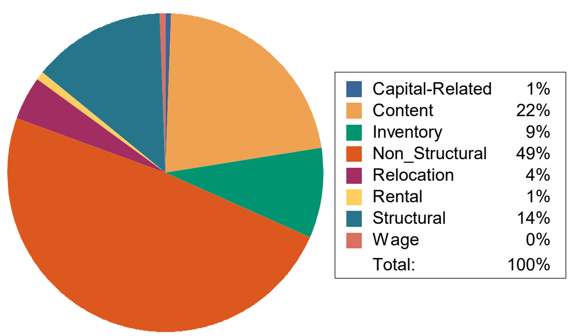
The total economic loss estimated for the earthquake is 253.61 (millions of dollars), which includes building and lifeline related losses based on the region's available inventory. The following three sections provide more detailed information about these losses.

Building-Related Losses

The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the earthquake. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the earthquake.

The total building-related losses were 88.91 (millions of dollars); 6 % of the estimated losses were related to the business interruption of the region. By far, the largest loss was sustained by the residential occupancies which made up over 48 % of the total loss. Table 11 below provides a summary of the losses associated with the building damage.

Earthquake Losses by Loss Type ($ millions)



Earthquake Losses by Occupancy Type ($ millions)

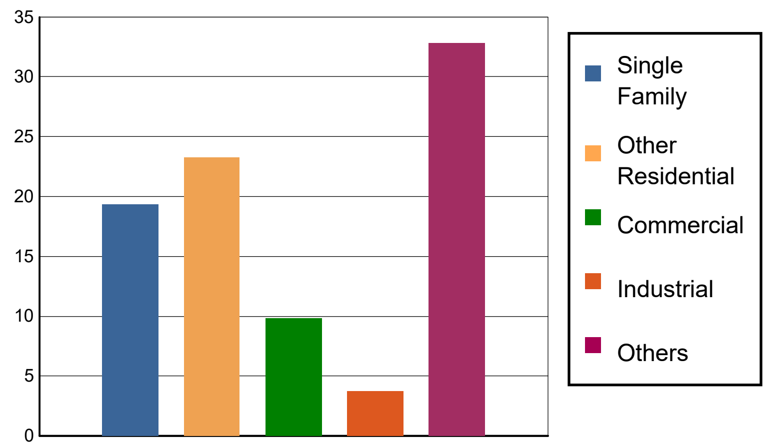


Table 11: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Single Family	Other Residential	Commercial	Industrial	Others	Total
Income Losses							
	Wage	0.0000	0.0077	0.3407	0.0131	0.0400	0.4015
	Capital-Related	0.0000	0.0032	0.4483	0.0076	0.0333	0.4924
	Rental	0.1467	0.3197	0.2878	0.0152	0.0230	0.7924
	Relocation	0.2269	2.8158	0.1817	0.0625	0.4887	3.7756
	Subtotal	**0.3736**	**3.1464**	**1.2585**	**0.0984**	**0.5850**	**5.4619**
Capital Stock Losses							
	Structural	2.0526	4.4103	0.5246	0.2247	5.0301	12.2423
	Non_Structural	12.5206	13.5159	4.7336	1.8890	10.8915	43.5506
	Content	4.3921	2.1880	2.8832	1.3324	8.7518	19.5475
	Inventory	0.0000	0.0000	0.3898	0.1755	7.5426	8.1079
	Subtotal	**18.9653**	**20.1142**	**8.5312**	**3.6216**	**32.2160**	**83.4483**
	Total	**19.34**	**23.26**	**9.79**	**3.72**	**32.80**	**88.91**

Transportation and Utility Lifeline Losses

For the transportation and utility lifeline systems, Hazus computes the direct repair cost for each component only. There are no losses computed by Hazus for business interruption due to lifeline outages. Tables 12 & 13 provide a detailed breakdown in the expected lifeline losses.

Table 12: Transportation System Economic Losses
(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Highway	Segments	2201.9774	0.0000	0.00
	Bridges	297.8540	3.0615	1.03
	Tunnels	0.0000	0.0000	0.00
	Subtotal	**2499.8314**	**3.0615**	
Railways	Segments	293.0732	0.0000	0.00
	Bridges	147.9400	0.2542	0.17
	Tunnels	0.0000	0.0000	0.00
	Facilities	0.0000	0.0000	0.00
	Subtotal	**441.0132**	**0.2542**	
Light Rail	Segments	0.0000	0.0000	0.00
	Bridges	0.0000	0.0000	0.00
	Tunnels	0.0000	0.0000	0.00
	Facilities	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
Bus	Facilities	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
Ferry	Facilities	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
Port	Facilities	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
Airport	Facilities	0.0000	0.0000	0.00
	Runways	5.6452	0.0000	0.00
	Subtotal	**5.6452**	**0.0000**	
	Total	**2,946.49**	**3.32**	

Table 13: Utility System Economic Losses

(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Potable Water	Pipelines	0.0000	0.0000	0.00
	Facilities	0.0000	0.0000	0.00
	Distribution Lines	42.7258	0.0000	0.00
	Subtotal	**42.7258**	**0.0000**	
Waste Water	Pipelines	0.0000	0.0000	0.00
	Facilities	171.9518	11.3970	6.63
	Distribution Lines	25.6355	0.0000	0.00
	Subtotal	**197.5873**	**11.3970**	
Natural Gas	Pipelines	72.7419	0.0000	0.00
	Facilities	0.0000	0.0000	0.00
	Distribution Lines	17.0903	0.0000	0.00
	Subtotal	**89.8322**	**0.0000**	
Oil Systems	Pipelines	0.0000	0.0000	0.00
	Facilities	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
Electrical Power	Facilities	1302.6783	149.9814	11.51
	Subtotal	**1302.6783**	**149.9814**	
Communication	Facilities	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
	Total	**1,632.82**	**161.38**	

Appendix A: County Listing for the Region

Imperial,CA

Riverside,CA

Appendix B: Regional Population and Building Value Data

State	County Name	Population	Building Value (millions of dollars)		
			Residential	Non-Residential	Total
California					
	Imperial	10,781	1,088	1,897	2,986
	Riverside	13,996	1,205	487	1,693
Total Region		**24,777**	**2,293**	**2,384**	**4,679**

Hazus: Earthquake Global Risk Report

Region Name: TMT_EQ2

Earthquake Scenario: M7.5-San_Jacinto v14

Print Date: November 11, 2024

Disclaimer:

Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using Hazus loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social and economic losses following a specific earthquake. These results can be improved by using enhanced inventory, geotechnical, and observed ground motion data.

Table of Contents

General Description of the Region

Hazus-MH is a regional earthquake loss estimation model that was developed by the Federal Emergency Management Agency (FEMA) and the National Institute of Building Sciences. The primary purpose of Hazus is to provide a methodology and software application to develop multi-hazard losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from multi-hazards and to prepare for emergency response and recovery.

The earthquake loss estimates provided in this report was based on a region that includes 2 county(ies) from the following state(s):

California

Note:
Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is 1,333.56 square miles and contains 6 census tracts. There are over 6 thousand households in the region which has a total population of 24,777 peopleF. The distribution of population by Total Region and County is provided in Appendix B.

There are an estimated 7 thousand buildings in the region with a total building replacement value (excluding contents) of 4,680 (millions of dollars). Approximately 94.00 % of the buildings (and 49.00% of the building value) are associated with residential housing.

The replacement value of the transportation and utility lifeline systems is estimated to be 2,946 and 1,632 (millions of dollars) , respectively.

Building and Lifeline Inventory

Building Inventory

Hazus estimates that there are 7 thousand buildings in the region which have an aggregate total replacement value of 4,680 (millions of dollars) . Appendix B provides a general distribution of the building value by Total Region and County.

In terms of building construction types found in the region, wood frame construction makes up 58% of the building inventory. The remaining percentage is distributed between the other general building types.

Critical Facility Inventory

Hazus breaks critical facilities into two (2) groups: essential facilities and high potential loss facilities (HPL). Essential facilities include hospitals, medical clinics, schools, fire stations, police stations and emergency operations facilities. High potential loss facilities include dams, levees, military installations, nuclear power plants and hazardous material sites.

For essential facilities, there are 0 hospitals in the region with a total bed capacity of beds. There are 6 schools, 4 fire stations, 0 police stations and 0 emergency operation facilities. With respect to high potential loss facilities (HPL), there are no dams identified within the inventory. The inventory also includes no hazardous material sites, no military installations and no nuclear power plants.

Transportation and Utility Lifeline Inventory

Within Hazus, the lifeline inventory is divided between transportation and utility lifeline systems. There are seven (7) transportation systems that include highways, railways, light rail, bus, ports, ferry and airports. There are six (6) utility systems that include potable water, wastewater, natural gas, crude & refined oil, electric power and communications. The lifeline inventory data are provided in Tables 1 and 2.

