Tribal Hazard Mitigation Plan Chemehuevi Indian Tribe

March 2020



Protect people, property, natural and cultural assets from natural hazards through climate adaptation and hazard mitigation actions.

CHEMEHUEVI INDIAN TRIBE HAZARD MITIGATION PLAN

MARCH 2020

Chemehuevi Indian Tribe P.O. Box 1976 Havasu Lake, CA 92363

Prepared by:



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Acknowledgements

The Chemehuevi Indian Tribe would like to thank the Tribal Community as a whole for participating in the mitigation planning process. Many people took their time to meet with the consulting team, participate in public meetings and take the Public Preparedness Survey. This plan would not be the success that it is without their support. In addition, the tribe would like to specifically thank the following people and organizations for supporting the development of this plan.

Tribal Council

- Charles F. Wood, Chairman
- Sierra Pencille, Vice Chairman
- June Leivas, Secretary/Treasurer
- Ronald Escobar
- Evangelina "Conkie" Hoover
- John "Lucky" Devilla
- Edward C. "Butch" Ochoa
- Edward D. "Tito" Smith
- Kostan Lathouris

Havasu Lake Emergency Planning Group

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Name	Organization/Position
Vince Balsitis	San Bernardino County Sheriff's Office; Deputy Sheriff
Chelsea Bunim	Chemehuevi Indian Tribe EPA; Outreach Coordinator
John Csicsery	Havasu Landing Resort; Property Manager
Brian Davis	Lake Havasu City Fire; Fire Chief
Donner Ellsworth	Chemehuevi Indian Tribe; Administrator
Lorrie Ellsworth	Chemehuevi Indian Tribe Housing; Director
Josh Esquerra	Havasu Landing Resort; Market Manager
Emmanuel Evans	Chemehuevi Indian Tribe Housing; Maintenance Supervisor
Daniel Felix	Chemehuevi Indian Tribe Conservation; Conservation Aid
Christina Gordon	Chemehuevi Indian Tribe Head Start; Family Specialist
John Gordon	Chemehuevi Indian Tribe Water Department; Supervisor
Jeffry Harran	Lake Havasu City Fire; Operations Chief
Lex Koscielak	Chemehuevi Indian Tribe EPA; Deputy Director
Matthew Kramer	Chemehuevi Indian Tribe Agriculture; Agriculture Technician
Daniel Leivas	Chemehuevi Indian Tribe Agriculture; Director
Dawn McElwain	Chemehuevi Indian Tribe Health and Wellness Center; Director
Raymond Mejia	Chemehuevi Indian Tribe EPA; Director
Michael Murphy	San Bernardino County Fire; BG Captain I
David Nye	Havasu Landing Resort; Resort Manager
Isac Ochoa	Chemehuevi Indian Tribe Community Center; Activities Director

Table 1. Havasu Lake Emergency Planning Group.

Name	Organization/Position
Josie Pintor	Chemehuevi Indian Tribe Head Start; Director
Frederick Rivera	Chemehuevi Indian Tribe Conservation; Conservation Officer
Jim Rolls	Chemehuevi Elementary; Principal
Rio Sandate	Chemehuevi Indian Tribe EPA; Environmental Technician
Jonathan Schlotthauer	San Bernardino County Fire; BG Firefighter Paramedic
Joseph Sewart	Bureau of Indian Affairs; Public Utility Specialist
Sheridan Silversmith	Chemehuevi Indian Tribe Tribal Employment Rights Office; TERO Director
Kevin Stephens	Colorado River Service Unit Parker IHS; RN, Nurse Educator
Adam Trujillo	Chemehuevi Indian Tribe Head Start; Transporter

Certificate of Local Adoption



CHEM.RES. 06-27-20-23

A RESOLUTION OF THE CHEMEHUEVI INDIAN TRIBE ADOPTING A HAZARD MITIGATION PLAN

WHEREAS, the Chemehuevi Indian Tribe ("Tribe") is a federally recognized Indian Tribe, organized under the provisions of the Indian Reorganization Act, 25 U.S.C. §461 et seq., and maintains a government-to-government relationship with the United States; and

WHEREAS, the Tribe has a written Constitution which has been approved by the Secretary of the Interior and which designates the Chemehuevi Tribal Council ("Tribal Council") as the governing body of the Tribe; and

WHEREAS, among the Tribal Council's responsibilities is protecting the health and welfare of its citizens; and

WHEREAS, the Chemehuevi Indian Tribe has 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; and

WHEREAS, the Chemehuevi Indian Tribe 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, and (1) the Plan specifically addresses hazard mitigation strategies and plan maintenance procedures for Chemehuevi Indian Tribe; (2) the Plan recommends several hazard mitigation actions/projects that will provide mitigation for specific natural and human caused hazards that impact Chemehuevi Indian Tribe, with the effect of protecting people and property from loss associated with those hazards; and (3) adoption of this plan will make the Chemehuevi Indian Tribe eligible for funding to alleviate the impacts of future hazards on the Reservation;

CHEM.RES.06-27-20-23

1 of 2

NOW THEREFORE BE IT RESOLVED, that the Plan is hereby adopted as an official plan of Chemehuevi Indian Tribe. The respective officials identified in the mitigation strategy of the Plan are hereby directed to pursue implementation of the recommended actions assigned to them.

BE IT FURTHER RESOLVED, that (1) 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 September 30 of each calendar year; and (2) The Chemehuevi Indian Tribe 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 its Plan whenever necessary to reflect applicable changes in Tribal, State or Federal laws and statutes as required in 44 CFR 13.11. (d).

CERTIFICATION

The foregoing resolution was approved by the Chemehuevi Tribal Council at its regular meeting of June 27th, 2020, with a quorum present and a vote of 8 Yes, 0 No, 0 Abstain, and 1 Absent.

Approved:

Charles F. Wood Chairman

Attest:

Secretary Treasurer

Record of Changes

This Tribal Hazard Mitigation Plan, including Appendices, will be reviewed and approved on a bi-annual basis by the Havasu Lake Emergency Planning (HLEP) Group 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.

Date of Change	Entered By	Summary of Changes

Table 2 Summary of changes

Table of Contents

Tribal Council 2 Havasu Lake Emergency Planning Group 2 Havasu Lake Emergency Planning Group 2 Certificate of Local Adoption 4 Record of Changes 7 Table of Contents 8 Chapter 1. Introduction 11 Tribal / FEMA Relationship 12 Mitigation Plan Goals 13 Plan Adoption and Assurances 13 Summary of Plan Contents 14 Plan Updates 15 Changes in Development 15 Chapter 2. Planning Area Profile 17 History and Culture 17 Culturally Sensitive Areas 18 Government 18 Tribal Facilities 19 Economy 20 Reservation Infrastructure 21 Water Resources 21 Land Use and Development Trends 23 Havasu Lake Emergency Planning Group 25 Housing and	Acknowledgements	2
Havasu Lake Emergency Planning Group. 2 Certificate of Local Adoption 4 Record of Changes 7 Table of Contents. 8 Chapter 1. Introduction 11 Purpose 11 Tribal / FEMA Relationship. 12 Mitigation Plan Goals. 13 Plan Adoption and Assurances. 13 Summary of Plan Contents 14 Plan Updates 15 Changes in Development 15 Mitigation Action Status 15 Chapter 2. Planning Area Profile 17 History and Culture 17 Culturally Sensitive Areas 18 Government. 18 Tribal Facilities 19 Economy 20 Housing and Demographics 20 Reservation Infrastructure 21 Water Resources 21 Land Use and Development Trends 23 Chapter 3. Planning Process 25 Havasu Lake Emergency Planning Group 25 Public Outraech and Engagement 27 Public Preparedness Survey Results <td< td=""><td>Tribal Council</td><td>2</td></td<>	Tribal Council	2
Certificate of Local Adoption 4 Record of Changes 7 Table of Contents 8 Chapter 1. Introduction 11 Purpose 11 Tribal / FEMA Relationship 12 Mitigation Plan Goals 13 Plan Adoption and Assurances 13 Summary of Plan Contents 14 Plan Updates 15 Changer J. Pevelopment 15 Mitigation Action Status 15 Chapter 2. Planning Area Profile 17 History and Culture 17 Culturally Sensitive Areas 18 Government 18 Tribal Facilities 19 Economy 20 Housing and Demographics 20 Reservation Infrastructure 21 Water Resources 22 Land Use and Development Trends 23 Chapter 3. Planning Process 25 Public Outreach and Engagement 27	Havasu Lake Emergency Planning Group	2
Record of Changes 7 Table of Contents 8 Chapter 1. Introduction 11 Purpose 11 Tribal / FEMA Relationship 12 Mitigation Plan Goals 13 Plan Adoption and Assurances 13 Summary of Plan Contents 14 Plan Updates 15 Changes in Development 15 Mitigation Action Status 15 Chapter 2. Planning Area Profile 17 History and Culture 17 Culturally Sensitive Areas 18 Government 18 Tribal Facilities 19 Economy 20 Housing and Demographics 20 Reservation Infrastructure 21 Water Resources 21 Uad Use and Development Trends 23 Chapter 3. Planning Process 25 Havasu Lake Emergency Planning Group 25 Public Outreach and Engagement 27 Public Outreach and Engagement 27 Public Outreach and Engagement 30 Review and Incorporation of Studies and Reports	Certificate of Local Adoption	4
Table of Contents8Chapter 1. Introduction11Purpose11Purpose11Mitigation Plan Goals12Mitigation Plan Goals13Plan Adoption and Assurances13Summary of Plan Contents14Plan Updates15Changes in Development15Mitigation Action Status15Chapter 2. Planning Area Profile17Culturally Sensitive Areas18Government18Tribal Facilities19Economy20Housing and Demographics20Reservation Infrastructure21Water Resources21Emergency Services22Land Use and Development Trends23Chapter 3. Planning Process25Public Outreach and Engagement27Public Outreach and Engagement27Public Outreach and Engagement27Public Outreach and Engagement27Public Outreach and Engagement30Review and Incorporation of Studies and Reports30Integrating the Planning Process with other Planning Efforts30Integrating the Planning Process with other Planning Efforts30Integration31Plan Adoption31Plan Adoption31Plan Adoption33Local, State, and Federal Sources33Developing the Tribal Asset Geodatabase34Developing the Tribal Asset Geodatabase34Developing the Tribal Asset Geodatabase </td <td>Record of Changes</td> <td>7</td>	Record of Changes	7
Chapter 1. Introduction 11 Purpose 11 Tribal / FEMA Relationship 12 Mitigation Plan Goals 13 Plan Adoption and Assurances. 13 Summary of Plan Contents 14 Plan Updates 15 Changes in Development 15 Mitigation Action Status 15 Chapter 2. Planning Area Profile 17 History and Culture 17 Culturally Sensitive Areas 18 Government 18 Tribal Facilities 19 Economy 20 Reservation Infrastructure 21 Water Resources 21 Land Use and Development Trends 23 Chapter 3. Planning Process 25 Havasu Lake Emergency Planning Group 25 Public Outreach and Engagement 27 Public Outreach and Eng	Table of Contents	8
Purpose11Tribal / FEMA Relationship.12Mitigation Plan Goals.13Summary of Plan Contents13Summary of Plan Contents14Plan Updates.15Changes in Development15Charges in Development17Culturally Sensitive Areas18Government18Tribal Facilities19Economy20Housing and Demographics20Reservation Infrastructure21Water Resources21Emergency Services22Land Use and Development Trends23Chapter 3. Planning Process25Havasu Lake Emergency Planning Group25Public Outreach and Engagement27Public Preparedness Survey Results27Public Preparedness Survey Results27Stakeholder Engagement28Neighboring Communities and Regional Partners30Review and Incorporation of Studies and Reports30Integrating the Planning Process with other Planning Efforts30Review of Draft Plan31Plan Adoption31Introduction33Sources of Information33Local, State, a	Chapter 1. Introduction	1
Tribal / FEMA Relationship12Mitigation Plan Goals13Plan Adoption and Assurances13Summary of Plan Contents14Plan Updates15Changes in Development15Chapter 2. Planning Area Profile17Mitigation Action Status15Chapter 2. Planning Area Profile17Culturally Sensitive Areas18Government18Tribal Facilities19Economy20Housing and Demographics20Reservation Infrastructure21Water Resources21Emergency Services22Land Use and Development Trends23Chapter 3. Planning Process25Havasu Lake Emergency Planning Group25Havasu Lake Emergency Planning Group25Havasu Lake Emergency Planning Group25Public Outreach and Engagement27Stakeholder Engagement28Neighboring Communities and Regional Partners30Review and Incorporation of Studies and Reports30Integrating the Planning Process with other Planning Efforts30Review of Draft Plan31Plan Adoption31Chapter 4. Risk Assessment33Local, State, and Federal Sources33Developing the Tribal Asset Geodatabase34Developing the Tribal Asset Geodatabase34Keik Skessment Process and Tools39	Purpose	1
Mitigation Plan Goals13Plan Adoption and Assurances13Summary of Plan Contents14Plan Updates15Changes in Development15Mitigation Action Status15Changes in Development15Mitigation Action Status15Chapter 2. Planning Area Profile17History and Culture17Culturally Sensitive Areas18Government18Tribal Facilities19Economy20Housing and Demographics20Housing and Demographics20Reservation Infrastructure21Water Resources21Emergency Services22Land Use and Development Trends23Chapter 3. Planning Process25Public Outreach and Engagement27Public Outreach and Engagement27Public Oreparedness Survey Results27Stakeholder Engagement30Integrating the Planning Process with other Planning Efforts30Neview of Draft Plan31Plan Adoption31Chapter 4. Risk Assessment33Local, State, and Federal Sources33Local, State, and Federal Sources33Developing the Tribal Asset Geodatabase34Neisk Sessment Trools33Developing the Tribal Asset Geodatabase34Developing the Tribal Asset Geodatabase34	Tribal / FEMA Relationship1	2
Plan Adoption and Assurances.13Summary of Plan Contents14Plan Updates15Changes in Development15Changes in Development15Chapter 2. Planning Area Profile17History and Culture17Culturally Sensitive Areas18Government18Tribal Facilities19Economy20Housing and Demographics20Reservation Infrastructure21Water Resources21Emergency Services22Land Use and Development Trends23Chapter 3. Planning Process25Havasu Lake Emergency Planning Group25Public Outreach and Engagement27Public Outreach and Engagement27Stakeholder Engagement28Neighboring Communities and Regional Partners30Review of Draft Plan31Phan Adoption31Introduction33Sources of Information33Local, State, and Federal Sources33Developing the Tribal Asset Geodatabase33Developing the Tribal Asset Geodatabase33Developing the Tribal Asset Geodatabase34Risk Assessment Process and Tools33Developing the Tribal Asset Geodatabase34	Mitigation Plan Goals	3
Summary of Plan Contents 14 Plan Updates 15 Changes in Development 15 Mitigation Action Status 15 Chapter 2. Planning Area Profile 17 History and Culture 17 Culturally Sensitive Areas 18 Government 18 Tribal Facilities 19 Economy 20 Housing and Demographics 20 Reservation Infrastructure 21 Water Resources 21 Emergency Services 22 Land Use and Development Trends 23 Chapter 3. Planning Process 25 Public Outreach and Engagement 27 Public Preparedness Survey Results 27 Stakeholder Engagement 28 Neighboring Communities and Regional Partners 30 Review and Incorporation of Studies and Reports 30 Integrating the Planning Process with other Planning Efforts 30 Review of Draft Plan 31 Plan Adoption 31 Chapter 4. Risk Assessment 33 Local, State, and Federal Sources 33	Plan Adoption and Assurances1	3
Plan Updates 15 Changes in Development 15 Mitigation Action Status 15 Chapter 2. Planning Area Profile 17 History and Culture 17 Culturally Sensitive Areas 18 Government 18 Tribal Facilities 19 Economy 20 Housing and Demographics 20 Reservation Infrastructure 21 Water Resources 21 Euand Use and Development Trends 23 Chapter 3. Planning Process 25 Havasu Lake Emergency Planning Group 25 Public Outreach and Engagement 27 Public Preparedness Survey Results 27 Stakeholder Engagement 28 Neighboring Communities and Regional Partners 30 Integrating the Planning Process with other Planning Efforts 30 Review and Incorporation of Studies and Reports 30 Integrating the Planning Process with other Planning Efforts 30 Review of Draft Plan 31 Plan Adoption 31 Chapter 4. Risk Assessment 33	Summary of Plan Contents1	4
Changes in Development15Mitigation Action Status15 Chapter 2. Planning Area Profile 17History and Culture17Culturally Sensitive Areas18Government18Tribal Facilities19Economy20Housing and Demographics20Housing and Demographics20Reservation Infrastructure21Water Resources21Emergency Services22Land Use and Development Trends23 Chapter 3. Planning Process 25Havasu Lake Emergency Planning Group25Public Outreach and Engagement27Public Preparedness Survey Results27Stakeholder Engagement28Neighboring Communities and Regional Partners30Review and Incorporation of Studies and Reports30Integrating the Planning Process with other Planning Efforts30Integrating the Planning Process with other Planning Efforts33Introduction33Sources of Information33Local, State, and Federal Sources33Local, State, and Federal Sources33Local, State, and Federal Sources34Risk Assessment Process and Tools39	Plan Updates1	5
Mitigation Action Status 15 Chapter 2. Planning Area Profile 17 History and Culture 17 Culturally Sensitive Areas 18 Government 18 Tribal Facilities 19 Economy 20 Housing and Demographics 20 Reservation Infrastructure 21 Water Resources 21 Eurorepart 3. Planning Process 22 Land Use and Development Trends 23 Chapter 3. Planning Group 25 Public Outreach and Engagement 27 Public Outreach and Engagement 27 Stakeholder Engagement 28 Neighboring Communities and Regional Partners 30 Review and Incorporation of Studies and Reports 30 Review of Draft Plan 31 Plan Adoption 31 Chapter 4. Risk Assessment 33 Sources of Information 33 Local, State, and Federal Sources 33 Local, State, and Federal Sources 34 Risk Assessment Process and Tools 39	Changes in Development1	5
Chapter 2. Planning Area Profile17History and Culture17Culturally Sensitive Areas18Government18Tribal Facilities19Economy20Housing and Demographics20Reservation Infrastructure21Water Resources21Eund Use and Development Trends23Chapter 3. Planning Process25Public Outreach and Engagement27Public Outreach and Engagement27Stakeholder Engagement28Neighboring Communities and Regional Partners30Review and Incorporation of Studies and Reports30Integrating the Planning Process with other Planning Efforts30Integrating the Planning Orous31Plan Adoption31Plan Adoption31Plan Adoption33Sources of Information33Local, State, and Federal Sources33Developing the Tribal Asset Geodatabase34Risk Assessment Process and Tools39	Mitigation Action Status1	5
History and Culture17Culturally Sensitive Areas18Government18Tribal Facilities19Economy20Housing and Demographics20Reservation Infrastructure21Water Resources21Emergency Services22Land Use and Development Trends23Chapter 3. Planning Process25Havasu Lake Emergency Planning Group25Public Outreach and Engagement27Public Preparedness Survey Results27Stakeholder Engagement28Neighboring Communities and Regional Partners30Review of Draft Plan31Plan Adoption31Plan Adoption31Chapter 4. Risk Assessment33Local, State, and Federal Sources33Developing the Tribal Asset Geodatabase34Risk Assessment Process and Tools39	Chapter 2. Planning Area Profile1	7
Culturally Sensitive Areas18Government18Tribal Facilities19Economy20Housing and Demographics20Reservation Infrastructure21Water Resources21Emergency Services22Land Use and Development Trends23Chapter 3. Planning Process25Public Outreach and Engagement27Public Outreach and Engagement27Stakeholder Engagement28Neighboring Communities and Regional Partners30Review and Incorporation of Studies and Reports30Integrating the Planning Process with other Planning Efforts30Review of Draft Plan31Plan Adoption31Chapter 4. Risk Assessment33Local, State, and Federal Sources33Developing the Tribal Asset Geodatabase34Risk Assessment Process and Tools39	History and Culture1	7
Government18Tribal Facilities19Economy20Housing and Demographics20Reservation Infrastructure21Water Resources21Emergency Services22Land Use and Development Trends23Chapter 3. Planning Process25Havasu Lake Emergency Planning Group25Public Outreach and Engagement27Stakeholder Engagement27Stakeholder Engagement28Neighboring Communities and Regional Partners30Review and Incorporation of Studies and Reports30Integrating the Planning Process with other Planning Efforts30Review of Draft Plan31Plan Adoption31Local, State, and Federal Sources33Local, State, and Federal Sources33Developing the Tribal Asset Geodatabase34Risk Assessment Process and Tools39	Culturally Sensitive Areas1	8
Tribal Facilities19Economy20Housing and Demographics20Reservation Infrastructure21Water Resources21Emergency Services22Land Use and Development Trends23Chapter 3. Planning Process25Havasu Lake Emergency Planning Group25Public Outreach and Engagement27Public Preparedness Survey Results27Stakeholder Engagement28Neighboring Communities and Regional Partners30Review and Incorporation of Studies and Reports30Integrating the Planning Process with other Planning Efforts30Review of Draft Plan31Plan Adoption31Chapter 4. Risk Assessment33Local, State, and Federal Sources33Developing the Tribal Asset Geodatabase34Risk Assessment Process and Tools39	Government1	8
Economy20Housing and Demographics20Reservation Infrastructure.21Water Resources.21Emergency Services22Land Use and Development Trends23Chapter 3. Planning Process25Havasu Lake Emergency Planning Group25Public Outreach and Engagement.27Public Preparedness Survey Results27Stakeholder Engagement.28Neighboring Communities and Regional Partners.30Review and Incorporation of Studies and Reports30Integrating the Planning Process with other Planning Efforts30Integrating the Planning Process with other Planning Efforts30Introduction31Chapter 4. Risk Assessment.33Local, State, and Federal Sources33Developing the Tribal Asset Geodatabase34Risk Assessment Process and Tools39	Tribal Facilities1	9
Housing and Demographics20Reservation Infrastructure21Water Resources.21Emergency Services22Land Use and Development Trends23Chapter 3. Planning Process25Havasu Lake Emergency Planning Group25Public Outreach and Engagement.27Public Preparedness Survey Results27Stakeholder Engagement.28Neighboring Communities and Regional Partners.30Review and Incorporation of Studies and Reports30Integrating the Planning Process with other Planning Efforts30Integrating the Planning Process with other Planning Efforts31Plan Adoption31Chapter 4. Risk Assessment.33Local, State, and Federal Sources33Developing the Tribal Asset Geodatabase34Risk Assessment Process and Tools39	Economy2	0
Reservation Infrastructure21Water Resources21Emergency Services22Land Use and Development Trends23Chapter 3. Planning Process25Havasu Lake Emergency Planning Group25Public Outreach and Engagement27Public Preparedness Survey Results27Stakeholder Engagement28Neighboring Communities and Regional Partners30Review and Incorporation of Studies and Reports30Integrating the Planning Process with other Planning Efforts30Review of Draft Plan31Plan Adoption31Chapter 4. Risk Assessment33Local, State, and Federal Sources33Developing the Tribal Asset Geodatabase34Risk Assessment Process and Tools39	Housing and Demographics2	0
Water Resources.21Emergency Services22Land Use and Development Trends23Chapter 3. Planning Process25Havasu Lake Emergency Planning Group25Public Outreach and Engagement27Public Preparedness Survey Results27Stakeholder Engagement28Neighboring Communities and Regional Partners30Review and Incorporation of Studies and Reports30Integrating the Planning Process with other Planning Efforts30Review of Draft Plan31Plan Adoption31Chapter 4. Risk Assessment33Local, State, and Federal Sources33Developing the Tribal Asset Geodatabase34Risk Assessment Process and Tools39	Reservation Infrastructure2	1
Emergency Services22Land Use and Development Trends23Chapter 3. Planning Process25Havasu Lake Emergency Planning Group25Public Outreach and Engagement.27Public Preparedness Survey Results27Stakeholder Engagement.28Neighboring Communities and Regional Partners.30Review and Incorporation of Studies and Reports30Integrating the Planning Process with other Planning Efforts30Review of Draft Plan31Plan Adoption31Chapter 4. Risk Assessment.33Sources of Information33Local, State, and Federal Sources33Developing the Tribal Asset Geodatabase34Risk Assessment Process and Tools39	Water Resources	1
Land Use and Development Trends23Chapter 3. Planning Process25Havasu Lake Emergency Planning Group25Public Outreach and Engagement27Public Preparedness Survey Results27Stakeholder Engagement28Neighboring Communities and Regional Partners30Review and Incorporation of Studies and Reports30Integrating the Planning Process with other Planning Efforts30Review of Draft Plan31Plan Adoption31Chapter 4. Risk Assessment33Sources of Information33Local, State, and Federal Sources34Risk Assessment Process and Tools39	Emergency Services	2
Chapter 3. Planning Process25Havasu Lake Emergency Planning Group25Public Outreach and Engagement27Public Preparedness Survey Results27Stakeholder Engagement28Neighboring Communities and Regional Partners30Review and Incorporation of Studies and Reports30Integrating the Planning Process with other Planning Efforts30Review of Draft Plan31Plan Adoption31Chapter 4. Risk Assessment33Introduction33Sources of Information33Local, State, and Federal Sources33Developing the Tribal Asset Geodatabase34Risk Assessment Process and Tools39	Land Use and Development Trends	3
Havasu Lake Emergency Planning Group25Public Outreach and Engagement27Public Preparedness Survey Results27Stakeholder Engagement28Neighboring Communities and Regional Partners30Review and Incorporation of Studies and Reports30Integrating the Planning Process with other Planning Efforts30Review of Draft Plan31Plan Adoption31Chapter 4. Risk Assessment33Sources of Information33Local, State, and Federal Sources33Developing the Tribal Asset Geodatabase34Risk Assessment Process and Tools39	Chapter 3. Planning Process	5
Public Outreach and Engagement.27Public Preparedness Survey Results27Stakeholder Engagement.28Neighboring Communities and Regional Partners.30Review and Incorporation of Studies and Reports30Integrating the Planning Process with other Planning Efforts30Review of Draft Plan31Plan Adoption31Chapter 4. Risk Assessment.33Sources of Information33Local, State, and Federal Sources33Developing the Tribal Asset Geodatabase34Risk Assessment Process and Tools39	Havasu Lake Emergency Planning Group2	5
Public Preparedness Survey Results27Stakeholder Engagement28Neighboring Communities and Regional Partners30Review and Incorporation of Studies and Reports30Integrating the Planning Process with other Planning Efforts30Review of Draft Plan31Plan Adoption31Chapter 4. Risk Assessment33Introduction33Sources of Information33Local, State, and Federal Sources34Risk Assessment Process and Tools39	Public Outreach and Engagement2	7
Stakeholder Engagement.28Neighboring Communities and Regional Partners.30Review and Incorporation of Studies and Reports30Integrating the Planning Process with other Planning Efforts30Review of Draft Plan31Plan Adoption31Chapter 4. Risk Assessment.33Introduction33Sources of Information33Local, State, and Federal Sources33Developing the Tribal Asset Geodatabase34Risk Assessment Process and Tools39	Public Preparedness Survey Results2	7
Neighboring Communities and Regional Partners	Stakeholder Engagement	8
Review and incorporation of Studies and Reports 30 Integrating the Planning Process with other Planning Efforts 30 Review of Draft Plan 31 Plan Adoption 31 Chapter 4. Risk Assessment 33 Introduction 33 Sources of Information 33 Local, State, and Federal Sources 33 Developing the Tribal Asset Geodatabase 34 Risk Assessment Process and Tools 39	Neighboring Communities and Regional Partners	0
Integrating the Planning Process with other Planning Errorts 30 Review of Draft Plan 31 Plan Adoption 31 Chapter 4. Risk Assessment 33 Introduction 33 Sources of Information 33 Local, State, and Federal Sources 33 Developing the Tribal Asset Geodatabase 34 Risk Assessment Process and Tools 39	Review and Incorporation of Studies and Reports	0
Review of Drait Plan 31 Plan Adoption 31 Chapter 4. Risk Assessment 33 Introduction 33 Sources of Information 33 Local, State, and Federal Sources 33 Developing the Tribal Asset Geodatabase 34 Risk Assessment Process and Tools 39	Integrating the Planning Process with other Planning Efforts	1
Plan Adoption 31 Chapter 4. Risk Assessment. 33 Introduction 33 Sources of Information 33 Local, State, and Federal Sources 33 Developing the Tribal Asset Geodatabase 34 Risk Assessment Process and Tools 39	Review of Drait Plan	1
Introduction	Plan Adoption	⊥ ר
Sources of Information	Chapter 4. Risk Assessment	3
Local, State, and Federal Sources	Introduction	3
Developing the Tribal Asset Geodatabase	Jocal State and Edderal Sources	2 2
Risk Assessment Process and Tools	Developing the Tribal Asset Geodatabase	כ ∧
Nijk Augustinent Floress and Tools	Risk Assessment Process and Tools	4
Quantitative Analysis: GIS 40	Ouantitative Analysis: GIS	0
Qualitative Analysis and a second sec	Qualitative Analysis Closen 4	.0

Priority Risk Index	41
Limitations	42
Data Availability	43
Loss Estimates	43
Unreported Events	43
Hazard Identification	43
Disaster Declarations	46
Hazard Profiles	47
Drought	48
Earthquake	54
Extreme Cold	70
Extreme Heat	73
Extreme Winds	
Flood	87
Landslides	
Lightning	
Tornadoes	
Wildfire	
Dam Failure (redact for public consumption)	
Hazardous Materials Incidents	
Power Outage	
Terrorism and Similar Criminal Activity (Including Cyber Threats)	
Summary of Overall Risk	
Critical Facility Analysis	
Priority Risk Index Results	
Hazard Ranking	
Key Points on Hazard Vulnerability	
Chapter 5. Capability Assessment	
Evaluation of Pre- and Post-Disaster Capabilities	
Planning and Regulatory Capabilities	
Administrative and Technical Capabilities	
Education and Outreach Capabilities	
Financial Capabilities	
National Flood Insurance Compliance	
Summary of Findings	
Chapter 6. Mitigation Strategy	
Funding Sources	
Potential Sources of Funding	
Mitigation Goals and Objectives	
Mitigation Actions	
Types of Mitigation Action	
Mitigation Action Plan	
Opportunities to incorporate the Mitigation Plan	
Chapter 7. Plan Maintenance	
System for Reviewing Implementation Progress	
Method and Schedule to Keep the Plan Current	
Monitoring	

Evaluating	
Updating	
Continued Public Involvement	
List of Acronyms	
Appendixes	
Appendix A. Planning Process Supporting Materials	201
Havasu Lake Emergency Planning Group	201
Stakeholder and Public Engagement	209
Public Preparedness Survey	217
Appendix B: Capability Assessment Supporting Materials	239
Chemehuevi Emergency Inventory	239
Appendix C: Mitigation Strategy Supporting Materials	242
Mitigation Action Priority Ranking	242
Appendix D: Implementation Plan Supporting Materials	245
Mitigation Action Progress Worksheet	245
Mitigation Plan Annual Review Questionnaire	246

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

"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 Chemehuevi Indian Tribe decided to develop a Federal Emergency Management Agency (FEMA)approved hazard mitigation plan. They applied for and received a Pre-Disaster Hazard Mitigation grant from FEMA and hired a consulting team led by Jamie Caplan, Consulting LLC, to develop the plan.

Purpose

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 Chemehuevi Indian Tribe 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 <u>https://www.fema.gov/what-mitigation</u>

² https://www.fema.gov/media-library-data/1478260600306-

¹¹⁷bda8ab179bd301b0b61b52a143485/StateMitigationPlanning_MS_Bulletin_V9_508.pdf

³ <u>https://www.fema.gov/media-library/assets/documents/4596</u>

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

Tribal / FEMA Relationship

FEMA's Tribal Policy⁴ 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 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

⁴ <u>https://www.fema.gov/media-library/assets/documents/25324</u>

⁵ Tribal Mitigation Plan Review Guide 2017, FEMA, p.2-3.