The total value of the lifeline inventory is over 4,578.00 (millions of dollars). This inventory includes over 286.45 miles of highways, 207 bridges, 2,136.27 miles of pipes.

Table 1: Transportation System Lifeline Inventory

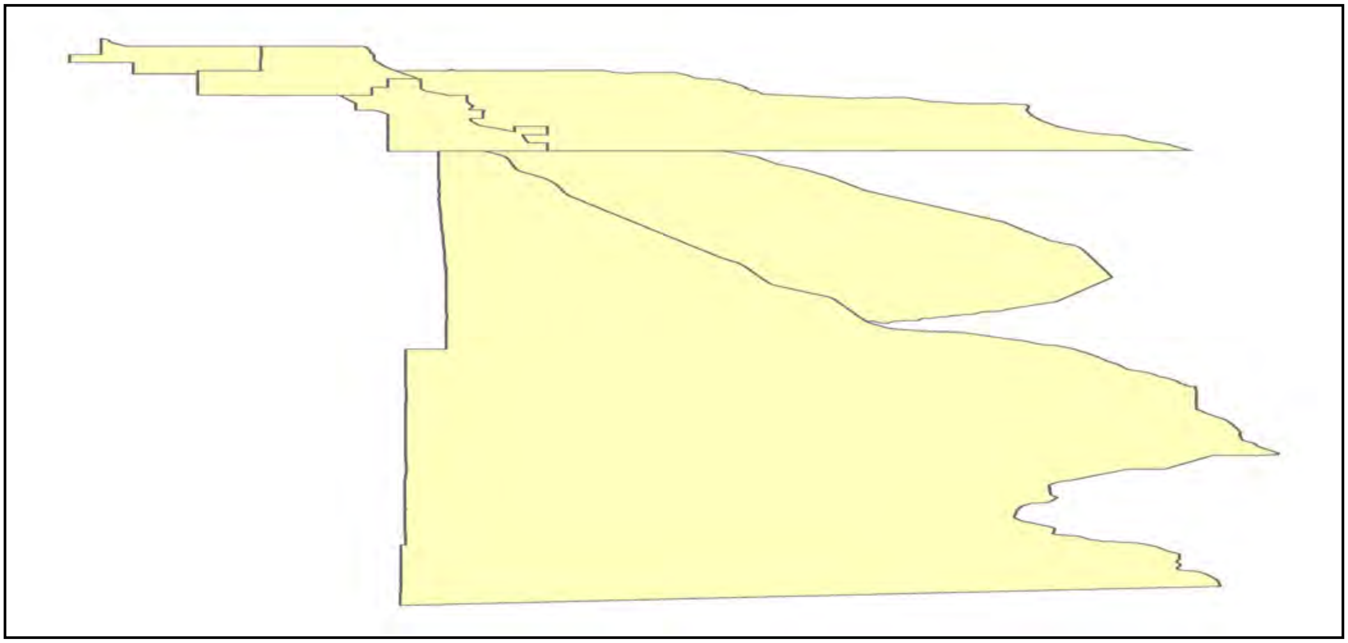
System	Component	# Locations/ # Segments	Replacement value (millions of dollars)
Highway	Bridges	207	297.8540
	Segments	64	2201.9774
	Tunnels	0	0.0000
		Subtotal	**2499.8314**
Railways	Bridges	26	147.9400
	Facilities	0	0.0000
	Segments	27	293.0732
	Tunnels	0	0.0000
		Subtotal	**441.0132**
Light Rail	Bridges	0	0.0000
	Facilities	0	0.0000
	Segments	0	0.0000
	Tunnels	0	0.0000
		Subtotal	**0.0000**
Bus	Facilities	0	0.0000
		Subtotal	**0.0000**
Ferry	Facilities	0	0.0000
		Subtotal	**0.0000**
Port	Facilities	0	0.0000
		Subtotal	**0.0000**
Airport	Facilities	0	0.0000
	Runways	1	5.6452
		Subtotal	**5.6452**
		Total	**2,946.50**

Table 2: Utility System Lifeline Inventory

System	Component	# Locations / Segments	Replacement value (millions of dollars)
Potable Water	Distribution Lines	NA	42.7258
	Facilities	0	0.0000
	Pipelines	0	0.0000
		Subtotal	**42.7258**
Waste Water	Distribution Lines	NA	25.6355
	Facilities	1	171.9518
	Pipelines	0	0.0000
		Subtotal	**197.5873**
Natural Gas	Distribution Lines	NA	17.0903
	Facilities	0	0.0000
	Pipelines	1	72.7419
		Subtotal	**89.8322**
Oil Systems	Facilities	0	0.0000
	Pipelines	0	0.0000
		Subtotal	**0.0000**
Electrical Power	Facilities	6	1302.6783
		Subtotal	**1302.6783**
Communication	Facilities	0	0.0000
		Subtotal	**0.0000**
		Total	**1,632.80**

Earthquake Scenario

Hazus uses the following set of information to define the earthquake parameters used for the earthquake loss estimate provided in this report.



Scenario Name	M7.5-San_Jacinto v14
Type of Earthquake	
Fault Name	NA
Historical Epicenter ID #	NA
Probabilistic Return Period	NA
Longitude of Epicenter	0.00
Latitude of Epicenter	0.00
Earthquake Magnitude	7.52
Depth (km)	0.00
Rupture Length (Km)	0.00
Rupture Orientation (degrees)	0.00
Attenuation Function	

Direct Earthquake Damage

Building Damage

Hazus estimates that about 1,377 buildings will be at least moderately damaged. This is over 19.00 % of the buildings in the region. There are an estimated 5 buildings that will be damaged beyond repair. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the Hazus technical manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 below summarizes the expected damage by general building type.

Damage Categories by General Occupancy Type

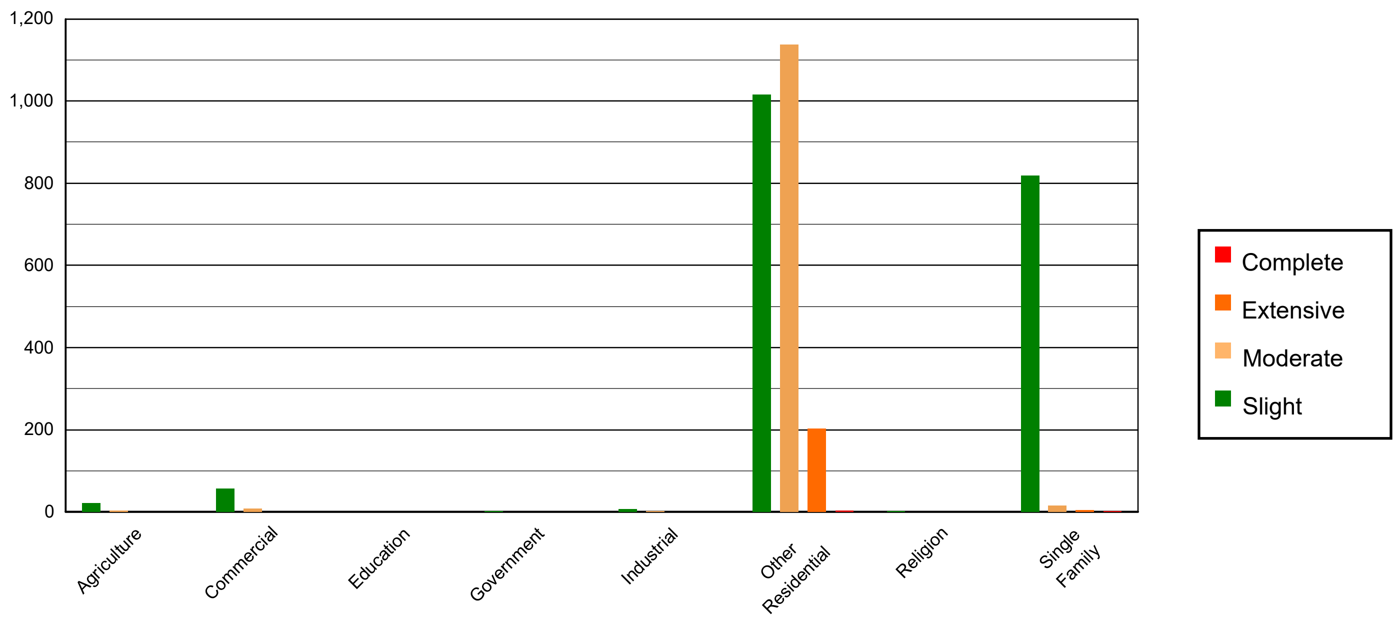


Table 3: Expected Building Damage by Occupancy

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	61.11	1.50	22.34	1.16	2.53	0.22	0.02	0.01	0.00	0.00
Commercial	227.43	5.59	56.20	2.92	7.23	0.62	0.13	0.06	0.00	0.03
Education	5.42	0.13	0.57	0.03	0.01	0.00	0.00	0.00	0.00	0.00
Government	6.06	0.15	1.76	0.09	0.18	0.02	0.00	0.00	0.00	0.00
Industrial	30.66	0.75	7.08	0.37	1.14	0.10	0.12	0.06	0.00	0.02
Other Residential	708.41	17.41	1016.19	52.82	1137.04	97.65	202.57	97.60	3.79	74.48
Religion	8.70	0.21	2.08	0.11	0.22	0.02	0.00	0.00	0.00	0.00
Single Family	3021.46	74.25	817.49	42.50	16.05	1.38	4.71	2.27	1.30	25.48
Total	**4,069**		**1,924**		**1,164**		**208**		**5**	