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.

Mitigation Plan Goals

Through several meetings with the Havasu Lake Emergency Planning group, the goals shown below were chosen. For the mitigation actions developed to support these goals, see Chapter 6, Mitigation Strategy.

- 1. Protect people, property, natural and cultural assets from natural hazards through climate adaptation and hazard mitigation actions.
- 2. Implement systems to combat the impacts of power outages.
- 3. Expand capacity to communicate with people on the reservation before, during, and after a disaster.
- 4. Build the capacity of emergency management on the reservation to increase the tribe's resilience to natural hazards.

The goals from the 2007 Hazard Mitigation Plan were revised to reflect current need and interest.

Plan Adoption and Assurances

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 implementation of mitigation actions.

The Chemehuevi Indian Tribe 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.

Summary of Plan Contents

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 Chemehuevi Indian Tribe completely, including geography and the built environment. Also included is a description of the Tribal government, economy and utilities. The essential 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 Havasu Lake Emergency Planning group meetings, the public outreach process (including public meetings), and the Public Preparedness 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 Chemehuevi Indian Tribe and its tribal citizens. 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 pre- and post-disaster.

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

The Plan Maintenance 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 include documentation regarding the planning process, such as HLEP and public meeting sign-in sheets and the Public Preparedness Survey results. In addition, resources supporting the risk assessment are included.

Plan Updates

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

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

Changes in Development

The 2020 Hazard Mitigation Plan includes all of the changes in development on the Reservation. These include new homes, new infrastructure, and the new Casino. The Tribe builds to the current California Building Code and avoids building in high hazard areas.

Mitigation Action Status

The table below indicates the mitigation actions named in the 2007 Hazard Mitigation Plan and their current status. The 2007 actions did not include detailed descriptions, so it is a bit challenging to determine the level of success.

2007 Actions	2020 Status
Emergency Shelters	There is still a need to improve the designated shelter, the Gymnasium. The tribe intends to add a generator with a solar battery back-up system.
Storm Culverts	The washes on the Reservation function as natural culverts. The Tribe does not have a schedule for maintaining these culverts. This maintenance would be considered a capability not a mitigation action. The Tribe does manage stormwater effectively

Table 3 2007 Mitigation Action Status

2007 Actions	2020 Status
	when putting in new buildings. This is evidenced by the new Casino.
Retention Barriers	Retention barriers for stormwater are similar to the natural washes. The Tribe does not see the need for developing new retention barriers at this time.
Clear Zone / Fire Breaks	Wildfire continues to be an issue for the Tribe. They have several mitigation actions related to wildfire including creating fire breaks, expanding warning systems, and improving water access.
Use Uniformed Building Codes	The Tribe has adopted California building codes.
Best Management Practices for controlled burns	San Bernardino County manages the Fire Station on the Reservation and they do use best management practices. The Tribe works closely with the Fire Department for all issues related to clearing brush and mitigating wildfire risk.

Chapter 2. Planning Area Profile

The Chemehuevi Indian Reservation is located in San Bernardino County, California, on 39,579 acres. It extends to the middle of Lake Havasu (pre-lake center of the Colorado River channel) and across the lake from Lake Havasu City, Arizona. The Chemehuevi Indian Tribe has jurisdiction over all washes, lake waters, and underlying ground water within the exterior boundary of the Chemehuevi Indian Reservation. Of the 39,579 acres of the Chemehuevi Indian Reservation, 33,193 acres are on land and 6,386 acres are inundated by Lake Havasu.

The Colorado River and tributary ephemeral washes and bays are traditionally significant to the Chemehuevi Indian Tribe. These waterbodies provide the Chemehuevi Indian Tribe traditional uses that include fishing, crop irrigation, recreation in and on the water, and cultural uses of wetland and adjacent upland plants. Within the northern portions of the Chemehuevi Indian Reservation, the Colorado River is a flowing stream, while in the southern portions, the Colorado River is controlled by Parker Dam, which forms Lake Havasu.⁶

History and Culture

As part of the Great Basin Culture Area, the Chemehuevi, a branch of the Southern Paiute, have been persistent occupants of the Mojave Desert. Known to themselves as Nüwü, (The People) they have been nomadic residents of the Mojave Desert's mountains and canyons, and the Colorado River shoreline, for thousands of years.

In 1853, the people lost their traditional lands when the Federal government declared them public domain. Hostilities with the neighboring Mojave scattered the people, now numbering no more than a few hundred people. By 1885, they had reunited in the Chemehuevi Valley.

Federal authorities established the Chemehuevi Valley Reservation in 1907. This protected some 36,000 acres of Chemehuevi homeland. But the Tribal members were soon relocated to the Parker area, and their status as a tribe was taken away. With 1929 came the formation of the Metropolitan Water District, and in 1935, Congress authorized the acquisition of as much of the reservation as necessary for the Parker Dam Project. In 1940, the flood gates closed, and nearly 8000 acres of traditional Nüwüvi lands drowned.

From the early 1940's, a persistent desire for recognition and self-determination fueled the struggle to achieve Federal recognition. Thirty years later, the Nüwü were formally reinstated as the Chemehuevi Tribe on June 5, 1970. Nüwüvi Day, the first Friday in June, recognizes the long struggle to return home and honors those who fought for it.

⁶ Chemehuevi Indian Tribe Website. <u>http://www.chemehuevi.net/history-culture/</u>.

Today, the Reservation comprises approximately 32,000 acres of trust land that includes thirty miles of Colorado River frontage.⁷

Culturally Sensitive Areas

The Chemehuevi Cultural Center is a community-based organization that promotes the preservation and development of both traditional and contemporary Chemehuevi heritage. It provides an interactive and educational environment where Chemehuevi elders and culture bearers contribute to the educational development and growth of the younger Chemehuevi generations. The Cultural Center is also a museum. It cares for a collection of artifacts and other objects of scientific, artistic, cultural, or historical importance, and makes them available for public viewing. The staff demonstrates a commitment to assist tribal members in researching, preserving, and claiming their



Figure 1 Chemehuevi Cultural Center

rightful history and cultural legacy.⁸ The tribe also has a cemetery on the reservation.

Government

The Chemehuevi Indian Tribe maintains nine departments and approximately 100 employees. This number does not include the resort or the casino. An Executive Committee oversees the daily operations of the tribe and its enterprises.

The Tribal Administrator is the head administrative officer of the Chemehuevi Indian Tribe. The Tribal Administrator has responsibility for the daily operation of all Tribal affairs, including the performance of all staff persons and the achievement of goals within Tribe programs. The major responsibility of the Tribal Administrator is the implementation of Tribal Policy once it is formulated by the Tribal Executive Committee and enacted by the Tribal Council. The Tribal Administrator supervises all Program Directors. The Tribal Administrator also assists the Tribal Executive Committee in identifying and formulating policy, goals, objectives, unmet needs, etc. The Tribal Administrator is the In-House contract/grant monitor for all Tribal contracts/grants. The Tribal Administrator facilitates interaction between other employees and the Executive Committee and Subcommittees. The Tribal Administrator reports on a day-to-day basis to the Executive Committee, but overall directly reports to Tribal Council.

The Tribal Council is made up of nine elected council members. They swear to the following oath when they take office:

"I solemnly swear that I will uphold the Constitution and Laws of the Chemehuevi Indian Tribe, that I will serve the Tribe to the best of my ability, that I will work for the entire membership of

⁷ http://www.chemehuevi.net/history-culture/

⁸ http://www.chemehuevi.net/cultural-center/

the Tribe, that I will responsibly represent the Tribe, that I will carry out the directions of the Tribal Council, that I will declare when a conflict of interest could affect the performance of my duties on behalf of the Tribe, and that I will perform all duties required of me by the Constitution and Law of the Tribe."⁹

Tribal Facilities

The facilities listed below are considered critical to the Tribe.

Facility Name	Facility Function
Chemehuevi Valley Elementary School	The elementary school is a part of the Needles Unified School District. Attending students are both tribal and non-tribal members. The school includes four classrooms and two offices for children between kindergarten and fifth grade. The school has about thirty-eight students and three teachers. A berm just beyond the school protects the school from flash flooding. The school does NOT have a generator and is frequently closed during power outages. The school is part of the district's emergency operations plan.
Community Center	A one-level facility with restrooms, a large kitchen, and general community service rooms. The Community Center was used for the public meetings in developing this plan.
Conservation Office	This is a single-story, two-bedroom, two bath residence used as living quarters for the lead maintenance technician. It is located at the entrance of Nüwüvi Park.
Educational Training Center	One building functions as the Educational Training Center and Childcare for the Chemehuevi Indian Reservation. It has restrooms, childcare rooms, and training rooms.
Environmental Services	Small office building.
Head Start Center	This structure is the Head Start Building for the Chemehuevi Indian Reservation. On one level, it has restrooms and office rooms.
Health Clinic	This is a one-level structure occupied as the Chemehuevi Indian Tribe Reservation Health Clinic. The structure includes offices and medical rooms.
Multipurpose Gym	The Gymnasium for the Chemehuevi Indian Tribe Reservation is occupied on periodic occasions. Within are his/her locker rooms, the basketball gymnasium, and restrooms.
Nüwúvi Park Meeting Hall	This building is one large room used primarily as a meeting hall with separate, partitioned, kitchen and restrooms.
Tribal Administration	This structure holds the Chemehuevi Indian Tribal Administration offices for the Reservation.

Table 3 Critical facilities

⁹ <u>http://www.chemehuevi.net/tribal-council/</u>

Economy

The economy on the reservation is fueled by the resort, the casino, and the hotel. Most people who visit the casino and the hotel come by way of the ferry across Lake Havasu. About 400,000 people per year are transported by the ferries, which hold approximately 150 people.

The Havasu Landing Resort and Casino includes Trails End Restaurant, lakefront rentals, and a campground. The campground includes 170 spaces for campers or tents. The vacation rentals are fully furnished, and the restaurant has a beautiful lakefront view. In addition, the marina offers 24hour fueling, boat slips and boat ramps. In 2019, a



Figure 2 Chemehuevi housing

new casino and hotel were built on the shore of the lake just north of the original casino. A new marina, a hotel with 40 rooms, a new restaurant, and a larger casino were built. The tribe is making decisions about how to best use the old casino and restaurant space. The ferry landing moved to the new casino area. <u>http://www.havasulanding.com</u>

The resort includes five mobile-home parks with a total of 424 mobile homes. Fifteen of the homes are used full-time, with the remaining occupied only in the summer months. The population of the resort easily soars to 5,000 people during summer holidays. The property is supported by a campground office, which does not have back-up power. The resort has security officers, but no police. During busy holiday weekends, the California Highway Patrol sometimes adds extra staff. The resort has a large maintenance shed that is critical to the sustainability of the tribe. It includes equipment to repair and maintain the ferries.



Figure 3 Havasu Landing Market

Rounding out the Havasu Landing Resort and Casino is a gas station, the Havasu Landing Market, and the Chemehuevi Hardware Store. The market has a generator attached to it that could function for about five days if power goes out. The hardware store also has back-up power and the only ice on the reservation. The gas station pumps do not have back-up power. This plan includes a mitigation action to add backup power to the gas pumps.

Housing and Demographics

The Chemehuevi Housing Authority provides and maintains 60 rental housing units and 21 Mutual Help (homeownership) units for income-eligible families within

the jurisdiction of the Chemehuevi Tribe. The department is funded and regulated by the Native American Housing and Self Determination Act of 1996 (NAHASDA). They also provide funding to the Chemehuevi Community Center, Security Program, and Gymnasium. The Housing Authority is co-located with the laundromat. The Reservation includes 23 Colony Houses, 85 HUD homes, a five-apartment building called Quail Trail Apartments, and a five-apartment Senior Complex. All homes on the Reservation are within a ten-mile radius of each other, except for Havasu Ponds, a community located at the far end of Lake Havasu that has 45 mobile homes and is accessed by a dirt road. That community has about three full-time residents.

Reservation Infrastructure

Infrastructure on the reservation includes several paved roads, an airport, fuel tanks, water infrastructure, and electrical infrastructure provided by ConEdison. Garbage is picked up by an outside contractor. Seventeen Mile Road is the only route on and off the reservation, other than via ferry across Lake Havasu. The intersection of Seventeen Mile Road with Route 95 is extremely dangerous! Many members of the tribal community expressed concern during public meetings and through the survey that this road is dangerous, has the potential to flood, and is the only route off the reservation. The Bureau of Indian Affairs and San Bernardino County maintain the roads.

The Chemehuevi Valley Airport exists today as an overgrown area without any functional structures. The Tribe would like to retrofit the airport so it may be used during emergencies. The airport is outside the floodplain. The tribe maintains several fuel tanks at the gas station.

Water on the reservation is a huge concern because of how hot and dry the weather can be. The Water Department is responsible for maintaining water and sewer systems, providing safe drinking water, and responding to water issue emergencies. The department maintains two wells (east well and west well), two water tanks, a pump station adjacent to HUD housing, and a resort water tank. The west well has a generator. The resort water tank is not at risk to dam failure flooding. The water tanks provide water for a maximum of three days during a power outage. The water system on the reservation is not considered adequate, and is the primary concern of tribal leaders and employees. All of the pump stations have back-up power except for east well and Nüwüvi Park; these have been added to the list of mitigation actions.

Water Resources

The primary surface water on the Reservation is Lake Havasu, which was formed as the result of the construction of Parker Dam. Decreed Water Rights entitle the Tribe to 11,340-acre feet of Colorado River water annually. Recently, there has been much concern about contamination in the Colorado River from upstream, off-reservation industrial pollutants. Ammonium perchlorate (rocket fuel) is seeping into the Colorado River from a contaminated site located in Henderson, Nevada. Hexavalent chromium has been traced to a closed chainsaw manufacturing facility that was located in Lake Havasu City, Arizona. Abandoned uranium mine waste piles are located near the river's edge in Utah. There also exists the potential for contamination from faulty or poorly designed septic systems in riverfront communities

located on and off the Tribal lands. Drinking water on the Reservation comes entirely from ground water. There are two public water systems on the Chemehuevi Indian Reservation. 10

The Chemehuevi Environmental Protection Department developed a Water Pollution Control Program with funding from the EPA Clean Water Act (CWA) Section 106 program. The primary objective for water resources on the Chemehuevi Indian Reservation is to restore and maintain the quality and quantity of Tribal waters. To achieve this objective, a reservation-wide water quality and quantity monitoring program will be implemented to provide sufficient information to prepare a 305(b) Tribal Water Quality Assessment.

All surface and groundwater sources on the Chemehuevi Indian Reservation are important to tribal resources. The Colorado River is a cultural resource to the Chemehuevi. The Chemehuevi Indian Tribe is concerned about the effect present land use (e.g., septic systems, agriculture, recreational, etc.) may have on the Colorado River. Surface water monitoring is needed to provide a baseline of the current conditions of the Colorado River and track changes in water quality over time.

Water quality issues of special concern to the Chemehuevi Indian Tribe include:

- Lake Havasu, bays, shorelines, beaches, and wetlands should benefit the Chemehuevi people through employment, services, and preservation of cultural and ceremonial ways and lifestyles; protect the health of our Tribal and local residents; support viable fisheries; and provide recreational opportunities (e.g., swimming, wading, boating, and fishing)
- Ground water should be protected through programs designed to ensure that drinking water is potable and irrigation water is safe for crops, including organic farming

The water quality monitoring program will be conducted in accordance with the Chemehuevi Environmental Department's Water Quality Monitoring Strategy. The objective will be to sufficiently monitor the Tribal surface water and ground water quality. There will be preparations to incorporate 16 monitoring site locations for the surface water quality monitoring program. Additional testing will be conducted at all domestic water sources on the Chemehuevi Indian Reservation (wells and pumping stations). All locations are within the boundaries of the Chemehuevi Indian Reservation waters, all locations are accessible by boat, and some are accessible by land. There will be at minimum four monitoring site locations for gathering baseline domestic ground water data. Field and laboratory water quality measurements will be conducted to meet the information needs of annual Tribal water quality assessment reports. Water quality data will be assessed to determine descriptive water conditions in waterbodies and aquifers, and compared with stream, ground, and drinking water criteria.

Emergency Services

Emergency services on the reservation have gradually expanded, and now include a Fire Station staffed by San Bernardino County firefighters. The reservation does not have a police force, which may pose a problem as businesses and housing expand on the reservation. The firefighters provide the only medical

¹⁰ Chemehuevi Indian Tribe website. <u>http://www.chemehuevi.net/history-culture/</u>.

expertise on the reservation, except for several employees and tribal members who are trained in first aid and CPR. The tribe does have several go-bags and five automated external defibrillators (AED). San Bernardino maintains an emergency dispensary trailer to combat disease if necessary; the contents of this trailer are shown in Appendix A. On the other side of Lake Havasu, in Havasu City, there is a hospital, full police and fire departments, and the Havasu City Air Patrol. The Air Patrol is responsible for medical response. Emergency 911 calls on the reservation are routed to San Bernardino County dispatch.

The Tribe considers their emergency services capacity to be lacking. They have several ideas to improve capacity, including retrofitting the airport to be functional and building a facility near the airport that could function as a shelter.

Land Use and Development Trends

The Tribal Realty Department is committed to the efficient and effective management of the Chemehuevi Tribe's 32,000 acres of trust lands in accordance with Tribal policies and Federal requirements.

Their responsibilities are to promote, preserve, and protect the interest of Chemehuevi Tribal members through maintaining a balanced use of the land for natural preservation, cultural enhancement, economic development, and prudent leasing practices that support economic independence for the Chemehuevi Indian Tribe.

Under the Department of the Interior, Bureau of Indian Affairs, Section 108 Model Contract, the Annual funding Agreement with the Chemehuevi Indian Tribes states that Tribal Realty administers the technical aspects and functions as follows:

- Negotiates and executes all permits and leases of Tribal Lands
- Oversees the implementation and compliance of all leases
- Collects all rents due
- Issues notices of violation of lease terms
- Coordinates with the BIA to issue notices of termination
- Is responsible for conducting all self-help evictions under the Tribes' Self-Help Eviction Ordinance
- Coordinates Land Use Planning between Tribal, Local, Regional, State and Federal jurisdictional levels
- Conducts Real Estate Appraisals for evaluating and estimating market, rental, leasing or other value of real and other property owned by the Tribe
- Maintains records
- Boundary surveys of land delineation for rights-of-ways, lease permits and economic development
- Maintains evaluations, assessments, studies, statements for Environmental Quality and Archeological Resource Services for National Environmental Policy Act (NEPA), National

Historical Preservation Act (NHPA), Clear Air Act (CAA), Clean Water Act (CWA), Endangered Species Act (ESA), Resource Conservation and Recovery Act (RERA)

The Tribal Realty Department provides long-range planning, including zoning and master planned land use, building permits, inspections and construction, and grants and other types of funding for Tribal economic and residential projects. It provides points of contact for governmental and commercial offices, and researches, advises and consults as required by the Council Executive Committee and the Chemehuevi Tribal Council.

The Tribe is interested in further developing the reservation. They would like to build a new administration building and new homes. They may consider adding a water park in the future, a large solar system, and new housing condominiums. In addition, they would like to further upgrade the campground. Revenue from the new casino and hotel may make these projects possible in the next three to five years.

Chapter 3. Planning Process

The hazard mitigation planning process followed the guidance and requirements provided by the Federal Emergency Management Agency (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.

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)]

Havasu Lake Emergency Planning Group

The Havasu Lake Emergency Planning Group (HLEP) was expanded to function as the primary decisionmaking body for the mitigation plan. The group is led by the Deputy Environmental Director, and includes representatives from most tribal departments, first responders, and regional stakeholders. The HLEP was introduced to FEMA's Guiding Principles (listed in Chapter 1: Introduction) for tribal hazard mitigation, and they guided the planning process. The list of HLEP members is shown in the table below and in the Introduction.

Name	Organization/Position
Vince Balsitis	San Bernardino County Sheriff's Office; Deputy Sheriff
Chelsea Bunim	Chemehuevi Indian Tribe EPA; Outreach Coordinator
John Csicsery	Havasu Landing Resort; Property Manager
Brian Davis	Lake Havasu City Fire; Fire Chief
Donner Ellsworth	Chemehuevi Indian Tribe; Administrator
Lorrie Ellsworth	Chemehuevi Indian Tribe Housing; Director
Josh Esquerra	Havasu Landing Resort; Market Manager
Emmanuel Evans	Chemehuevi Indian Tribe Housing; Maintenance Supervisor
Daniel Felix	Chemehuevi Indian Tribe Conservation; Conservation Aid
Christina Gordon	Chemehuevi Indian Tribe Head Start; Family Specialist
John Gordon	Chemehuevi Indian Tribe Water Department; Supervisor
Jeffry Harran	Lake Havasu City Fire; Operations Chief
Lex Koscielak	Chemehuevi Indian Tribe EPA; Deputy Director
Matthew Kramer	Chemehuevi Indian Tribe Agriculture; Agriculture Technician
Daniel Leivas	Chemehuevi Indian Tribe Agriculture; Director
Dawn McElwain	Chemehuevi Indian Tribe Health and Wellness Center; Director
Raymond Mejia	Chemehuevi Indian Tribe EPA; Director
Michael Murphy	San Bernardino County Fire; BG Captain I
David Nye	Havasu Landing Resort; Resort Manager
Isac Ochoa	Chemehuevi Indian Tribe Community Center; Activities Director

Table 4 HLEP members

Name	Organization/Position
Josie Pintor	Chemehuevi Indian Tribe Head Start; Director
Frederick Rivera	Chemehuevi Indian Tribe Conservation; Conservation Officer
Jim Rolls	Chemehuevi Elementary; Principal
Rio Sandate	Chemehuevi Indian Tribe EPA; Environmental Technician
Jonathan Schlotthauer	San Bernardino County Fire; BG Firefighter Paramedic
Joseph Sewart	Bureau of Indian Affairs; Public Utility Specialist
Sheridan Silversmith	Chemehuevi Indian Tribe Tribal Employment Rights Office; TERO Director
Kevin Stephens	Colorado River Service Unit Parker IHS; RN, Nurse Educator
Adam Trujillo	Chemehuevi Indian Tribe Head Start; Transporter

During the planning process, the HLEP met three times and hosted two public workshops, several reservation tours, and several stakeholder interviews. Supporting materials for all of these meetings are in the Appendix. The Tribal Chairman required department heads to participate in the meetings. The Deputy Environmental Director personally reached out to other local and regional stakeholders, ensuring their participation.

The first HLEP meeting was held April 11, 2019. The emphasis on this first meeting was describing the mitigation planning process and the role of the HLEP and identifying hazards and critical facilities. In this meeting, the HLEP described power outages as their biggest concern, and noted that they can be caused by wind, lightning, fire, or flood. They also shared their concern that there is only one road to and from the reservation, and it is susceptible to flooding.

The second meeting, on August 21, 2019, was an opportunity to review preliminary risk assessment results and discuss potential mitigation actions. At this meeting, the HLEP members tweaked the preliminary hazard ranking by moving wildfire from moderate to high, and lightning from low to moderate. They identified a number of mitigation actions concentrated around improving communication, managing electrical power outages, and increasing the capacity of emergency management. Attendance at this meeting was the highest of all three, probably because the Tribal Chairman sent a letter to all departmental supervisors requiring their attendance (the letter is included in Appendix A).



Figure 4 HLEP members pointing out high-hazard areas on a reservation base map

The third HLEP meeting was held on January 21, 2020 and was an opportunity to fine-tune the items and priorities on the list of identified mitigation actions. Between in-person meetings, the Deputy Environmental Director and the consulting team reached out to HLEP members via email and phone to review draft documents, collect data, and weigh in on issues related to plan development.

Public Outreach and 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 outreach part of the planning process was multi-pronged. It included a public survey, public meetings, and an opportunity for the public to review the draft Hazard Mitigation Plan. The HLEP hosted



Figure 5 Public meeting participants taking the survey before the meeting started

two public meetings: one on August 21, 2019, and one on January 21, 2020. Each meeting was advertised by a flyer, Facebook posting, and email and phone outreach. The Havasu Buzz is the Facebook page frequented by the tribal community. Copies of the flyers and sign-in sheets are included in the appendix. Each meeting included an opportunity for participants to complete the survey via hard copy or digitally, as shown in the picture to the right. Each meeting included a PowerPoint presentation indicating the findings and process of the plan development. Most importantly, the meeting included discussion opportunities, so all participants could ask

questions and share their ideas. A point that was made at the second public meeting — senior homes do not have water access in their back yards — became a mitigation action. An elaborate dinner was served at each meeting, which may have led to families participating.

Public Preparedness Survey Results

An opportunity for public participation was developed through the *Chemehuevi Disaster Preparedness Survey.* The ten-question survey was produced in SurveyMonkey and distributed in hard copy and online to the Chemehuevi Reservation community. Announcements about the survey's availability were made in flyers, social media, and at HLEP and public meetings.

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 results are in the Appendix A.

Ninety-five surveys were collected. 70% of respondents live on the reservation, 38% of them in HUD homes, and 24% on resort property. Survey respondents prefer to receive information regarding hazard mitigation, preparedness, and response and recovery through email, text messages, and social media, as seen in Figure 6 below. The biggest hazards of concern, consistent with those identified in the risk

assessment, were extreme temperatures, drought, dam failure, extreme winds, and flood. They are most interested in protecting the water department, fire station, and market.

Question 5 of the survey stated, "In your opinion, what are some actions that the Tribe could take to

reduce or eliminate the risk of future natural hazard damages in your community?" The responses helped guide the development of mitigation actions and certainly support those actions. Responses included, "Have a sound system to warn of danger, brush clearance, add more water tanks, and build more awareness and training." These suggestions and others have, in fact, become



Figure 6 Survey responses

mitigation actions and can be seen in the Mitigation Strategy.

Stakeholder Engagement

The consulting team worked with the HLEP 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.

The consulting team held in-person meetings with many stakeholders; some of these people were part of the public, and many were part of the HLEP team. 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. In addition, the consulting team toured the reservation several times with different stakeholders. The tours were an opportunity to see critical facilities and potential high-risk areas firsthand.

Below is a list of people the consulting team met with and some key insights from those meetings.

Stakeholder	Key Insights
Chairman and Vice Chairman	The Tribal Government includes nine departments and approximately 100 employees; this does not include the resort or the casino. A large percentage of people living on the Reservation are seniors. The two biggest concerns of the Chairman and Vice Chairman are power failure and the intersection of Seventeen Mile Road and Interstate 95. The intersection does not include turn lanes or appropriate signage. It is the only road access to the Reservation. The Reservation can become isolated, which poses an increased threat to seniors. Many homes have solar power, but they do not have battery backup. The future of the Reservation may include more homes and a new Administration Building. They are interested in improving communication and possibly starting a radio station.
School Principal	The school has four classrooms with a total of 38 students and three teachers. Power outage is their biggest concern; the school does NOT have a generator. The school is part of the regional school district and includes a mix of tribal and non- tribal children.
Planning and Realty Office	The Tribe's Master Plan is over 10 years old. The Tribe may consider additional development near the airport. They may reinstitute the Economic Development Council, a group that brings business ideas to the Council. They are optimizing solar on the Reservation and would like to develop condominiums as well. The ferry brings about 400,000 people a year to the casino.
Museum	The Museum would like to conduct more archeological studies of the Reservation to search for old village sites. They do know that some sewer ponds are covered in artifacts. In addition, they would like to decipher the petroglyphs on the Reservation. They are aware that many sacred sites may be under Lake Havasu and the Colorado River.
Resort Executives	The resort includes 424 mobile homes; about 15 of them are occupied full-time. They are all on leased land. The population on the resort can soar to 5,000 during a busy weekend. There are 170 sites for campers. The resort has security, but no police force. The California Highway Patrol and Sherriff's Department assist on busy weekends. The resort maintains three pump stations. The resort has a three- bell warning siren for a dam breach, after which people would have about 45 minutes to get to safety. The resort and Reservation do NOT have medical capabilities onsite.
Environmental Department	The biggest hazards are dam failure, power outages, and the isolation of the Reservation. If there is a hazardous materials incident or flooding on Seventeen Mile Road, the Tribe is cut off. The Environmental Department is taking the lead on Emergency Management, including hazard mitigation for the Tribe. The Tribe is part of the Southern California Catastrophic Earthquake Plan. The Plan calls for using the Reservation, including the airport, as a staging area.

Table 5 Stakeholder engagement key findings

Neighboring Communities and Regional Partners

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 Chemehuevi Indian Tribe collaborates regularly with their neighbors and regional agencies. Represented on the HLEP were the Bureau of Indian Affairs, Colorado River Service Unit, Lake Havasu City Fire Department, San Bernardino County Fire, and San Bernardino County Sheriff's Office. Representatives from each of these organizations participated in HLEP meetings, several attended public meetings, and they all had the opportunity to review and comment on the draft plan. The Chemehuevi Environmental Department has reached out to Lake Havasu City Fire Department to form an official memorandum of understanding (MOU) to support each other during a disaster. Lake Havasu City Fire Department was not interested in establishing a formal MOU; however, they are willing to offer support when necessary.

Review and Incorporation of 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)]

Development of this Plan included review of two relevant plans, which are named below. Additional capabilities were reviewed and are included in Chapter 5: Capability Assessment.

- San Bernardino County Hazard Mitigation Plan (This plan was reviewed for hazard identification and mitigation actions. The Chemehuevi Indian Tribe's plan is consistent with the goals and hazards in the County's plan.)
- Southern California Catastrophic Earthquake Plan (This plan relies on the Chemehuevi Indian Tribe's airport. The Tribe considers this pertinent and recognizes the need to improve the airport.)

Integrating the Planning Process with other Planning Efforts

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)]

The Havasu Lake Emergency Planning Team quickly identified ways the hazard mitigation planning process integrated with other programs in their individual areas of expertise. The opening of the new casino and hotel were an opportunity to consider mitigating risk to the building site as well as to the anticipated increased number of visitors to the reservation. They identified several mitigation actions for each of these. In addition, they identified the need for the presence of fire fighters to increase to full time, which happened in the Spring of 2019.

While the Environmental Department led this planning process and is responsible for nearly all of the mitigation actions, the other members of the HLEP did begin to assume additional responsibilities and work toward mitigating risk on the Reservation. For example, the airport runway was cleared during the planning process.

Review of Draft Plan

The Havasu Lake Emergency Planning team reviewed the draft plan in February and March 2020. When they felt comfortable with the content, the plan was shared with the rest of the tribal community and the public for their review.

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)]

For the purposes of this planning process, the HLEP defined "public" as any tribal stakeholder, tribal member, or Chemehuevi Indian Tribe community member. The public was presented with components of the plan at each public meeting for their review. They had the opportunity to contribute data and comments as well as mitigation actions. They were given the opportunity to review the draft plan electronically or in hard copy prior to the plan's submittal to FEMA for review. The plan was available from March 2, 2020 to March 16, 2020. An opportunity to send feedback was included by way of an electronic form. The plan was posted to the Tribe's webpage, and a hard copy was available in the Environmental Department for review. A press release and a flyer were distributed to alert the public of the opportunity to review the plan.

Plan Adoption

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 Region 9 for their review. Upon FEMA's review and designation of the plan as "Approved Pending Adoption," the Tribe scheduled a Tribal Council meeting 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 fulfill the hazard mitigation goals outlined in this plan and authorizes the implementation of the mitigation actions.