Table 4: Expected Building Damage by Building Type (All Design Levels)

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Wood	3358.79	82.54	920.19	47.83	13.40	1.15	0.04	0.02	0.00	0.02
Steel	167.05	4.11	186.82	9.71	77.34	6.64	1.48	0.71	0.00	0.02
Concrete	56.84	1.40	11.86	0.62	0.55	0.05	0.00	0.00	0.00	0.00
Precast	32.70	0.80	12.48	0.65	2.72	0.23	0.04	0.02	0.00	0.00
RM	104.73	2.57	19.56	1.02	3.52	0.30	0.06	0.03	0.00	0.00
URM	0.10	0.00	1.09	0.06	5.48	0.47	5.58	2.69	1.67	32.75
MH	349.04	8.58	771.71	40.12	1061.39	91.15	200.34	96.53	3.42	67.20
Total	**4,069**		**1,924**		**1,164**		**208**		**5**	

*Note:

RM Reinforced Masonry
URM Unreinforced Masonry
MH Manufactured Housing

Essential Facility Damage

Before the earthquake, the region had hospital beds available for use. On the day of the earthquake, the model estimates that only hospital beds (%) are available for use by patients already in the hospital and those injured by the earthquake. After one week, % of the beds will be back in service. By 30 days, % will be operational.

Table 5: Expected Damage to Essential Facilities

		# Facilities		
Classification	**Total**	**At Least Moderate Damage > 50%**	**Complete Damage > 50%**	**With Functionality > 50% on day 1**
Hospitals	0	0	0	0
Schools	6	0	0	6
EOCs	0	0	0	0
PoliceStations	0	0	0	0
FireStations	4	0	0	4

Transportation Lifeline Damage

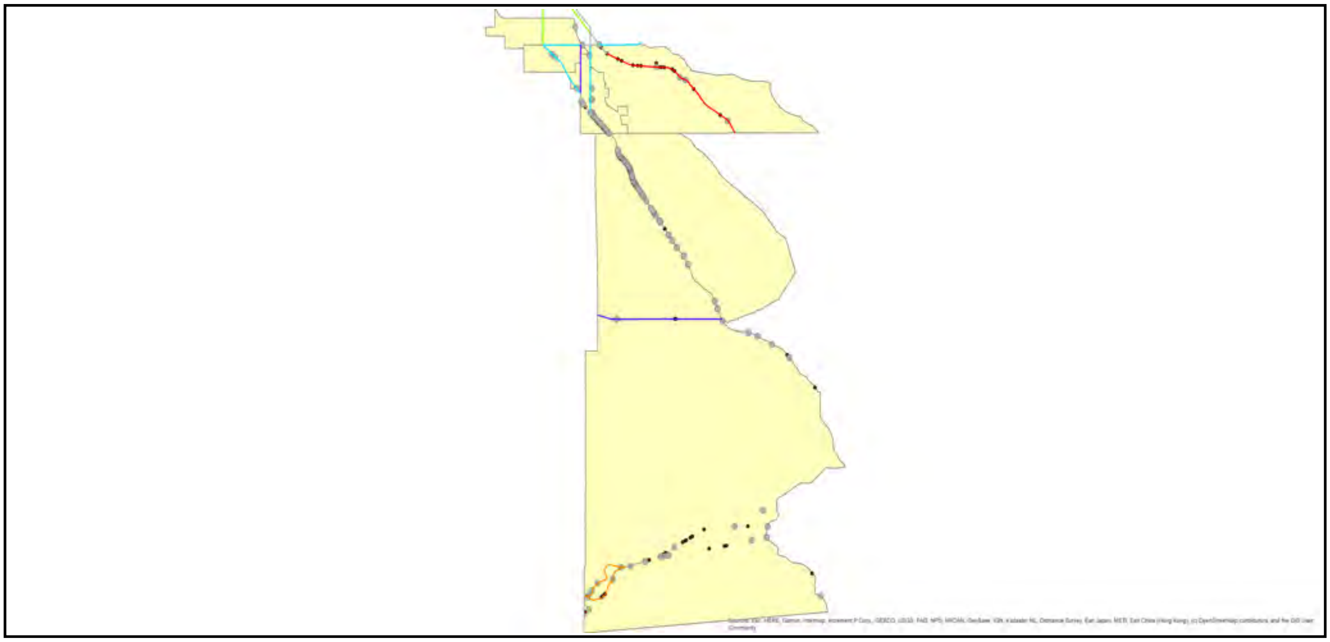


Table 6: Expected Damage to the Transportation Systems

System	Component	Number of Locations_				
		Locations/ Segments	With at Least Mod. Damage	With Complete Damage	With Functionality > 50 %	
					After Day 1	After Day 7
Highway	Segments	64	0	0	64	64
	Bridges	207	0	0	207	207
	Tunnels	0	0	0	0	0
Railways	Segments	27	0	0	27	27
	Bridges	26	0	0	26	26
	Tunnels	0	0	0	0	0
	Facilities	0	0	0	0	0
Light Rail	Segments	0	0	0	0	0
	Bridges	0	0	0	0	0
	Tunnels	0	0	0	0	0
	Facilities	0	0	0	0	0
Bus	Facilities	0	0	0	0	0
Ferry	Facilities	0	0	0	0	0
Port	Facilities	0	0	0	0	0
Airport	Facilities	0	0	0	0	0
	Runways	1	0	0	1	1

Table 6 provides damage estimates for the transportation system.

Note: Roadway segments, railroad tracks and light rail tracks are assumed to be damaged by ground failure only. If ground failure maps are not provided, damage estimates to these components will not be computed.

Tables 7-9 provide information on the damage to the utility lifeline systems. Table 7 provides damage to the utility system facilities. Table 8 provides estimates on the number of leaks and breaks by the pipelines of the utility systems. For electric power and potable water, Hazus performs a simplified system performance analysis. Table 9 provides a summary of the system performance information.

Table 7 : Expected Utility System Facility Damage

System	# of Locations				
	Total #	With at Least Moderate Damage	With Complete Damage	with Functionality > 50 %	
				After Day 1	After Day 7
Potable Water	0	0	0	0	0
Waste Water	1	0	0	1	1
Natural Gas	0	0	0	0	0
Oil Systems	0	0	0	0	0
Electrical Power	6	2	0	4	6
Communication	0	0	0	0	0

Table 8 : Expected Utility System Pipeline Damage (Site Specific)

System	Total Pipelines Length (miles)	Number of Leaks	Number of Breaks
Potable Water	1,327	0	0
Waste Water	796	0	0
Natural Gas	13	0	0
Oil	0	0	0

Table 9: Expected Potable Water and Electric Power System Performance

	Total # of Households	Number of Households without Service				
		At Day 1	At Day 3	At Day 7	At Day 30	At Day 90
Potable Water	6,063	0	0	0	0	0
Electric Power		0	0	0	0	0

Induced Earthquake Damage

Fire Following Earthquake

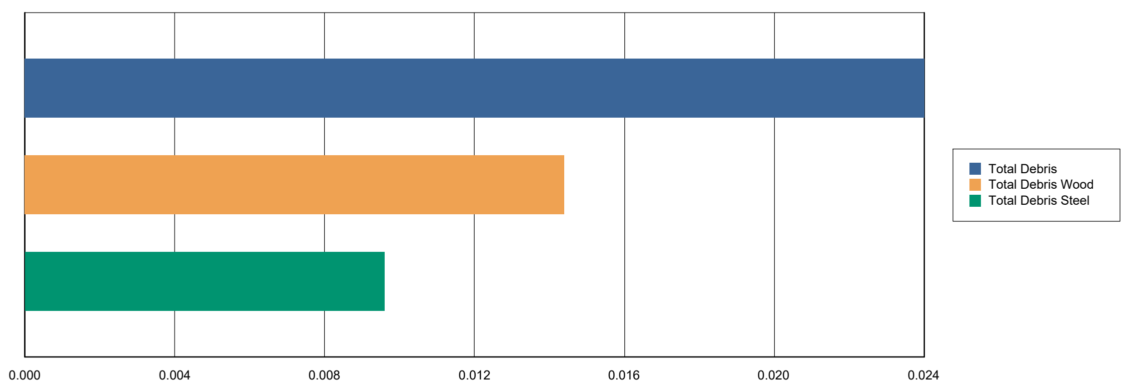
Fires often occur after an earthquake. Because of the number of fires and the lack of water to fight the fires, they can often burn out of control. Hazus uses a Monte Carlo simulation model to estimate the number of ignitions and the amount of burnt area. For this scenario, the model estimates that there will be 0 ignitions that will burn about 0.00 sq. mi 0.00 % of the region's total area.) The model also estimates that the fires will displace about 0 people and burn about 0 (millions of dollars) of building value.