The Chemehuevi Indian Tribe assures compliance with all applicable Federal statutes and regulations with respect to the periods for which it receives grant funding, including 2 CFR Parts 200 and 3002, and will amend this plan whenever necessary to reflect changes in Tribal or Federal laws and statutes.

Chapter 4. Risk Assessment

Introduction

Assessing risks is the second step in the four-step mitigation plan process. The risk assessment step includes four parts: identify hazards, profile hazard events, inventory assets, and estimate losses. Conducting a risk assessment is a way of asking and answering "what if . . ." questions. For instance, what if the Reservation receives several days of heavy rain?

The risk assessment answers questions regarding the history, location, frequency, probability, and impact of each hazard. These answers are used in the third step of mitigation planning: developing a mitigation plan. The risk assessment provides essential data to determine and prioritize mitigation measures.

The risk assessment update is formatted to meet the Federal Emergency Management Agency's tribal hazard mitigation planning regulations (as found in C.F.R. 44 201). FEMA requires the Chemehuevi Tribe to include all possible natural hazard events, to assess vulnerability, and to estimate potential losses. Each hazard must include a description of the hazard, location, historical occurrences, extent (or magnitude), and vulnerability. In addition, all assets must be appraised. Identified hazards and hazard profile details are described below.

Sources of Information

Local, State, and Federal Sources

Hazard information was collected for all hazards under consideration, using hazard studies, GIS data, and descriptions of previous events. This information is cited throughout the plan.

Local sources used in the risk and vulnerability assessment include:

- Information gleaned from interviews and meetings with Tribal officials
- Tribal reports, studies, plans, and memos
- Tribal insurance data
- Tribal geospatial data
- 2017 San Bernardino County Hazard Mitigation Plan
- County studies and reports applicable to the planning area
- Local news sources

State sources used in the risk and vulnerability assessment include:

- 2017 California State Hazard Mitigation Plan
- California state agency studies, reports, web tools, and webpages applicable to the planning area

Federal sources used in the risk and vulnerability assessment include:

 Agency studies, geospatial data, web tools, and reports applicable to the planning area, including but not limited to those from FEMA, the U.S. Department of Agriculture (USDA) Forest Service, NOAA National Centers for Environmental Information (NCEI) Storm Events Database, the NWS, the U.S. Drought Monitor, and the U.S. Geological Survey (USGS)

Developing the Tribal Asset Geodatabase

Requirement 201.7(c)(2)(ii)(A): [The plan should describe vulnerability in terms of the] types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard areas.

A geodatabase of tribal assets was developed for use in the risk assessment and for ongoing use by the Tribe. Our team utilized the ESRI's Collector for ArcGIS application on mobile tablets to collect and document critical facilities, cultural resources, and other tribal assets across the Reservation. This information was collected onsite over a one-day period, and further supplemented with information to best reflect each asset. All assets collected were initially documented as geospatial points. After data was collected onsite, each structure's digital footprint was created. Structure assets in the database include residential, commercial, governmental, and other tribally-owned assets (e.g., fuels tanks, wells). Cultural resources (e.g., sacred sites) were also collected as spatial points representing the general area. The assets in the database were further refined to indicate whether an asset was considered a critical facility and/or cultural resource. Additional characteristics were included for each asset, such as a picture, building name, number of stories, building type, and other attributes as determined necessary in discussions with the tribe.

As much as feasible, each asset was also assigned a structure value and content value to determine the value of assets potentially at risk to hazards. Tribally provided insurance replacement values were used to assign building and content value to tribally-owned buildings in the database. In instances where replacement value information was not provided for residential structures, an imputed value was applied based on typical construction values for the area. The replacement value applied was \$125 per square foot.

In total, there are 152 assets in the database, including 143 critical facilities and two cultural resources. **Table 6** shows the number and approximate replacement value (building, contents, and total value) of

Chemehuevi Reservation assets, and notes whether an asset is considered a critical facility or a cultural resource. Two of the Tribe's housing communities, including 85 HUD houses and 23 houses in the Colony community, have been grouped together in **Table 6**, but are assessed as individual structures when determining vulnerability to hazards. **Figure 7** provides a basemap that highlights where assets are clustered across the Reservation, including those deemed critical. **Figure 8** and **Figure 9** show these tribal assets at a finer scale for clarity.

As shown in the table below, 143 assets have been deemed critical. Critical facilities are typically considered structures or institutions necessary for the Tribe in terms of response and recovery from emergencies, and can include facilities such as airports, emergency operation centers (EOCs), fire stations, hospitals, police stations, schools, government buildings, and railroad stations. According to FEMA guidance, these facilities must continue to operate during and following a disaster to reduce the severity of impacts and accelerate recovery.¹¹ The Chemehuevi Reservation has identified several additional critical facilities due to their economic and/or cultural significance.

Asset	Approximate Replacement Value	Approximate Content Value	Approximate Total Value	Critical Facility (Y/N)	Cultural Resource (Y/N)
Cemetery	\$10,000	N/A	\$10,000	N	Y
Chemehuevi Housing Authority	\$490,620	\$130,724	\$621,344	Y	N
Chemehuevi Valley Airport (Airfield, no structures)	\$529,229	N/A	\$529,229	Y	N
Chemehuevi Valley Elementary School	\$501,160	N/A	\$501,160	Y	N
Colony Houses (23 houses total)	\$4,783,000	\$2,391,499	\$7,174,499	Y	N
Community Center	\$1,730,276	\$130,724	\$1,861,000	Y	N
Conservation Office	\$116,442	\$3,542	\$119,984	Y	N
Cultural Center	\$1,128,050	\$190,896	\$1,318,946	Y	Y
Educational Training Center	\$1,092,626	\$257,157	\$1,349,783	Y	N
Environmental Services	\$348,941	\$355073	\$704,014	Y	N
Former Havasu Landing Casino	\$3,000,000	N/A	\$3,000,000	Y	N
Fire Station	\$5,500,000	\$2,500,000	\$8,000,000	Y	Ν
Fuel Tanks	\$1,132,300	\$68,951	\$1,201,251	Y	Ν
Hardware Store and Fuel Pumps	\$911,711	\$355,916	\$1,267,627	Y	N
Havasu Landing Market	\$1,600,288	\$571,662	\$2,171950	Y	N

Table 6 Chemehuevi Reservation assets summary

¹¹ Federal Emergency Management Agency, Local Mitigation Planning Handbook, Washington, Federal Emergency Management Agency, 2013. Available at: <u>http://www.fema.gov/hazard-mitigation-planning-resources</u>
Asset	Approximate Replacement Value	Approximate Content Value	Approximate Total Value	Critical Facility (Y/N)	Cultural Resource (Y/N)
Havasu Palms Mobile	N/A	N/A	N/A	Ν	N
Home Park					
Head Start Center	\$946,579	\$122,374	\$1,068,953	Y	N
Health Clinic	\$916,562	\$98,042	\$1,014,604	Y	N
HUD Single Family	\$22,661,875	\$11,330,935	\$33,992,810	Y	N
Houses (85 houses total)			-		
HUD Pump Station	\$1,000,000	N/A	\$1,000,000	Y	N
Multipurpose Gym	\$1,851,141	\$19,827	\$1,870,968	Y	N
New Havasu Landing Casino & Hotel	\$42,000,000	\$3,000,000	\$45,000,000	Y	N
North Estates	N/A	N/A	N/A	Ν	N
Nüwüvi Park Meeting Hall	\$794,647	\$171,438	\$966,085	Y	N
Outdoor Storage Area	N/A	N/A	N/A	N	N
Quail Trail Apartments (three buildings)	\$2,727,396	N/A	\$2,727,396	Y	N
Real Estate Planning Office	\$191,403	\$54,468	\$245,871	Y	N
Resort Administration	\$499,531	\$187,542	\$687,073	Y	N
Resort Home 1	N/A	N/A	N/A	Ν	Ν
Resort Home 2	N/A	N/A	N/A	Ν	N
Resort Water Tank	\$2,250,000	N/A	\$2,250,000	Y	N
RV Park	N/A	N/A	N/A	Ν	N
Section 36	N/A	N/A	N/A	Ν	N
Senior Complex	\$909,132	N/A	\$909,132	Y	N
Sheriff Housing	\$300,000	N/A	\$300,000	Y	N
Storage Warehouse	\$513,453	\$381,219	\$894,672	Y	N
Surveillance Office	\$95,409	\$110,014	\$205,423	Y	N
Tribal Administration	\$838,080	\$272,341	\$1,110,421	Y	N
Utility Water Building	\$465,423	\$278,877	\$744,300	Y	N
Vista del Lago	N/A	N/A	N/A	Ν	N
Water Tank 1	\$417,733	N/A	\$417,733	Y	N
Water Tank 2	\$318,126	N/A	\$318,126	Y	N
Well, East	\$110,000	N/A	\$110,000	Y	N
Well, West	\$110,000	N/A	\$110,000	Y	N
TOTAL	\$102,791,133	\$22,983,221	\$125,774,354	143	2



Figure 7 Chemehuevi Reservation assets



Figure 8 Chemehuevi Tribal assets



Figure 9 Chemehuevi Tribal assets (resort area)

Risk Assessment Process and Tools

This risk assessment was conducted using both qualitative and quantitative approaches. The quantitative assessment utilizes a geographic information system (GIS)-based analysis. The qualitative approach draws on previous impacts in and near the planning area, as well as professional judgement, to determine vulnerability in the region and jurisdictions. More information on each approach is described below.

Quantitative Analysis: GIS

When possible, the vulnerability assessment for each hazard was completed utilizing a GIS-based analysis. Hazards that have specified geographic boundaries permit GIS analysis. These hazards include:

- Flood
- Landslides
- Wildfire
- Dam failure
- Hazardous material incidents

The objective of the GIS-based analysis was to determine the estimated vulnerability of critical facilities, cultural resources, and structures for the identified hazards on the Chemehuevi Reservation using the best available geospatial data. ESRI® ArcGIS[™] 10.2 was used to assess hazard vulnerability utilizing digital hazard data, such as FEMA DFIRMs, building footprints, and building values based on insurance information. Digital data was collected from local, regional, state, and national sources for hazards. As described above, information was collected onsite to develop an asset database with building footprints for critical facilities and point data for cultural resources. Using these data layers, hazard vulnerability can be assessed by estimating the number and of type of assets, as well as potential dollar losses, determined to be in identified geographic hazard area boundaries.

Qualitative Analysis

A qualitative approach was employed for hazards that generally have the potential to impact, or occur within, the entire planning area. It was also used for such hazards that lack a geographic boundary or sufficient data to perform a reliable spatial analysis. This includes hazards considered atmospheric, including drought, extreme temperatures, extreme winds, lightning, and tornadoes. It also includes power outage and terrorism. All of these hazards have the potential to affect all current and future buildings and all populations. Qualitative analyses were performed using available research, data, and risk expertise to draw conclusions on probability of occurence and potential impacts across the entire planning area, rather than applying a structure-specific approach. All conclusions are presented in "Conclusions on Hazard Vulnerability" at the end of this section.

Priority Risk Index

The prioritization and categorization of identified hazards for Chemehuevi Reservation is based principally on the Priority Risk Index (PRI), a tool used to measure the degree of risk for identified hazards in a particular planning area. The PRI was used to assist the Chemehuevi Tribal Mitigation Planning Team in identifying hazards that pose the most significant threats to the tribe and its assets.

PRI results provide a numerical value for each hazard, allowing hazards to be ranked against one another (i.e. the higher the PRI value, the greater the hazard risk). PRI values are obtained by assigning varying degrees of risk to five categories for each hazard: probability, impact, spatial extent, warning time, and duration. Each degree of risk has been assigned a value (1 to 4) and a weighting factor.

To calculate the PRI value for a given hazard, the assigned risk value for each category is multiplied by the weighting factor. The sum of all five categories equals the final PRI value, as demonstrated in the example equation below:

PRI VALUE = [(PROBABILITY x .30) + (IMPACT x .30) + (SPATIAL EXTENT x .20) + (WARNING TIME x .10) + (DURATION x .10)]

According to the weighting scheme applied, the highest possible PRI value is 4.0. **Table 7** shows the weighting schemes for each category. By determining a value for each hazard that can be compared to other hazards threatening the planning area, hazards can be ranked with greater ease.

Many of the PRI categories are described within the hazard profiles. The final PRI results, including the calculated values for each hazard threatening the Chemehuevi Reservation, are found at the end of this section in the Summary of Hazard Risk.

551		DEGREE OF RISK	Assigned		
Category Level		Criteria		Weighing Factor	
	Unlikely	Less than 1% annual probability	1		
Probability Possi	Possible	Between 1 and 10% annual probability	2	- 30%	
	Likely	Between 10 and 90% annual probability	3		
	Highly likely	90%+ annual probability	4		
Impact	Minor	Only minor property damage and minimal disruption to government functions and services. No shutdown of critical facilities.	1	30%	
	Limited	Minor injuries are possible. More than 10% of buildings damaged or destroyed. Temporary	2		

Table 7 Priority Risk Index scoring criteria

	DEGREE OF RISK				
PRI Category	Level	Index Value	Weighing Factor		
		shutdown of critical facilities (less than one week).			
	Critical	Multiple deaths/injuries possible. More than 25% of buildings 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 buildings damaged or destroyed. Complete shutdown of critical facilities for 30 days or more.	4		
	Negligible	Limited to one specific area.	1		
Spatial	Small	Small areas affected.	2	200/	
Extent	Moderate	Large areas affected.	3	2070	
	Large	All areas affected.	4		
	More than 24 hours	Self-explanatory	1		
Warning	12 to 24 hours	Self-explanatory	2	10%	
Time	6 to 12 hours	Self-explanatory	3		
	Less than 6 hours	Self-explanatory	4		
	Less than 6 hours	Self-explanatory	1		
Duration	6 to 12 hours	Self-explanatory			
	12 to 24 hours	Self-explanatory		10%	
	More than 24 hours	Self-explanatory	4		

Limitations

Although many different sources of data and information were collected, limitations in analysis did exist. Limitations include those associated with data availability specific to tribal boundaries, loss estimates, and unreported or underreported events as described below.

Data Availability

It should be noted that limited information was found regarding events directly impacting the Chemehuevi Reservation and its assets. When possible, information was supplemented with interview data from various Tribal officials, but detailed monetary losses for historic events impacting the Reservation were not available. In many cases, data from San Bernardino Count was used to demonstrate hazard probability, extent, and previous occurrences. In certain instances, data reported for the overlying county or NWS public forecast zone had to be used to determine instances of previous occurrences. The National Weather Service issues watches and warnings for public forecast zones, which typically follow county or multi-county boundaries. When variables such as elevation differences or proximity to water bodies create differences in weather across a county, zones may differ from county boundaries in order to allow for more accurate forecasts.¹² Instances where forecast zones or countylevel reporting were used to determine previous occurrences are noted in a hazard's profile. Without loss estimates from previous events impacting the Chemehuevi Reservation, it wasn't feasible to calculate annualized loss estimates for the Reservation.

Further, asset values were not available for all Tribal assets, as indicated in **Table 6**. Therefore, estimates of Tribal asset value at risk to certain hazards may underrepresent the Tribe's true vulnerability.

Loss Estimates

Loss estimates provided in this vulnerability assessment are based on best available data and methodologies. The results are an approximation of risk. These estimates should be used to understand relative risk from hazards and potential losses. Uncertainties are inherent in any loss estimation methodology, arising in part from incomplete scientific knowledge concerning natural hazards and their effects on the built environment. Uncertainties also result from approximations and simplifications that are necessary for a comprehensive analysis (e.g., incomplete inventories, non-specific locations, lack of demographic information or economic parameters).

Unreported Events

In calculating annual probability estimates used in the Priority Risk Index, it should be noted that not all events for each hazard are reported, which can impact the probability assigned to each hazard, which in turn can affect index values.

Hazard Identification

Requirement 201.7(c)(2)(i): A description of the type, location, and extent of all natural hazards that can affect the tribal planning area.

¹² NWS Public Forecast Zones. (2018). The National Weather Service. Retrieved March 12, 2018 from <u>https://www.weather.gov/gis/PublicZones</u>.

Hazard identification is the process of distinguishing the types of natural hazards that can affect the mitigation plan study area: the Chemehuevi Reservation and its assets. Several human-caused hazards are also included in this plan. As this is the first iteration of a hazard mitigation plan for the Chemehuevi Tribe, an extensive hazard identification process was undertaken. Information was evaluated from key sources, including the current California State Hazard Mitigation Plan, the existing county-level hazard mitigation plan for San Bernardino County (which overlies the Chemehuevi Reservation), research of past disaster declarations for the overlying county, and input from the planning team. In addition, readily available information from reputable sources (federal and state agencies) was evaluated to supplement information from these key sources.

Table 8 presents the final hazards list identified for inclusion in this plan, and whether each hazard was recognized in the California State Hazard Mitigation Plan and/or the San Bernardino County Hazard Mitigation Plan. **Table 9** indicates the hazards from the California State Hazard Mitigation Plan that were excluded from this plan and the justification for exclusion.

Chemehuevi Reservation Hazard Mitigation Plan Identified Hazards	2018 California SHMP Identified Hazard?	2017 San Bernardino County HMP Identified Hazard?
Natural Hazards		
Climate Change (included for each hazard)	х	Х
Drought	X	X
Earthquake	Х	Х
Extreme Cold	Х	X
Extreme Heat	Х	Х
Extreme Wind	X (Under Severe Weather and Storms)	Х
Flood	Х	Х
Landslides	Х	X (Under Earthquake and Wildfire)
Lightning	X (Under Severe Weather and Storms)	Х
Tornado	-	X
Wildfire	Х	X
Non-Natural Hazards		
Dam Failure	Х	X
Hazardous Materials Incidents	Х	X (Under Terrorism)
Power Outage	X	X
Terrorism (including Cyber Threats)	х	х

Table 8 Relevant state and county hazard mitigation plan identified hazards

2018 California SHMP Identified Hazards (Excluded from 2019 Chemehuevi Plan)	Justification
Agricultural and Silvicultural Pests and Diseases	 Not a hazard of concern within planning area (Tribe does not rely on agriculture)
Air Pollution	 Not a hazard of concern to the Tribe; out of scope for hazard mitigation plan (addressed by state/regional plans and agencies)
Aquatic Invasive Species	 Not a hazard of concern to the Tribe; out of scope for hazard mitigation plan (addressed by state/regional plans and agencies).
Avalanche	Lack of substantial snow accumulation on slopesNo history of avalanches
Civil Disorder	 Not a hazard of concern to the Tribe. Described in Tribal Emergency Response Plan as low frequency and low consequence. No history of civil disorder on Reservation. Non-natural hazard.
Epidemic/Pandemic/Vector-	• Considered a biohazard rather than a natural hazard.
borne Diseases	 Considered out of the scope of this plan.
Hydraulic Fracturing Hazards	Non-natural hazard; not addressedNo known history of events
Levee Failure	Not relevant to planning area; no levees identified.
Nuclear Incidents	No known nuclear power plants near planning area.Non-natural hazard; not addressed
Pipeline Hazards	Non-natural hazard; not addressedNo history of events
Sea Level Rise/Coastal Flooding	• Inland location (Reservation is 240 miles from the coast)
Tree Mortality	• Reservation not located in forest or heavily treed area. Area is defined by brush and desert shrubs.
Tsunami/Seiche	• Inland location (Reservation is 240 miles from the coast)
Urban Structural Fire	Non-natural hazard; not addressed
Volcano	 According to USGS data, no volcanic hazards identified near the Reservation

Table 9 Justification for excluded hazards

Disaster Declarations

From 1965 to 2019, 27 disasters were declared in San Bernardino County. It should be noted that declared disasters did not necessarily impact the Chemehuevi Reservation or its assets. However, reviewing historic disaster declarations indicates what disasters have or could impact the planning area. **Table 10** lists historic disaster declarations for San Bernardino County from 1965 to December 2019.¹³

Date	Disaster Number	Description
12/7/1965	211	Heavy Rains and Flooding
1/2/1967	223	Severe Storms and Flooding
1/26/1969	253	Severe Storms and Flooding
9/29/1970	295	Forest and Brush Fires
9/21/1976	521	Flooding, Tropical Storm Kathleen
2/15/1978	547	Coastal Storms, Mudslides, and Flooding
2/21/1980	615	Severe Storms, Mudslides, and Flooding
11/27/1980	635	Brush and Timber Fires
2/9/1983	677	Coastal Storms, Floods, Slides, and Tornadoes
7/1/1983	687	Flooding
9/22/1983	690	Flash Flooding
6/30/1990	872	Fires
2/11/1991	894	Severe Freeze
7/2/1992	947	Earthquake and Aftershocks
2/25/1992	935	Rain, Snow, Windstorms, Flooding, Mudslides
10/28/1992	1005	Fires, Mud/Landslides, Flooding, Soil Erosion
2/2/1993	979	Severe Winter Storm, Landslides, Mudflows, Flooding
1/10/1995	1044	Severe Winter Storm, Landslides, Mudflows, Flooding
3/12/1995	1046	Severe Winter Storm, Landslides, Mudflows, Flooding
2/9/1998	1203	Severe Winter Storms and Flooding
10/27/2003	1498	Wildfires, Flooding, Mudflow and Debris Flow
2/4/2005	1577	Severe Storm, Debris Flows, Mudflows, Flooding
4/14/2005	1585	Severe Storm, Landslides, Debris Flows, Mudflows, Flooding
10/24/2006	1731	Wildfires, Flooding, Mudflow and Debris Flow
3/13/2007	1689	Severe Freeze
3/8/2010	1884	Severe Winter Storm, Debris Flows, Mudflows, Flooding
1/26/2011	1952	Severe Winter Storm, Debris Flows, Mudflows, Flooding

Table 10 Historic presidential disaster declarations for San Bernardino County

¹³ Open FEMA Dataset: Disaster Declarations Summaries V1. (2019). Federal Emergency Management Agency. Retrieved from https://www.fema.gov/openfema-dataset-disaster-declarations-summaries-v1

Hazard Profiles

Requirement 201.7(c)(2)(i): A description of the type, location, and extent of all natural hazards that can affect the tribal planning area. The plan shall include information on previous occurrences of hazard events and on the probability of future hazard events.

Requirement 201.7(c)(2)(ii): A description of the Indian tribal government's vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description shall include an overall summary of each hazard and its impact on the tribe. The plan should describe vulnerability in terms of:

(A) The types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard areas;

(B) An estimate of the potential dollar losses to vulnerable structures identified in paragraph (c)(2)(ii)(A) of this section and a description of the methodology used to prepare the estimate;

(C) A general description of land uses and development trends within the tribal planning area so that mitigation options can be considered in future land use decisions; and

(D) Cultural and sacred sites that are significant, even if they cannot be valued in monetary terms

Each identified hazard is profiled separately to describe the hazard and potential impacts to the Chemehuevi Reservation and its assets. The profile for each hazard includes:

- Hazard description: a scientific explanation of the hazard including potential magnitude (or severity) and impacts.
- Location: geographical extent of the hazard.
- Previous occurrences: the number of previous impacts from the hazard on Reservation (or surrounding area).
- Extent (or magnitude): the severity of the hazard in the past and potential severity in the future. Measures may include wind speed, wave height, or property damage.
- Probability of future events: The likelihood of future events impacting the Chemehuevi Reservation. Given an exact probability is often difficult to quantify, this characteristic is categorized into ranges.
 - Unlikely: Less than 1% annual probability
 - Possible: Between 1% and 10% annual probability
 - Likely: Between 10+% and 90% annual probability
 - o Highly Likely: Greater than 90% annual probability

Vulnerability Assessment and Estimated Losses: The vulnerability assessment addresses conditions that may increase or decrease vulnerability, such as topography, soil type, land use, and development trends. Potential impacts to hazards from climate change are also addressed in this section, including potential changes in hazard frequency, duration, and/or intensity. Estimated losses to assets are calculated using available data and resources. Methods utilized include GIS analysis and hazard modeling, for example. The number of structures at risk, critical facilities at risk, and cultural sacred sites at risk are analyzed using GIS analysis when possible.

Drought 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."¹⁴ Thus, the National Drought Mitigation Center has classified droughts into five types: 1) meteorological, 2) hydrologic, 3) agricultural, 4) socioeconomic, or 5) ecological.¹⁵ The definition for each of these drought classifications is shown in the table below.

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.

Table 11 Drought classification definitions

¹⁴ National Centers for Environmental Information (2017). "Definition of Drought." National Oceanic and Atmospheric Administration. Retrieved from <u>https://www.ncdc.noaa.gov/monitoring-references/dyk/drought-definition</u>

¹⁵ The National Drought Mitigation Center, Types of Drought. (2017). Retrieved May 3, 2019, from https://drought.unl.edu/Education/DroughtIn-depth/TypesofDrought.aspx

The U.S. Drought Monitor records drought in the U.S. and categorizes drought into five categories as shown below.¹⁶

DO	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.
D4	Exceptional Drought	Exceptional and widespread crop/pasture losses; shortages of water in reservoirs, streams, and wells, creating water emergencies.

Table	12	Drought	monitor	categories
rabic		Diougne	11101111001	categories

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 amount to 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.¹⁷ 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 Chemehuevi Tribe utilizes water allocated from the Colorado River for their domestic and commercial water needs.

¹⁶ The National Drought Mitigation Center, U.S. Drought Monitor Classification Scheme. (n.d.). Retrieved May 3, 2019, from <u>https://droughtmonitor.unl.edu/AboutUSDM/AbouttheData/DroughtClassification.aspx</u>

¹⁷ California State Hazard Mitigation Plan, Chapter 9 (2018). California Office of Emergency Services. Retrieved in May 2, 2019, from https://www.caloes.ca.gov/HazardMitigationSite/Documents/012-2018%20SHMP_FINAL_Ch%209.pdf

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 vary in severity across those areas. All areas of the Chemehuevi Reservation are at risk to drought occurrence.

Previous Occurrences

In order to understand the conditions of past drought, it is helpful to understand the typical precipitation received each year. The Western Regional Climate Center reports an annual average of 3.45 inches of precipitation at Lake Havasu City, Arizona, the closest monitoring station to the Chemehuevi Reservation (approximately 1.5 miles from the Reservation). Monthly precipitation averages are shown in **Figure 10**.



Figure 10 Average monthly precipitation in Lake Havasu City, AZ¹⁸

The U.S. Drought Monitor was used to ascertain historical drought levels for San Bernardino County. Because the U.S. Drought Monitor reports drought occurrences by county, drought occurrences specific to the Chemehuevi Reservation could not be obtained. However, due to the regional nature of drought occurrences, it can be assumed that when San Bernardino County was experiencing a drought, all or part of the Chemehuevi Reservation also experienced similar drought conditions. The U.S. Drought Monitor reports data on drought conditions from 2000 through 2019. Drought conditions are reported by category as percentages. Therefore, it is possible that more than one drought category was reported

¹⁸ Western Regional Climate Center, Lake Havasu City (024761). (2017). Retrieved May 1, 2019, from <u>https://wrcc.dri.edu/cgi-bin/cliMAIN.pl?az4761</u>.

in each week. In such cases, the highest drought category reported was used. This information is compiled and presented below.

Abnormally Dry	Moderate Dr	ought	Severe Drought	Extreme Drought	Exceptional
	Table 13 Histori	c drough	t occurrences in San	Bernardino County	
	Year	San Ber	nardino County		
	2000	Modera	ate (up to 2 weeks)		
	2001	Abnorn	nal (up to 14 weeks)		
	2002	Extrem	e (up to 36 weeks)		
	2003	Extrem	e (up to 16 weeks)		
	2004	Severe	(up to 48 weeks)		
	2005	Abnorn	nal (up to 7 weeks)		
	2006	Modera	ate (up to 43 weeks)		
	2007	Extrem	e (up to 42 weeks)		
	2008	Extrem	e (up to 1 week)		
	2009	Severe	(up to 39 weeks)		
	2010	Severe	(up to 3 weeks)		
	2011	Abnorn	nal (up to 30 weeks)		
	2012	Severe	(up to 42 weeks)		
	2013	Extrem	e (up to 21 weeks)		
	2014	Excepti	onal (up to 27 week	s)	
	2015	Excepti	onal (52 weeks)		
	2016	Excepti	onal (up to 51 week	s)	
	2017	Excepti	onal (up to 3 weeks)		
	2018	Extrem	e (up to 25 weeks)		
	2019	Severe	(up to 3 weeks, as of	f April 29, 2019)	

In the study period, years 2002-2003, 2007-2008, and 2013-2018 reported the most intense droughts. However, another notable trend is that some level of drought was present in each of the 20 years studied, possibly indicating a long-term issue.

The California State Hazard Mitigation Plan describes several historic droughts, three of which impacted San Bernardino County (and therefore likely impacted the Chemehuevi Reservation).¹⁹

• The 1976-1977 drought affected 31 counties in California, including San Bernardino County, and resulted in \$2.67 billion in crop damage throughout the state. Most water reservoirs were

¹⁹ California State Hazard Mitigation Plan, Chapter 9 (2018). California Office of Emergency Services. Retrieved in May 2, 2019, from <u>https://www.caloes.ca.gov/HazardMitigationSite/Documents/012-2018%20SHMP_FINAL_Ch%209.pdf</u>.

substantially drained by the end of 1976, leading to widespread water shortages in 1977, which was even drier than 1976.

• The 2001 drought affected 16 counties in California, including San Bernardino County.

2012-2017 Drought. California experienced five consecutive years of drought from 2012 through 2017 due to record low precipitation and snowpack levels. These included the driest four consecutive years of statewide precipitation in the historical record.²⁰ The Governor proclaimed a Drought State of Emergency in January of 2014, which was lifted in April of 2017 after a wet winter and replenished snowpack. This event is one of the most intense and costliest droughts on record for the state, costing \$6.6 billion in drought response and mitigation measures alone.²¹ San Bernardino County experienced intense drought conditions during these years. For example, the county experienced exceptional drought conditions in over half of 2014 and in nearly all of 2015 and 2016.

Extent

Extent can be defined by the highest drought monitor category: Exceptional Drought. Since the U.S. Drought Monitor began in 2000, there have been 133 weeks during which all or part of San Bernardino County experienced Exceptional Drought (in 2014, 2015, 2016, and 2017). It should be noted that a drought worse than the 2012-2017 California Drought is possible.

Probability of Future Events

An exact probability is difficult to quantify given the limited reporting period available from Drought Monitor (18 years; 2000-2019). There have been reported drought conditions in every year on record for San Bernardino County, which overlies the Chemehuevi Reservation. Further, drought frequency and severity are projected to increase in the region in the future due to changing climatic conditions, as described in the section below. Also, recent climate research projects that extended drought occurrence, referred to as "mega-droughts," will become more pervasive in the region in future decades.²² Based on historic data and information regarding future conditions, a probability of "highly likely" (greater than 90% 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.²³

²⁰ California Department of Water Resources. California Must Prepare for Flood and Drought. (2017, February 21). Retrieved June 28, 2017, from http://www.water.ca.gov/waterconditions/

²¹ California Department of Water Resources. Governor's Drought Declaration. (2017, April 12). Retrieved June 28, 2017, from http://www.water.ca.gov/waterconditions/declaration.cfm

²² Cal-adapt. Extended Drought Scenarios. Retrieved from <u>https://cal-adapt.org/tools/extended-drought/</u>.

²³ National Drought Mitigation Center. ENSO and Drought Forecasting. Retrieved March 30, 2014 <u>http://drought.unl.edu/DroughtBasics/ENSOandForecasting.aspx</u>

Vulnerability Assessment and Estimation of Losses

It is assumed that all current and future buildings, populations, critical facilities, and cultural resources on the Chemehuevi Reservation are at risk of drought. The atmospheric nature of drought and lack of specific boundaries make it more conducive to a qualitative assessment as opposed to a quantitative analysis. The majority of drought impacts, however, are not structural but societal in nature.