Debris Generation

Hazus estimates the amount of debris that will be generated by the earthquake. The model breaks the debris into two general categories: a) Brick/Wood and b) Reinforced Concrete/Steel. This distinction is made because of the different types of material handling equipment required to handle the debris.

The model estimates that a total of 24,000 tons of debris will be generated. Of the total amount, Brick/Wood comprises 60.00% of the total, with the remainder being Reinforced Concrete/Steel. If the debris tonnage is converted to an estimated number of truckloads, it will require 960 truckloads (@25 tons/truck) to remove the debris generated by the earthquake.

Earthquake Debris (millions of tons)



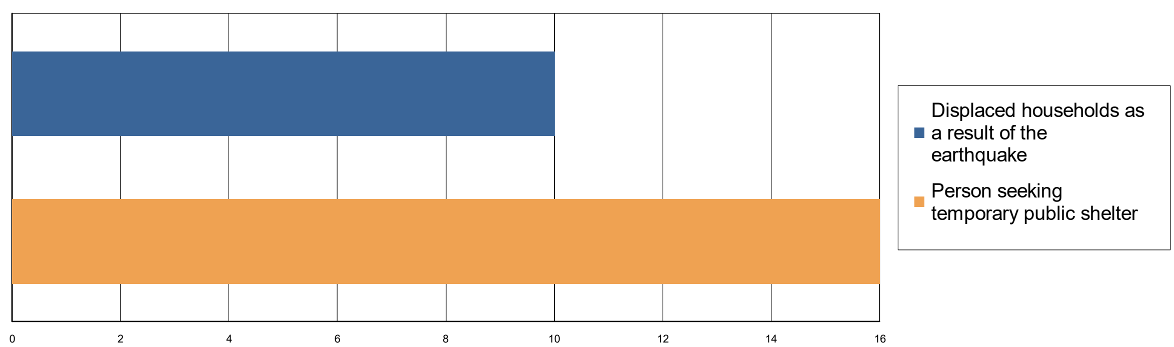
Brick/ Wood	Reinforced Concrete/Steel	Total Debris	Truck Load
0.01	0.01	0.02	960 (@25 tons/truck)

Social Impact

Shelter Requirement

Hazus estimates the number of households that are expected to be displaced from their homes due to the earthquake and the number of displaced people that will require accommodations in temporary public shelters. The model estimates 10 households to be displaced due to the earthquake. Of these, 16 people (out of a total population of 24,777) will seek temporary shelter in public shelters.

Displaced Households/ Persons Seeking Short Term Public Shelter



Displaced households as a result of the earthquake	Persons seeking temporary public shelter
10	16

Casualties

Hazus estimates the number of people that will be injured and killed by the earthquake. The casualties are broken down into four (4) severity levels that describe the extent of the injuries. The levels are described as follows;

· Severity Level 1: Injuries will require medical attention but hospitalization is not needed.
· Severity Level 2: Injuries will require hospitalization but are not considered life-threatening
· Severity Level 3: Injuries will require hospitalization and can become life threatening if not promptly treated.
· Severity Level 4: Victims are killed by the earthquake.

The casualty estimates are provided for three (3) times of day: 2:00 AM, 2:00 PM and 5:00 PM. These times represent the periods of the day that different sectors of the community are at their peak occupancy loads. The 2:00 AM estimate considers that the residential occupancy load is maximum, the 2:00 PM estimate considers that the educational, commercial and industrial sector loads are maximum and 5:00 PM represents peak commute time.

Table 10 provides a summary of the casualties estimated for this earthquake

Table 10: Casualty Estimates

		Level 1	Level 2	Level 3	Level 4
2 AM	Commercial	0.04	0.00	0.00	0.00
	Commuting	0.00	0.00	0.00	0.00
	Educational	0.00	0.00	0.00	0.00
	Hotels	0.00	0.00	0.00	0.00
	Industrial	0.01	0.00	0.00	0.00
	Other-Residential	24.80	2.81	0.05	0.08
	Single Family	4.06	0.66	0.09	0.18
	Total	**29**	**3**	**0**	**0**
2 PM	Commercial	3.10	0.15	0.00	0.00
	Commuting	0.01	0.01	0.02	0.00
	Educational	0.35	0.01	0.00	0.00
	Hotels	0.00	0.00	0.00	0.00
	Industrial	0.06	0.00	0.00	0.00
	Other-Residential	9.15	1.04	0.02	0.03
	Single Family	1.60	0.27	0.04	0.07
	Total	**14**	**1**	**0**	**0**
5 PM	Commercial	2.01	0.10	0.00	0.00
	Commuting	0.17	0.21	0.37	0.07
	Educational	0.00	0.00	0.00	0.00
	Hotels	0.00	0.00	0.00	0.00
	Industrial	0.03	0.00	0.00	0.00
	Other-Residential	8.80	1.00	0.02	0.03
	Single Family	1.58	0.27	0.04	0.07
	Total	**13**	**2**	**0**	**0**

Economic Loss

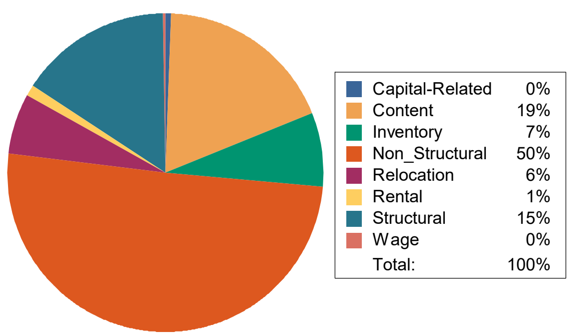
The total economic loss estimated for the earthquake is 273.27 (millions of dollars), which includes building and lifeline related losses based on the region's available inventory. The following three sections provide more detailed information about these losses.

Building-Related Losses

The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the earthquake. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the earthquake.

The total building-related losses were 108.58 (millions of dollars); 8 % of the estimated losses were related to the business interruption of the region. By far, the largest loss was sustained by the residential occupancies which made up over 57 % of the total loss. Table 11 below provides a summary of the losses associated with the building damage.

Earthquake Losses by Loss Type ($ millions)



Earthquake Losses by Occupancy Type ($ millions)

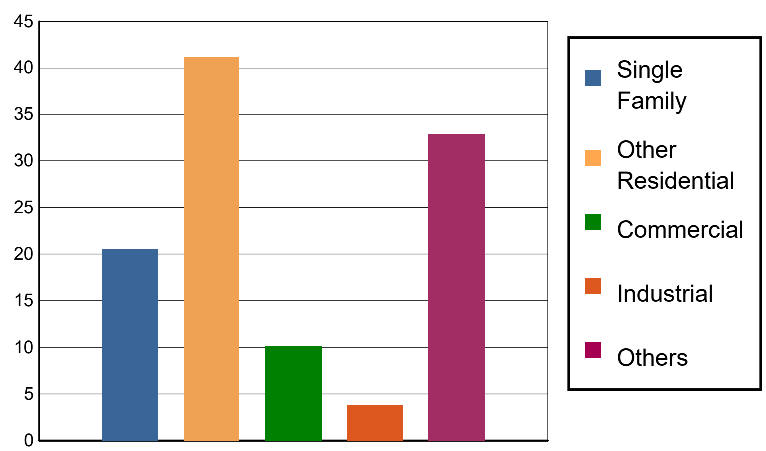


Table 11: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Single Family	Other Residential	Commercial	Industrial	Others	Total
Income Losses							
	Wage	0.0000	0.0085	0.3605	0.0178	0.0406	0.4274
	Capital-Related	0.0000	0.0036	0.4733	0.0102	0.0337	0.5208
	Rental	0.1937	0.5884	0.3171	0.0161	0.0233	1.1386
	Relocation	0.3840	5.5791	0.2259	0.0755	0.4947	6.7592
	Subtotal	**0.5777**	**6.1796**	**1.3768**	**0.1196**	**0.5923**	**8.8460**
Capital Stock Losses							
	Structural	2.3391	8.4989	0.5988	0.2629	5.0688	16.7685
	Non_Structural	13.1126	23.8780	4.8786	1.9403	10.9253	54.7348
	Content	4.4878	2.5627	2.9253	1.3509	8.7704	20.0971
	Inventory	0.0000	0.0000	0.3950	0.1780	7.5581	8.1311
	Subtotal	**19.9395**	**34.9396**	**8.7977**	**3.7321**	**32.3226**	**99.7315**
	Total	**20.52**	**41.12**	**10.17**	**3.85**	**32.91**	**108.58**

Transportation and Utility Lifeline Losses

For the transportation and utility lifeline systems, Hazus computes the direct repair cost for each component only. There are no losses computed by Hazus for business interruption due to lifeline outages. Tables 12 & 13 provide a detailed breakdown in the expected lifeline losses.

Table 12: Transportation System Economic Losses
(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Highway	Segments	2201.9774	0.0000	0.00
	Bridges	297.8540	3.0615	1.03
	Tunnels	0.0000	0.0000	0.00
	Subtotal	**2499.8314**	**3.0615**	
Railways	Segments	293.0732	0.0000	0.00
	Bridges	147.9400	0.2542	0.17
	Tunnels	0.0000	0.0000	0.00
	Facilities	0.0000	0.0000	0.00
	Subtotal	**441.0132**	**0.2542**	
Light Rail	Segments	0.0000	0.0000	0.00
	Bridges	0.0000	0.0000	0.00
	Tunnels	0.0000	0.0000	0.00
	Facilities	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
Bus	Facilities	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
Ferry	Facilities	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
Port	Facilities	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
Airport	Facilities	0.0000	0.0000	0.00
	Runways	5.6452	0.0000	0.00
	Subtotal	**5.6452**	**0.0000**	
	Total	**2,946.49**	**3.32**	

Table 13: Utility System Economic Losses

(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Potable Water	Pipelines	0.0000	0.0000	0.00
	Facilities	0.0000	0.0000	0.00
	Distribution Lines	42.7258	0.0000	0.00
	Subtotal	**42.7258**	**0.0000**	
Waste Water	Pipelines	0.0000	0.0000	0.00
	Facilities	171.9518	11.3970	6.63
	Distribution Lines	25.6355	0.0000	0.00
	Subtotal	**197.5873**	**11.3970**	
Natural Gas	Pipelines	72.7419	0.0000	0.00
	Facilities	0.0000	0.0000	0.00
	Distribution Lines	17.0903	0.0000	0.00
	Subtotal	**89.8322**	**0.0000**	
Oil Systems	Pipelines	0.0000	0.0000	0.00
	Facilities	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
Electrical Power	Facilities	1302.6783	149.9814	11.51
	Subtotal	**1302.6783**	**149.9814**	
Communication	Facilities	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
	Total	**1,632.82**	**161.38**	

Appendix A: County Listing for the Region

Imperial,CA

Riverside,CA

Appendix B: Regional Population and Building Value Data

State	County Name	Population	Building Value (millions of dollars)		
			Residential	Non-Residential	Total
California					
	Imperial	10,781	1,088	1,897	2,986
	Riverside	13,996	1,205	487	1,693
Total Region		**24,777**	**2,293**	**2,384**	**4,679**

Hazus: Earthquake Global Risk Report

Region Name: TMT_EQ2

Earthquake Scenario: 1000year

Print Date: November 11, 2024

Disclaimer:

Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using Hazus loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social and economic losses following a specific earthquake. These results can be improved by using enhanced inventory, geotechnical, and observed ground motion data.

Table of Contents

General Description of the Region

Hazus-MH is a regional earthquake loss estimation model that was developed by the Federal Emergency Management Agency (FEMA) and the National Institute of Building Sciences. The primary purpose of Hazus is to provide a methodology and software application to develop multi-hazard losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from multi-hazards and to prepare for emergency response and recovery.

The earthquake loss estimates provided in this report was based on a region that includes 2 county(ies) from the following state(s):

California

Note:
Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is 1,333.56 square miles and contains 6 census tracts. There are over 6 thousand households in the region which has a total population of 24,777 peopleF. The distribution of population by Total Region and County is provided in Appendix B.

There are an estimated 7 thousand buildings in the region with a total building replacement value (excluding contents) of 4,680 (millions of dollars). Approximately 94.00 % of the buildings (and 49.00% of the building value) are associated with residential housing.

The replacement value of the transportation and utility lifeline systems is estimated to be 2,946 and 1,632 (millions of dollars) , respectively.

Building and Lifeline Inventory

Building Inventory

Hazus estimates that there are 7 thousand buildings in the region which have an aggregate total replacement value of 4,680 (millions of dollars) . Appendix B provides a general distribution of the building value by Total Region and County.

In terms of building construction types found in the region, wood frame construction makes up 58% of the building inventory. The remaining percentage is distributed between the other general building types.

Critical Facility Inventory

Hazus breaks critical facilities into two (2) groups: essential facilities and high potential loss facilities (HPL). Essential facilities include hospitals, medical clinics, schools, fire stations, police stations and emergency operations facilities. High potential loss facilities include dams, levees, military installations, nuclear power plants and hazardous material sites.

For essential facilities, there are 0 hospitals in the region with a total bed capacity of beds. There are 6 schools, 4 fire stations, 0 police stations and 0 emergency operation facilities. With respect to high potential loss facilities (HPL), there are no dams identified within the inventory. The inventory also includes no hazardous material sites, no military installations and no nuclear power plants.

Transportation and Utility Lifeline Inventory

Within Hazus, the lifeline inventory is divided between transportation and utility lifeline systems. There are seven (7) transportation systems that include highways, railways, light rail, bus, ports, ferry and airports. There are six (6) utility systems that include potable water, wastewater, natural gas, crude & refined oil, electric power and communications. The lifeline inventory data are provided in Tables 1 and 2.

The total value of the lifeline inventory is over 4,578.00 (millions of dollars). This inventory includes over 286.45 miles of highways, 207 bridges, 2,136.27 miles of pipes.

Table 1: Transportation System Lifeline Inventory

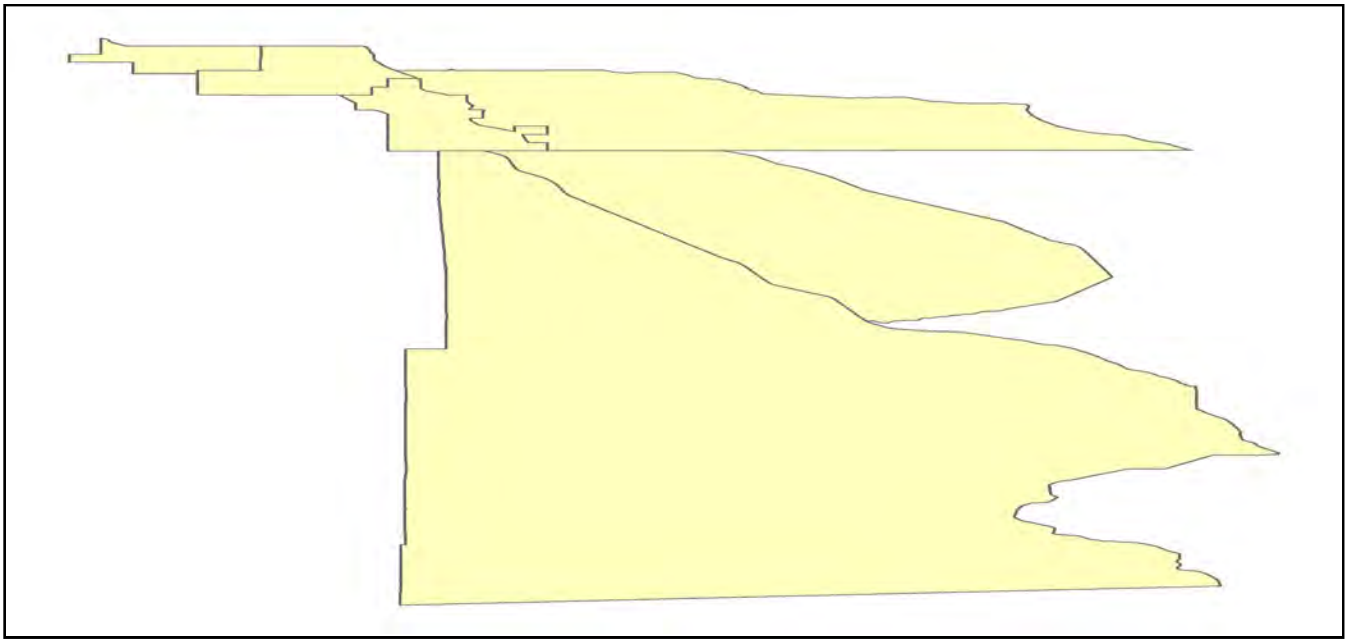
System	Component	# Locations/ # Segments	Replacement value (millions of dollars)
Highway	Bridges	207	297.8540
	Segments	64	2201.9774
	Tunnels	0	0.0000
		Subtotal	**2499.8314**
Railways	Bridges	26	147.9400
	Facilities	0	0.0000
	Segments	27	293.0732
	Tunnels	0	0.0000
		Subtotal	**441.0132**
Light Rail	Bridges	0	0.0000
	Facilities	0	0.0000
	Segments	0	0.0000
	Tunnels	0	0.0000
		Subtotal	**0.0000**
Bus	Facilities	0	0.0000
		Subtotal	**0.0000**
Ferry	Facilities	0	0.0000
		Subtotal	**0.0000**
Port	Facilities	0	0.0000
		Subtotal	**0.0000**
Airport	Facilities	0	0.0000
	Runways	1	5.6452
		Subtotal	**5.6452**
		Total	**2,946.50**