Drought presents a major concern in terms of water supply for commercial, household, safety, and landscaping needs. Drought may impact water supply, prompt water conservation measures, and damage landscaping and other natural resources. The Chemehuevi Reservation abuts Lake Havasu, and tourism from visitors to the lake is an important source of revenue for the Tribe. Intense, long-lasting droughts have the potential to significantly impact lake water levels and lake water quality, which in turn could impact tourism and have economic consequences for the Tribe. Because water is drawn from Lake Havasu to supply Los Angeles, the lake is well monitored and maintained.

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. In addition, soil that is dry and loosened due to dead or barren vegetation is more prone to landslides and sedimentation when a drought is followed by a heavy rain event.

Limited damage reports make estimating annualized dollar loss infeasible. While some direct losses are possible (particularly to landscaping), indirect losses may be more severe, e.g. impacts to business and water prices. Reduced water capacity may also increase damage in the event of a wildfire.

Climate Change Impacts

Climate change can be expected to increase drought frequency and severity on the Chemehuevi Reservation. Warmer temperatures cause drought conditions by reducing soil moisture. Average maximum temperatures on the Reservation are projected to increase from a baseline of 87.6°F to upwards of 91.3°F by 2050 and 96.5°F by 2099 (see **Figure 19**, located in the *Extreme Heat* hazard profile, which shows the projected increase in average maximum temperatures on the Reservation under different emissions scenarios and timelines). Further, the effects of warmer temperatures on drought are not expected to be offset by precipitation; average precipitation is projected to vary little from the current historical baseline average (4.5 inches per year, 1961-1990) under both the lower and higher emissions scenarios.²⁴

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

²⁴ Annual Averages. (2019). Cal Adapt. Retrieved May 3, 2019 from <u>https://cal-adapt.org/tools/annual-averages/#climatevar=pr&scenario=rcp85&lat=34.53125&lng=-114.40625&boundary=locagrid&units=inches%20per%20day.</u>

Earthquake

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 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). Damage following this intensity range from minor to catastrophic. Earthquakes also occur without warning, resulting in deaths and injuries.



Figure 11 Earth's sub layers

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 11**²⁵): 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 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 12**. 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 particularly high risk, since most of the largest earthquake events of the last century have occurred in the region.²⁶

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.

²⁵ http://www.bbc.co.uk/bitesize/ks3/geography/physical_processes/plate_tectonics/revision/2/

²⁶ Canales, M. and Chwastyk, M. The Pacific's Fiery Ring. National Geographic. Retrieved from <u>https://www.nationalgeographic.com/magazine/2019/06/pacific-ring-of-fire-volcanoes-earthquakes-threaten-millions/</u>.



Figure 12 Global plate tectonics and seismic activity²⁷

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.

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 States does face moderate risk to less frequent, less intense earthquake events. **Figure 13** shows relative seismic risk for the United States.

²⁷ 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.



Figure 13 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 14**).²⁸ 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 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 larger 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 15** shows the Moment Magnitude Scale.

Source: United States Geological Survey

²⁸ Earthquake Glossary: Richter scale. USGS. Retrieved from <u>https://earthquake.usgs.gov/learn/glossary/?term=Richter%20scale</u>

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 14 Richter scale

Source: Federal Emergency Management Agency

Table 4 Moment magnitude scale

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.

Source: Federal Emergency Management Agency

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 162**. **Table 37** compares the Richter scale magnitudes and MMI magnitudes for several well-known historic earthquakes in the U.S.

MMI 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 56 Modified Mercalli Intensity Scale for Earthquakes²⁹

Table 67 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
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.³⁰ Essentially, the soil acts like a fluid, similar to wet sand near the beach, resulting in ground failure. Liquefaction causes different types of ground failure: lateral spread/flow failures and loss of bearing strength. Lateral spread develops on gentle slopes and entails

²⁹ Magnitude/Intensity Comparison. USGS. Retrieved from <u>http://earthquake.usgs.gov/learn/topics/mag_vs_int.php Retrieved</u> March 3, 2015.

³⁰What is soil liquefaction? (n.d.). University of Washington. Retrieved October 9, 2017 from http://www.ce.washington.edu/~liquefaction/html/what/what1.html

the sidelong movement of large masses of soil as an underlying layer liquefies. Similarly, flow failures also displace large masses of soil laterally, generally on slopes greater than three degrees. Loss of bearing strength results when the soil supporting structures liquefies and causes structures to collapse. Liquefaction can also cause increased lateral pressure on retaining walls when the soil behind a wall liquefies, causing failure or displacement.³¹

Location

An earthquake event would likely impact the entire planning area. Fault locations and earthquake risk areas also help define location. Southern California is one of the most earthquake-prone regions in the world, with several major fault zones and many smaller faults known to have caused earthquakes over 6.0M in the last 1.6 million years (known as a quaternary fault). Most of these faults lie at least 50 miles from the Chemehuevi Reservation. However, one quaternary fault, the Needles Graben Fault, is located only 16 miles northeast of the Reservation. While this fault has been active in the last 130,000 years, it is a small, shallow fault (approximately four kilometers) with a low slip rate,³² and no significant earthquakes have been recorded along it. Major fault zones in the larger region surrounding the Chemehuevi Reservation include the San Andreas Fault Zone (approximately 135 miles southwest), the Garlock Fault Zone (approximately 162 miles northwest), and the Las Vegas Valley Faults (approximately 130 miles north). These fault zones are shown in **Figure 14.** It should be noted that earthquakes occurring outside of these fault zones still have the potential to impact the Reservation.

³¹ 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
 ³² Less than 0.2mm/year; USGS. Retrieved on January 7, 2020 from https://eeri.org/wp-content/uploads/store/Free%20PDF%20Downloads/LIQ1.pdf
 ³² Less than 0.2mm/year; USGS. Retrieved on January 7, 2020 from https://earthquake.usgs.gov/cfusion/qfault/show report AB archive.cfm?fault id=1011§ion id=.



Figure 14 Active fault lines and zones near the Chemehuevi 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.³³ Areas with man-made fill are also considered to have increased susceptibility to liquefaction.³⁴

The 2017 San Bernardino Hazard Mitigation Plan includes a map of liquefaction susceptibility zones adopted from a USGS ShakeOut exercise completed in 2008. This map, shown in **Figure 15**, shows the Chemehuevi Reservation as having none to moderate susceptibility to liquefaction on various parts of the Reservation. The upper half of the Chemehuevi Reservation, which is the more developed portion, is the most susceptible to liquefaction.



Figure 15 USGS liquefaction susceptibility zones in San Bernardino County

Previous Occurrences

Given limited information about events on the Chemehuevi Reservation and the knowledge that earthquakes can impact vast areas, several local, state, and federal data sources were used to investigate previous occurrences. These sources include:

³³ SANDAG GIS liquefaction metadata

³⁴ Liquefaction Susceptibility. USGS. Retrieved from <u>https://earthquake.usgs.gov/learn/topics/geologicmaps/liquefaction.php</u>.

- NOAA's Significant Earthquake Database.³⁵ 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
 - Earthquake generated a tsunami
- USGS ShakeMap Archives
- The San Bernardino County Hazard Mitigation Plan Draft Update (2017)
- Accounts from Chemehuevi Tribal officials

From the sources above, records of 13 earthquakes and their aftershocks are referenced between 1800 and 2017 near the planning area. It should be noted that, unless indicated, the inclusion of the following earthquake events does not necessarily mean they resulted in damage on the Chemehuevi Reservation. These events are shown in **Figure 16.**

³⁵ National Geophysical Data Center / World Data Service (NGDC/WDS): Significant Earthquake Database. National Geophysical Data Center, NOAA. doi:10.7289/V5TD9V7K [July 5, 2017]



Figure 26 Locations of referenced earthquake events

NOAA Significant Earthquakes Database

According to the NOAA Significant Earthquake Database, two significant earthquakes³⁶ have been recorded within 100 miles of the Chemehuevi Reservation.³⁷

- April 26, 1981 (M 6.0, MMI VII)
 - This event, called the Westmorland or Calipatria earthquake, occurred approximately 100 miles southwest of the Reservation. The event resulted in no deaths or injuries, and up to \$3 million in damages. Subsidence and liquefaction were reported. Most reported damage occurred near Westmorland, including failed roads, broken irrigation canals, and collapsed structures. Of Westmorland's 900 homes, 70% were damaged.
- November 24, 1987 (M 6.2 and MMI VI)
 - This event, called the Superstition Hills earthquake, occurred approximately 100 miles southwest of the Reservation. This event resulted in two reported deaths, no injuries, and approximately \$3 million in damages.

Additional earthquakes (below magnitude 5.0) that have occurred near the planning area are described below, by source.

USGS Shake Maps³⁸

According to available USGS shake map records, two earthquakes produced shaking that impacted the Chemehuevi Reservation.

- October 16, 1999 (M 7.1)
 - This event, called the Ludlow or Hector Mine earthquake, occurred in the Mojave Desert on the Twenty-nine Palms Marine Corps Base. On the Chemehuevi Reservation, this event resulted in an MMI of III to IV, with a PGA of approximately 4%g (see the Extent section below for an explanation of PGA). Figure 27 shows the shake map for this event is relation to the Chemehuevi Reservation.

³⁶ Significant Earthquake Search. NOAA Significant Earthquake Database. Retrieved May 22, 2019 from https://www.ngdc.noaa.gov/nndc/struts/form?t=101650&s=1&d=1.

³⁷ The NOAA Significant Earthquake Database contains information on destructive earthquakes from 2150 BC to the present.

³⁸ Earthquake Catalog Search. USGS Shake Map Archives. Retrieved May 22, 2019 from <u>https://earthquake.usgs.gov/earthquakes/search/</u>.



Figure 37 USGS shake map of the 1999 Hector Mine Earthquake

- June 28, 1992 (M 7.3, MMI IX)
 - This event, referred to as the Landers earthquake, occurred in the Landers Yucca Valley area. At Yucca Valley, three people were killed, and more than 400 people were injured in the region. Approximately \$92 million in in damages was reported. At the Chemehuevi Reservation, this event was felt as an MMI V with a PGA of 5.6%g. Figure 38 shows the shake map for this event in relation to the Chemehuevi Reservation. Tribal officials reported shaking during this event, but no damages.



Figure 48 USGS Shake Map of the 1992 Landers Earthquake

2017 San Bernardino Hazard Mitigation Plan

The 2017 San Bernardino County Hazard Mitigation Plan lists eight earthquakes above a magnitude 4.0 as having occurred between 2010 and 2015 within the county. These events occurred more than 100 miles from the Chemehuevi Reservation. These events include:

- September 14, 2011: Calimesa (M 4.1)
- January 15, 2014: Fontana (M 4.4)
- July 5, 2014: Running Springs (M 4.6)
- March 29, 2014: Brea (M 5.1)
- July 25, 2015: Fontana (M 4.2)
- September 16, 2015: Big Bear Lake (M 4.0)
- December 30, 2015: Muscoy (M 4.4)
- January 6, 2016: Banning (M 4.4)

Tribal Officials and Stakeholders

Tribal officials reported feeling light shaking from regional earthquake events, but no injuries, fatalities, or structural damages from earthquake events. One Tribal official noted that the Reservation experienced light shaking, but no damages and injuries, during the recent 7.1M Ridgecrest earthquake on July 5, 2019.

Extent

One way to measure the extent of an earthquake is peak ground acceleration.



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% probability of exceedance in C years." For data stating PGA (%g) as "10% probability of exceedance in 50 years," a map would indicate a 10% probability of reaching that level of shaking (%g) in 50 years. It is meant to show the upper bounds of possible shaking.

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

Figure 59 SA and PGA comparison

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."³⁹ It is the maximum acceleration of an object in an earthquake, 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 buildings less than seven stories. **Figure 49**⁴⁰ shows a comparative diagram.

The USGS 2014 Unified Hazard Tool was consulted.⁴¹ PGA was estimated for the Chemehuevi Reservation. PGA was considered rather than SA because the Reservation does not have buildings higher than seven stories. Given an input of 10% probability of exceedance in 50 years, the entire Chemehuevi Reservation had a PGA value of 5%g (potential damage is very light/perceived shaking is moderate), as shown in Figure 20. Considering a less likely event did not significantly change potential PGA; the Reservation had a PGA value of 8%g given an input of 2% probability of exceedance in 50 years, which is shown in Figure 21. This PGA value is also associated with very light damage and moderate shaking.



Figure 20 Peak Ground Acceleration (PGA) at the Chemehuevi Reservation Planning Area (10% probability of exceedance in 50 years)

³⁹ http://earthquake.usgs.gov/hazards/about/technical.php#sa

⁴⁰ <u>http://kula.geol.wwu.edu/rjmitch/pga_maps.pdf</u>

⁴¹ Unified Hazard Tool. (2014). USGS. Retrieved from <u>https://earthquake.usgs.gov/hazards/interactive/</u>.



Figure 216 Peak Ground Acceleration (PGA) at the Chemehuevi Reservation Planning Area (2% exceedance in 50 years).

MARCH 2020

Probability of Future Events

The Chemehuevi Reservation lies approximately 100 miles east of several large, seismically active fault zones, including the San Andres and the Garlock fault zones, and approximately 25 miles southwest of the lesser but still active Needles Graben fault zone. Faults further from the Reservation can also have an impact.

The probability of future earthquake events impacting the Chemehuevi Reservation was determined using historic occurrence information. Four significant (above a 5.0 magnitude) events have been reported within 150 miles of the Chemehuevi Reservation over a 219-year reporting period, resulting in a significant earthquake every 55 years on average. None of these events were within 100 miles of the Reservation. Considering the low number of major historic earthquakes near the Chemehuevi Reservation, the probability assigned to the Chemehuevi Reservation for a significant, damaging earthquake event is "possible" (1 to 10% annual probability).

Vulnerability Assessment and Estimation of Losses

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 Chemehuevi Reservation.

Given its distance from major fault lines and lack of historic earthquakes with magnitudes above 5.0, as well as the peak ground acceleration values for the planning area (8%g or under), an earthquake impacting the Reservation would likely result in minor structural damages and/or minor injuries. However, it is possible that 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, landslides, hazardous material spills, utility disruptions, or transportation crises.

Therefore, 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. 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.

Further, a large earthquake in southern California could have regional impacts on the Chemehuevi Reservation, including the ability to receive supplies (e.g., food, fuel, medicine). For example, an event impacting Interstate 40 or Interstate 10 could disrupt groceries and other supplies from reaching the Reservation. In addition, an influx of evacuees to the area could strain existing resources (e.g., evacuees arriving in RVs).

Extreme Cold Description

The term "extreme cold" can have varying definitions in hazard identification. Further, what is considered an extreme cold event will vary greater by region. Generally, extreme cold events refer to a prolonged period (days) with extremely cold temperatures, which may or may not be associated with a winter storm. Sustained temperatures below freezing in Southern California's generally warm and mild weather regions can cause health risks and loss of life to vulnerable populations.

Hypothermia is an extreme cold-related impact that results when individuals are exposed to extreme temperatures. Hypothermia occurs when the body begins to lose heat faster than it can produce it. As a result, the body's temperature begins to fall. If an individual's body temperature falls below 95°F, hypothermia has set in and immediate medical attention should be sought. Hypothermia is characterized by uncontrollable shivering, memory loss, disorientation, incoherence, slurred speech, drowsiness, and exhaustion. Left untreated, hypothermia leads to death. Hypothermia occurs most commonly at very cold temperatures but can occur at cool temperatures (above 40°F) if an individual isn't properly clothed or becomes chilled.

Location

Nearly the entire continental United States is susceptible to extreme cold events. The degree of exposure typically depends on the normal expected severity of local winter weather. Given the atmospheric nature of the hazard, the entire Chemehuevi Reservation has uniform exposure to extreme cold events.