Table 2: Utility System Lifeline Inventory

System	Component	# Locations / Segments	Replacement value (millions of dollars)
Potable Water	Distribution Lines	NA	42.7258
	Facilities	0	0.0000
	Pipelines	0	0.0000
		Subtotal	**42.7258**
Waste Water	Distribution Lines	NA	25.6355
	Facilities	1	171.9518
	Pipelines	0	0.0000
		Subtotal	**197.5873**
Natural Gas	Distribution Lines	NA	17.0903
	Facilities	0	0.0000
	Pipelines	1	72.7419
		Subtotal	**89.8322**
Oil Systems	Facilities	0	0.0000
	Pipelines	0	0.0000
		Subtotal	**0.0000**
Electrical Power	Facilities	6	1302.6783
		Subtotal	**1302.6783**
Communication	Facilities	0	0.0000
		Subtotal	**0.0000**
		Total	**1,632.80**

Earthquake Scenario

Hazus uses the following set of information to define the earthquake parameters used for the earthquake loss estimate provided in this report.



Scenario Name	1000year
Type of Earthquake	Probabilistic
Fault Name	NA
Historical Epicenter ID #	NA
Probabilistic Return Period	1,000.00
Longitude of Epicenter	NA
Latitude of Epicenter	NA
Earthquake Magnitude	7.00
Depth (km)	NA
Rupture Length (Km)	NA
Rupture Orientation (degrees)	NA
Attenuation Function	NA

Direct Earthquake Damage

Building Damage

Hazus estimates that about 4,290 buildings will be at least moderately damaged. This is over 58.00 % of the buildings in the region. There are an estimated 1,153 buildings that will be damaged beyond repair. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the Hazus technical manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 below summarizes the expected damage by general building type.

Damage Categories by General Occupancy Type

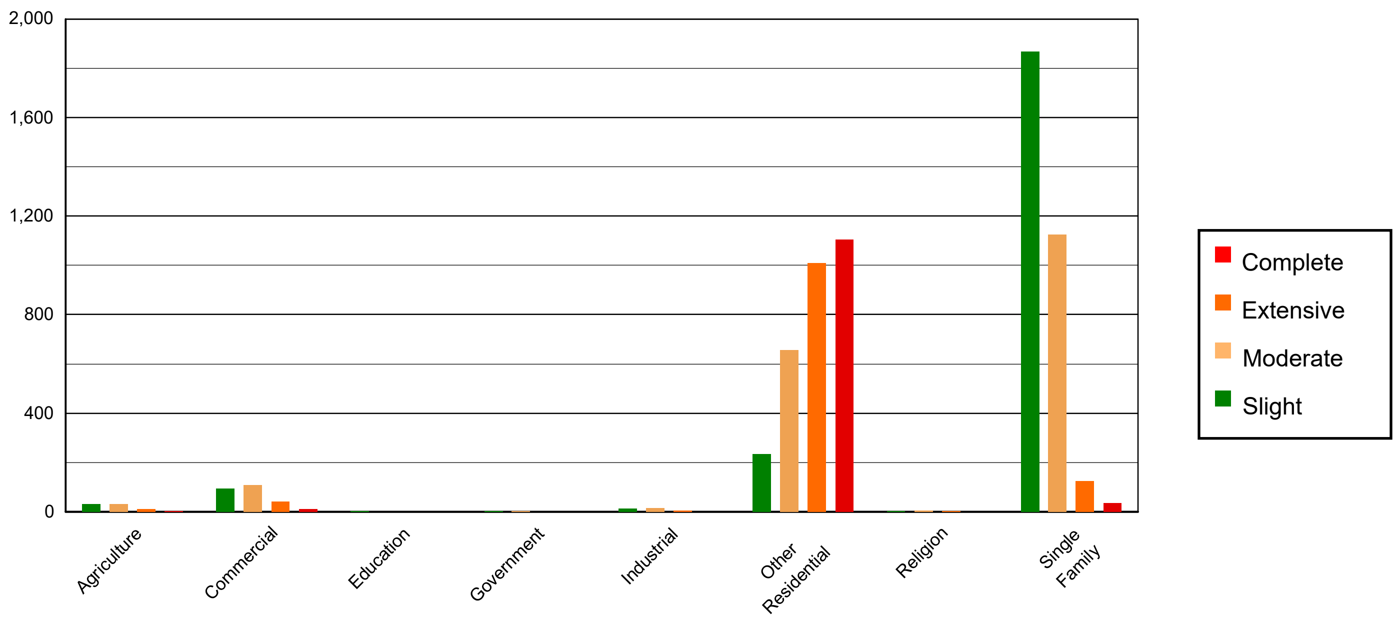


Table 3: Expected Building Damage by Occupancy

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	11.69	1.40	30.35	1.35	31.36	1.61	10.54	0.89	2.05	0.18
Commercial	37.54	4.51	93.26	4.15	109.69	5.64	40.61	3.41	9.90	0.86
Education	1.92	0.23	2.68	0.12	1.28	0.07	0.10	0.01	0.01	0.00
Government	1.36	0.16	2.68	0.12	2.94	0.15	0.92	0.08	0.10	0.01
Industrial	4.61	0.55	12.69	0.56	14.82	0.76	5.48	0.46	1.41	0.12
Other Residential	66.68	8.01	234.14	10.42	655.37	33.67	1007.98	84.63	1103.83	95.69
Religion	1.28	0.15	3.42	0.15	4.30	0.22	1.72	0.14	0.28	0.02
Single Family	707.60	84.98	1867.29	83.12	1126.40	57.88	123.71	10.39	36.00	3.12
Total	**833**		**2,247**		**1,946**		**1,191**		**1,154**	

Table 4: Expected Building Damage by Building Type (All Design Levels)

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Wood	782.41	93.96	2074.37	92.34	1265.32	65.02	140.10	11.76	30.23	2.62
Steel	12.42	1.49	50.16	2.23	188.53	9.69	145.08	12.18	36.50	3.16
Concrete	8.85	1.06	23.40	1.04	26.22	1.35	8.94	0.75	1.84	0.16
Precast	3.31	0.40	10.59	0.47	21.60	1.11	9.85	0.83	2.59	0.22
RM	20.39	2.45	31.28	1.39	46.15	2.37	21.30	1.79	8.75	0.76
URM	0.02	0.00	0.15	0.01	0.80	0.04	2.04	0.17	10.91	0.95
MH	5.28	0.63	56.56	2.52	397.55	20.43	863.75	72.52	1062.77	92.13
Total	**833**		**2,247**		**1,946**		**1,191**		**1,154**	

*Note:

RM	Reinforced Masonry
URM	Unreinforced Masonry
MH	Manufactured Housing

Essential Facility Damage

Before the earthquake, the region had hospital beds available for use. On the day of the earthquake, the model estimates that only hospital beds (%) are available for use by patients already in the hospital and those injured by the earthquake. After one week, % of the beds will be back in service. By 30 days, % will be operational.

Table 5: Expected Damage to Essential Facilities

		# Facilities		
Classification	**Total**	**At Least Moderate Damage > 50%**	**Complete Damage > 50%**	**With Functionality > 50% on day 1**
Hospitals	0	0	0	0
Schools	6	0	0	0
EOCs	0	0	0	0
PoliceStations	0	0	0	0
FireStations	4	0	0	0

Transportation Lifeline Damage

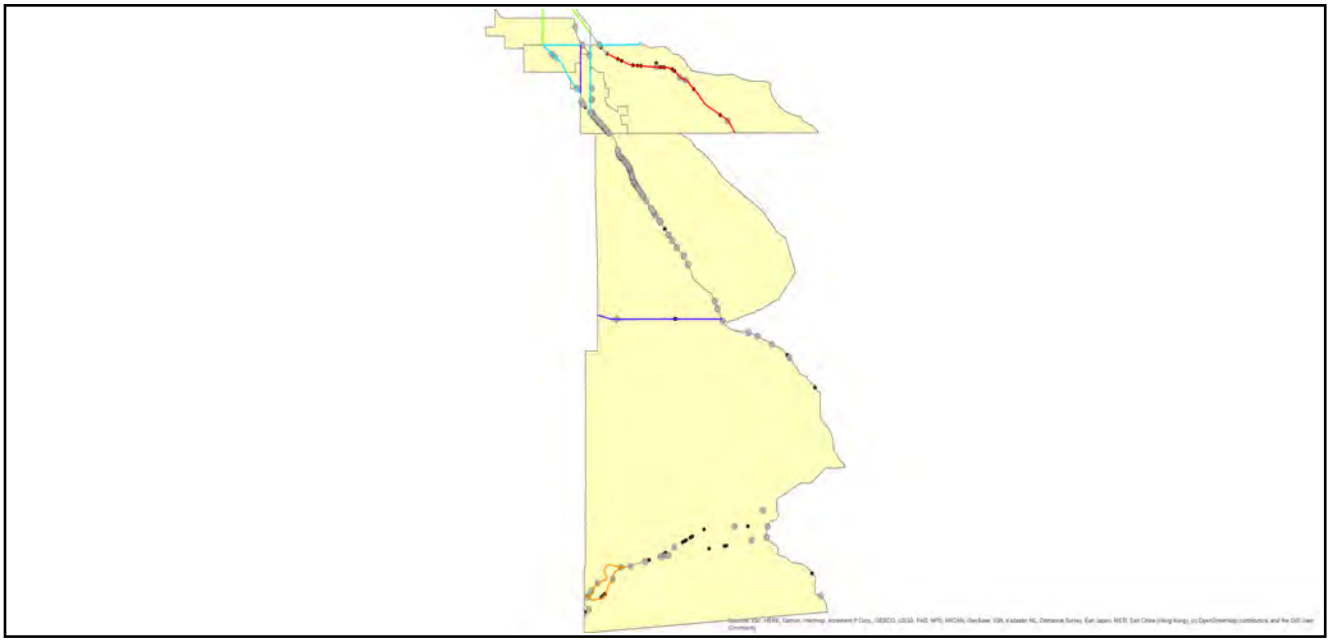


Table 6: Expected Damage to the Transportation Systems

System	Component	Number of Locations_				
		Locations/ Segments	With at Least Mod. Damage	With Complete Damage	With Functionality > 50 %	
					After Day 1	After Day 7
Highway	Segments	64	0	0	64	64
	Bridges	207	71	1	146	177
	Tunnels	0	0	0	0	0
Railways	Segments	27	0	0	27	27
	Bridges	26	14	0	12	14
	Tunnels	0	0	0	0	0
	Facilities	0	0	0	0	0
Light Rail	Segments	0	0	0	0	0
	Bridges	0	0	0	0	0
	Tunnels	0	0	0	0	0
	Facilities	0	0	0	0	0
Bus	Facilities	0	0	0	0	0
Ferry	Facilities	0	0	0	0	0
Port	Facilities	0	0	0	0	0
Airport	Facilities	0	0	0	0	0
	Runways	1	0	0	1	1

Table 6 provides damage estimates for the transportation system.

Note: Roadway segments, railroad tracks and light rail tracks are assumed to be damaged by ground failure only. If ground failure maps are not provided, damage estimates to these components will not be computed.

Tables 7-9 provide information on the damage to the utility lifeline systems. Table 7 provides damage to the utility system facilities. Table 8 provides estimates on the number of leaks and breaks by the pipelines of the utility systems. For electric power and potable water, Hazus performs a simplified system performance analysis. Table 9 provides a summary of the system performance information.

Table 7 : Expected Utility System Facility Damage

System	# of Locations				
	Total #	With at Least Moderate Damage	With Complete Damage	with Functionality > 50 %	
				After Day 1	After Day 7
Potable Water	0	0	0	0	0
Waste Water	1	1	0	0	0
Natural Gas	0	0	0	0	0
Oil Systems	0	0	0	0	0
Electrical Power	6	6	4	0	0
Communication	0	0	0	0	0

Table 8 : Expected Utility System Pipeline Damage (Site Specific)

System	Total Pipelines Length (miles)	Number of Leaks	Number of Breaks
Potable Water	1,327	2902	725
Waste Water	796	1458	364
Natural Gas	13	0	0
Oil	0	0	0

Table 9: Expected Potable Water and Electric Power System Performance

	Total # of Households	Number of Households without Service				
		At Day 1	At Day 3	At Day 7	At Day 30	At Day 90
Potable Water	6,063	5,588	5,412	4,731	0	0
Electric Power		5,522	4,716	3,019	725	6

Induced Earthquake Damage

Fire Following Earthquake

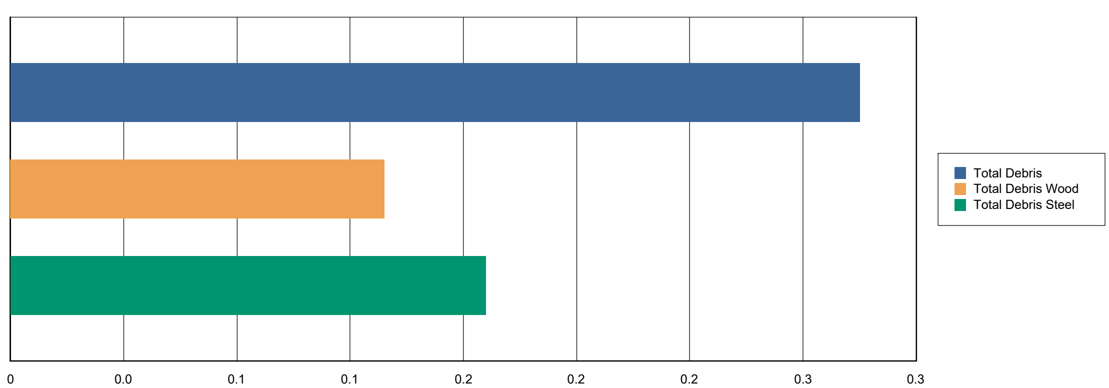
Fires often occur after an earthquake. Because of the number of fires and the lack of water to fight the fires, they can often burn out of control. Hazus uses a Monte Carlo simulation model to estimate the number of ignitions and the amount of burnt area. For this scenario, the model estimates that there will be 0 ignitions that will burn about 0.00 sq. mi 0.00 % of the region's total area.) The model also estimates that the fires will displace about 0 people and burn about 0 (millions of dollars) of building value.

Debris Generation

Hazus estimates the amount of debris that will be generated by the earthquake. The model breaks the debris into two general categories: a) Brick/Wood and b) Reinforced Concrete/Steel. This distinction is made because of the different types of material handling equipment required to handle the debris.

The model estimates that a total of 300,000 tons of debris will be generated. Of the total amount, Brick/Wood comprises 44.00% of the total, with the remainder being Reinforced Concrete/Steel. If the debris tonnage is converted to an estimated number of truckloads, it will require 12,000 truckloads (@25 tons/truck) to remove the debris generated by the earthquake.

Earthquake Debris (millions of tons)



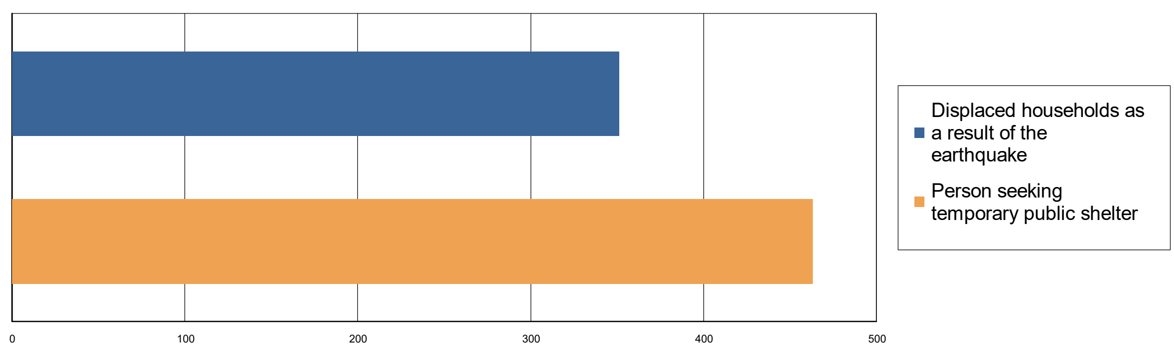
Brick/ Wood	Reinforced Concrete/Steel	Total Debris	Truck Load
0.13	0.17	0.30	12,000 (@25 tons/truck)

Social Impact

Shelter Requirement

Hazus estimates the number of households that are expected to be displaced from their homes due to the earthquake and the number of displaced people that will require accommodations in temporary public shelters. The model estimates 351 households to be displaced due to the earthquake. Of these, 463 people (out of a total population of 24,777) will seek temporary shelter in public shelters.

Displaced Households/ Persons Seeking Short Term Public Shelter



Displaced households as a result of the earthquake	Persons seeking temporary public shelter
351	463

Casualties

Hazus estimates the number of people that will be injured and killed by the earthquake. The casualties are broken down into four (4) severity levels that describe the extent of the injuries. The levels are described as follows;

- Severity Level 1: Injuries will require medical attention but hospitalization is not needed.
- Severity Level 2: Injuries will require hospitalization but are not considered life-threatening
- Severity Level 3: Injuries will require hospitalization and can become life threatening if not promptly treated.
- Severity Level 4: Victims are killed by the earthquake.

The casualty estimates are provided for three (3) times of day: 2:00 AM, 2:00 PM and 5:00 PM. These times represent the periods of the day that different sectors of the community are at their peak occupancy loads. The 2:00 AM estimate considers that the residential occupancy load is maximum, the 2:00 PM estimate considers that the educational, commercial and industrial sector loads are maximum and 5:00 PM represents peak commute time.

Table 10 provides a summary of the casualties estimated for this earthquake

Table 10: Casualty Estimates

		Level 1	Level 2	Level 3	Level 4
2 AM	Commercial	1.51	0.39	0.06	0.12
	Commuting	0.04	0.05	0.09	0.02
	Educational	0.00	0.00	0.00	0.00
	Hotels	0.03	0.00	0.00	0.00
	Industrial	0.17	0.03	0.00	0.01
	Other-Residential	327.08	78.42	4.87	7.85
	Single Family	33.65	6.97	0.77	1.48
	Total	**362**	**86**	**6**	**9**
2 PM	Commercial	110.70	28.06	4.45	8.72
	Commuting	0.36	0.47	0.80	0.16
	Educational	11.38	2.77	0.43	0.85
	Hotels	0.01	0.00	0.00	0.00
	Industrial	1.24	0.25	0.03	0.05
	Other-Residential	117.46	28.13	1.76	2.89
	Single Family	13.70	2.87	0.33	0.60
	Total	**255**	**63**	**8**	**13**
5 PM	Commercial	71.55	17.98	2.83	5.51
	Commuting	6.04	8.08	13.61	2.64
	Educational	0.00	0.00	0.00	0.00
	Hotels	0.01	0.00	0.00	0.00
	Industrial	0.77	0.16	0.02	0.03
	Other-Residential	116.14	27.83	1.74	2.86
	Single Family	13.29	2.84	0.34	0.61
	Total	**208**	**57**	**19**	**12**

Economic Loss

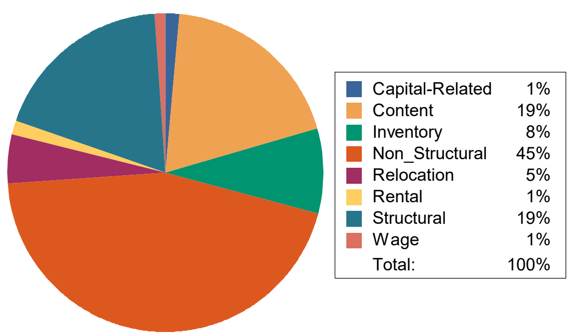
The total economic loss estimated for the earthquake is 2,374.85 (millions of dollars), which includes building and lifeline related losses based on the region's available inventory. The following three sections provide more detailed information about these losses.

Building-Related Losses

The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the earthquake. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the earthquake.

The total building-related losses were 1,245.67 (millions of dollars); 9 % of the estimated losses were related to the business interruption of the region. By far, the largest loss was sustained by the residential occupancies which made up over 44 % of the total loss. Table 11 below provides a summary of the losses associated with the building damage.

Earthquake Losses by Loss Type ($ millions)



Earthquake Losses by Occupancy Type ($ millions)

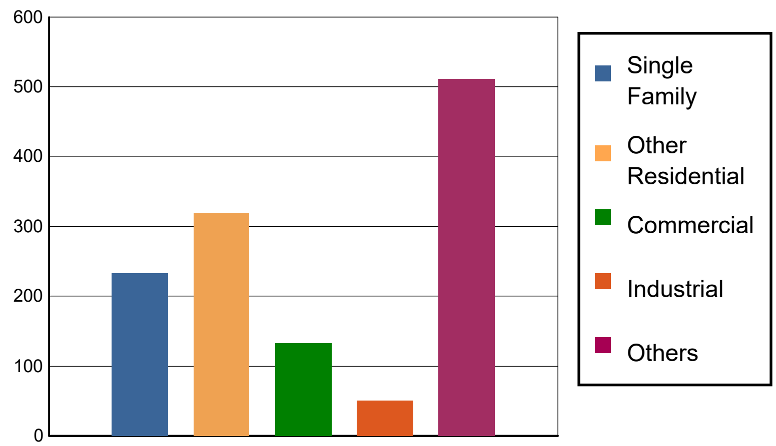


Table 11: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Single Family	Other Residential	Commercial	Industrial	Others	Total
Income Losses							
	Wage	0.0000	0.8621	11.0047	0.4151	1.1962	13.4781
	Capital-Related	0.0000	0.3659	14.3072	0.2465	2.2179	17.1375
	Rental	4.6166	5.5681	4.8670	0.3689	0.5740	15.9946
	Relocation	17.3086	21.9879	6.6694	1.8977	15.9545	63.8181
	Subtotal	**21.9252**	**28.7840**	**36.8483**	**2.9282**	**19.9426**	**110.4283**
Capital Stock Losses							
	Structural	24.5344	57.7387	11.4770	4.9613	134.6211	233.3325
	Non_Structural	143.4968	192.7416	54.9101	22.9850	141.9162	556.0497
	Content	42.9102	39.8286	26.6372	17.0813	114.0250	240.4823
	Inventory	0.0000	0.0000	2.7973	2.2295	100.3516	105.3784
	Subtotal	**210.9414**	**290.3089**	**95.8216**	**47.2571**	**490.9139**	**1135.2429**
	Total	**232.87**	**319.09**	**132.67**	**50.19**	**510.86**	**1245.67**

Transportation and Utility Lifeline Losses

For the transportation and utility lifeline systems, Hazus computes the direct repair cost for each component only. There are no losses computed by Hazus for business interruption due to lifeline outages. Tables 12 & 13 provide a detailed breakdown in the expected lifeline losses.

Table 12: Transportation System Economic Losses
(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Highway	Segments	2201.9774	0.0000	0.00
	Bridges	297.8540	50.9147	17.09
	Tunnels	0.0000	0.0000	0.00
	Subtotal	**2499.8314**	**50.9147**	
Railways	Segments	293.0732	0.0000	0.00
	Bridges	147.9400	43.0387	29.09
	Tunnels	0.0000	0.0000	0.00
	Facilities	0.0000	0.0000	0.00
	Subtotal	**441.0132**	**43.0387**	
Light Rail	Segments	0.0000	0.0000	0.00
	Bridges	0.0000	0.0000	0.00
	Tunnels	0.0000	0.0000	0.00
	Facilities	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
Bus	Facilities	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
Ferry	Facilities	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
Port	Facilities	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
Airport	Facilities	0.0000	0.0000	0.00
	Runways	5.6452	0.0000	0.00
	Subtotal	**5.6452**	**0.0000**	
	Total	**2,946.49**	**93.95**	

Table 13: Utility System Economic Losses

(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Potable Water	Pipelines	0.0000	0.0000	0.00
	Facilities	0.0000	0.0000	0.00
	Distribution Lines	42.7258	13.0568	30.56
	Subtotal	**42.7258**	**13.0568**	
Waste Water	Pipelines	0.0000	0.0000	0.00
	Facilities	171.9518	79.6584	46.33
	Distribution Lines	25.6355	6.5587	25.58
	Subtotal	**197.5873**	**86.2171**	
Natural Gas	Pipelines	72.7419	0.0000	0.00
	Facilities	0.0000	0.0000	0.00
	Distribution Lines	17.0903	2.2470	13.15
	Subtotal	**89.8322**	**2.2470**	
Oil Systems	Pipelines	0.0000	0.0000	0.00
	Facilities	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
Electrical Power	Facilities	1302.6783	933.7045	71.68
	Subtotal	**1302.6783**	**933.7045**	
Communication	Facilities	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
	Total	**1,632.82**	**1,035.23**	

Appendix A: County Listing for the Region

Imperial,CA

Riverside,CA

Appendix B: Regional Population and Building Value Data

State	County Name	Population	Building Value (millions of dollars)		
			Residential	Non-Residential	Total
California					
	Imperial	10,781	1,088	1,897	2,986
	Riverside	13,996	1,205	487	1,693
Total Region		**24,777**	**2,293**	**2,384**	**4,679**