Previous Occurrences

In order to understand cold temperature extremes, average cold temperatures were researched. In addition, previous occurrences from NCEI were reviewed. Average low temperatures on the Chemehuevi Reservation range from the low 40s in the winter to the mid-80s in the summer. Record lows were colder, ranging from the upper 20s in the winter to around 70°F in the summer. **Figure 22** below shows average monthly maximum and record temperatures for a monitoring station in Lake Havasu City, AZ.



Figure 22 Average minimum temperatures in Lake Havasu City, AZ, 1991-2019⁴²

The National Centers for Environmental Information (NCEI) Storm Events Database reports extreme cold and freeze events by county and National Weather Service public forecast zone. Therefore, extreme cold event data solely for the Chemehuevi Reservation is not available. Due to the regional nature of extreme cold events, events occurring in San Bernardino County were retrieved in order to indicate the number and severity of previous occurrences impacting the Chemehuevi Reservation. However, event descriptions indicate that not all events occurring in the county impacted the Chemehuevi Reservation.

Countywide, some events with temperatures below freezing are likely to go unreported, especially if no injuries or damages are associated with the event. There have been two NCEI reported extreme cold events in San Bernardino County since reporting began in 1996: one in January 2002 and the other in February 2002. The latter was described as resulting in hard freezes in San Bernardino County's valleys and deserts, and is therefore inferred to have impacted the Reservation. None of the reported events resulted in reported deaths or injuries; the January 2002 event resulted in approximately \$281,000 in property damages.

In addition to NCEI-reported events, Tribal officials reported an anecdotal account of one historic extreme cold event.

⁴² Western Regional Climate Center, Lake Havasu City (024761). (2019). Retrieved April 24, 2019, from <u>https://wrcc.dri.edu/cgi-bin/cliMAIN.pl?az4759</u>.
Extent

The extent of extreme cold or freeze events can be measured in terms of record low temperatures. The lowest temperature reported from the Western Regional Climate Center at the Chemehuevi Reservation (Lake Havasu City station) was 28°F (occurring in January 2007), but lower temperatures are possible.

Extent of extreme cold can also be measured in terms of loss of human and animal life, or by economic costs imposed by property and infrastructure loss. Few extreme cold impacts have been reported by the Chemehuevi Tribe. Therefore, it is unlikely that an extreme cold event would cause significant property damage to Chemehuevi Reservation.

Probability of Future Events

The NCEI Storm Events Database reported two extreme cold events in San Bernardino County since 1996, which corresponds to approximately one extreme cold event every 11 or 12 years, historically. However, it is likely that not all extreme cold events impacting the Reservation were reported to NCEI.

Further, the frequency of extreme cold events may decline in the future due to overall warming trends associated with climate change (see section below). Based on the above factors, the annual probability assigned for extreme cold events is "possible" (1 to 10% annual probability).

Vulnerability Assessment and Estimation of Losses

The entire Chemehuevi Reservation, including all current and future buildings, populations, cultural resources, land holdings, and critical facilities, are vulnerable to extreme cold events. The elderly and young children, or any individuals without access to an adequate heat source, may be at a greater risk during extreme cold events in which temperatures dip below freezing.

All structures, including critical facilities, are at risk to extreme cold and freeze events. Damages to structures are typically caused by burst pipes. Structural 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).

Climate Change Impacts

Extreme cold and freeze events are likely to become less frequent in Southern California as temperatures increase.⁴³ 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 60.6°F to upwards of 70.9°F by 2099 under a high emissions scenario (representative concentration pathway (RCP) 8.5). **Figure 23** shows the projected changes in average minimum temperature for the Chemehuevi Reservation under different timeframes and emissions scenarios (RCPs). Representative concentration pathways represent

⁴³ Chapter 6 - Other hazards: Risks and mitigation. (2013). California State Hazard Mitigation Plan. Retrieved October 9, 2017 from <u>http://www.caloes.ca.gov/HazardMitigationSite/Documents/007-SHMP%202013%20Chapter%206.pdf</u>

different radiative-forcing scenarios through the year 2100. These scenarios are tied to concentrations of greenhouse gases in the atmosphere, which are the drivers of climate change. In this plan, RCP4.5, the lower greenhouse emissions scenario used in the plan, represents a greenhouse gas emissions scenario in which emissions peak around 2040, then decline. RCP8.5, the higher greenhouse emissions scenario used in the plan, represents a scenario used in the plan, represents a scenario used in the plan, represents a scenario in which greenhouse gas emissions continue to rise sharply through 2050 and stabilize around 2100.



*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 237 Average Minimum Temperature Projections for Chemehuevi Reservation

Extreme Heat

Description

Extreme heat, or a heat wave, is generally defined as temperatures that hover 10°F 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.⁴⁴ CalAdapt (a tool provided by the California Energy Commission for obtaining localized climate change projections), defines an extreme heat day for the Chemehuevi Reservation as 114.6°F or above, which is well above the NWS threshold for "extreme danger." This threshold was calculated using baseline data from 1960-1991.

⁴⁴ Extreme heat (2017). University of Washington Emergency Management. Retrieved October 9, 2017 from <u>https://www.washington.edu/uwem/preparedness/know-your-hazards/extreme-heat/</u>

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 it is 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.

NOAA's NWS devised the Heat Index as a mechanism to better inform the public of heat dangers. The Heat Index Chart, shown in **Figure 245**, uses air temperature and humidity to determine the heat index, or apparent temperature.⁴⁵ In addition, information regarding the health dangers by temperature range is presented.



Figure 248 NWS Heat Index chart

Some populations, such as the elderly and young, are more susceptible to heat danger than other segments of the population.

Heat Disorders. Heat disorders are illnesses caused by prolonged exposure to hot temperatures, and are characterized by the body's inability to shed excess heat. These disorders develop when the heat gain exceeds the level of heat the body can remove, or if the body cannot compensate for fluids and salt lost through perspiration. In either case, the body loses its ability to regulate its internal temperature. All heat disorders share one common feature: the individual has been overexposed to heat, or over

⁴⁵ NWS Heat Index (n.d.). NOAA. Retrieved May 3, 2019 from <u>https://www.weather.gov/safety/heat-index</u>.

exercised for their age and physical condition on a hot day. The following describes the symptoms associated with the different heat disorders.

- *Sunburn* is characterized by redness and pain of skin exposed too long to the sun without proper protection. In severe cases, it can cause swelling, blisters, fever, and headaches. It can significantly retard the skin's ability to shed excess heat.
- *Heat cramps* are characterized by heavy sweating and painful spasms, usually in the muscles of the legs and possibly the abdomen. The loss of fluid through perspiration leaves the body dehydrated, resulting in muscle cramps. This is usually the first sign that the body is experiencing trouble dealing with heat.
- Heat exhaustion is characterized by heavy sweating, weakness, nausea, exhaustion, dizziness, and faintness. Breathing may become rapid and shallow, and the pulse weak. The skin may appear cool, moist, and pale. Blood flow to the skin increases, causing blood flow to decrease to the vital organs. This results in a mild form of shock. If not treated, the victim's condition will worsen.
- Heat stroke, or sunstroke, is a life-threatening condition characterized by a high body temperature (106°F or higher). The skin appears to be dry and flushed, with very little perspiration present. The individual may become mentally confused and aggressive. The pulse is rapid and strong. There is a possibility that the individual will faint or slip into unconsciousness. If the body is not cooled quickly, brain damage and death may result.

Studies indicate that all things being equal, the severity of heat disorders tend to increase with age. Heat cramps in a 17-year-old may be heat exhaustion in someone 40, and heat stroke in a person over 60. Elderly persons, small children, chronic invalids, those on certain medications, and persons with weight or alcohol problems are particularly susceptible to heat reactions.

Location

The entire region, including all of the Chemehuevi Reservation, is impacted by extreme heat events.

Previous Occurrences

In order to understand extremes, average temperatures were researched. In addition, previous occurrences from NCEI were reviewed. Average maximum temperatures on the Chemehuevi Reservation range from the mid-60s in the winter to around 110°F in the summer. Average record highs were hotter, ranging from the mid-80s in the winter to almost 130°F in the summer. Such temperatures, even with low humidity, can be extremely dangerous. **Figure 25** below shows average monthly maximum and record maximum temperatures for a monitoring station in Lake Havasu City, AZ, adjacent to the Chemehuevi Reservation.



Figure 25 Average maximum temperatures in Lake Havasu City, 1991-2019⁴⁶

Past extreme heat events were gleaned from the NCEI Storm Events Database, as well as Tribal officials. The NCEI Storm Events Database reports extreme heat events by county or by NWS public forecast zone. Therefore, extreme heat event data solely for the Chemehuevi Reservation was not available. Due to the regional nature of extreme heat events, events occurring in San Bernardino County were considered in order to indicate the number and severity of previous occurrences impacting the Chemehuevi Tribe. However, it is possible that not all events occurring in the county impacted the Chemehuevi Reservation. Likewise, because of the Reservation's desert location in one of the hottest areas of the county, where extreme high temperatures are common, it is possible that some events impacting the Chemehuevi Reservation were not reported to NCEI.

Twenty-one excessive heat or heat wave events were reported by NCEI in San Bernardino County from 1996 to April of 2019. Details for these events are listed in **Table 48.** These events resulted in 20 deaths, 17 injuries, and \$10,600 (2019 dollars) in damages. When available, details are provided for those events that resulted in deaths, injuries, or damages. It should be noted that deaths, injuries, and damages are reported for the event overall, and did not necessarily occur on the Chemehuevi Reservation.

⁴⁶ Western Regional Climate Center, Lake Havasu City (025761). (2019). Retrieved April 24, 2019, from <u>https://wrcc.dri.edu/cgi-bin/cliMAIN.pl?az4761</u>.

			Property
Date	Deaths	Injuries	Damage (2019 dollars)
08/02/1997	0	0	\$0
05/23/2001	1	0	\$0
07/08/2002	0	9	\$0
07/23/2002	1	0	\$0
07/10/2005	0	0	\$0
07/21/2006	10	6	\$0
07/04/2007	0	0	\$0
09/01/2007	4	2	\$0
09/02/2007	1	0	\$0
06/20/2008	0	0	\$0
08/05/2009	1	0	\$0
07/01/2013	0	0	\$0
08/12/2017	2	0	\$0
08/28/2017	0	0	\$10,609
08/29/2017	0	0	\$0
09/01/2017	0	0	\$0
09/02/2017	0	0	\$0
10/24/2017	0	0	\$0
11/23/2017	0	0	\$0
07/06/2018	0	0	\$0
08/06/2018	0	0	\$0
TOTAL	20	17	\$10,609

Table 18 NCEI Excessive Heat and Heat Wave Historic Events (1996- April 2019)

Damages from the August 28, 2017 heat event occurred in Yucaipa, CA (approximately 150 miles east of the Chemehuevi Reservation), when demand for power during an extreme heat event caused two transformers to fail. NCEI Event Descriptions indicate that heat impacts from several of the above events may have impacted the Chemehuevi Reservation, including heat-related deaths and injuries to humans and animals. Descriptions for these events are provided below.

- **May 23, 2001**: Record high temperatures were reported. A 78-year-old woman who attempted to walk for help after her vehicle became stuck in sand perished from heat exposure.
- July 8, 2002: Three days of temperatures over 100°F led to nine people being admitted to the hospital for heat exhaustion. A smog alert was put into effect due to the hot, stagnant air over the area.
- July 23, 2002: A young girl left inside a van died from heat stroke. Outside air temperatures reached 102°F.
- July 10, 2005: Record heat resulted in near-record power consumption and one death.

In addition to NCEI-reported events, Tribal officials note that normal high temperatures in the summer months can have catastrophic impacts, especially when power supplies, and thus air conditioning, are impacted.

Extent

The extent of extreme heat can be defined with record highs and the NWS Heat Index. Record temperatures at the monitoring station in Lake Havasu City, AZ, have been well above $120^{\circ}F$ — well into the extreme danger level of the NWS Heat Index Chart. The highest temperature reported was $128^{\circ}F$ (in June 1994),⁴⁷ but higher temperatures are possible.

The extent of extreme heat events can also be measured in terms of loss of human life or by economic costs imposed by property, crop, and infrastructure loss. County events have shown that deaths, injury, and property damage are possible due to heat.

Probability of Future Events

The Chemehuevi Reservation regularly experiences temperatures in the "danger" and "extreme danger" categories on the NWS Heat Index Chart (above 98°F). Based on 21 reported heat-related events between 1996 and 2019 across the county, about one extreme heat event is reported each year. However, extreme heat is a regular occurrence on the Chemehuevi Reservation, especially in the summer, with average maximum temperatures above 100°F in June, July, August, and September. Further, it is likely that record temperatures and frequency of heat events will increase as a result of climate change (see *Vulnerability Assessment*, below). Therefore, heat events were assigned a probability of "highly likely" (greater than 90% annual chance).

Vulnerability Assessment and Estimation of Losses

As the extreme heat hazard is atmospheric and does not have a geographic boundary, all current and future populations and structures, including critical facilities and cultural sites, are considered at risk. Extreme heat events generally have limited impact on buildings. However, in some rare cases, extreme heat can cause structures to collapse or buckle. Power consumption for air conditioning can increase during heat events, causing blackouts or brownouts. Loss of power during an extreme heat event can necessitate evacuations and rescues, cause schools to close, and impact tourism. Aside from the potential for damages, there are serious health risks to the population due to heat.

Vulnerable populations, such as the elderly, young children, mentally ill, disabled, or homeless persons, are at greatest risk to the impacts of extreme heat. Another population vulnerable to extreme heat events includes outdoor laborers. In addition, families or individuals living in housing without air conditioning or proper ventilation are at higher risk during heat events.

⁴⁷ Maximum of Maximum Temperature, North Form monitoring station, CA. Retrieved November 8, 2017 from https://wrcc.dri.edu/cgi-bin/cliMAIN.pl?ca6252

Impacts and preparedness tips for heat-related hazards are listed below.

Extreme heat can result in an array of heat illnesses described above. Heat is particularly deadly when temperatures remain elevated for long periods, or when individuals who are outdoors do not take proper precautions. Dehydration is a common health effect of extreme heat. Preparedness reduces the risks associated with this hazard. In cases of extreme heat:⁴⁸

- Stay indoors as much as possible to limit exposure (consider public buildings such as libraries, schools, movie theaters, or cooling centers if you do not have air conditioning).
- Limit alcoholic intake.
- Drink plenty of water, even if you do not feel thirsty.
- Do not leave children or pets in vehicles.
- Check on vulnerable populations.
- Arrange your day to avoid strenuous work during the warmest part of the day, if possible.
- Use an electric fan to vent hot air out or bring cool air in.
- Wear loose-fitting clothing.

Climate Change Impacts

Extreme heat events are likely to become more frequent and more intense in the planning area as temperatures rise due to climate change. Projections for extreme heat days and annual average maximum temperatures were obtained for the planning area using CalAdapt. According to CalAdapt, average maximum temperature on the Chemehuevi Reservation will rise from its baseline of 87.6°F to upwards of 96.5°F by 2099 under a high emissions scenario (RCP 8.5). **Figure 66** shows the projected changes in average maximum temperature for the Chemehuevi Reservation under different timeframes and emissions scenarios (RCPs).

⁴⁸ Extreme Heat. (n.d.). U.S. Department of Homeland Security. Retrieved October 9, 2017 from <u>http://www.ready.gov/heat</u>.



^{*}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 26 Average maximum temperature projections for the Chemehuevi Reservation

In addition, CalAdapt provides projections for extreme heat days under the different climate scenarios. The tool describes an extreme heat day as a day in April through October where the maximum temperature exceeds the 98th historical percentile based on data from 1961-1990. According to CalAdapt, the extreme heat threshold for the Chemehuevi Reservation is 114.6°F, and the Chemehuevi Reservation experienced an average of four extreme heat days per year during the baseline period (1961-1990). According to projections, the Chemehuevi Reservation could experience up to 74 extreme heat days under a high emissions scenario by 2070-2099, which means over 20% of the entire year could consist of extreme heat days in the future.⁴⁹ **Figure 77** shows the projected changes for extreme heat days for the Chemehuevi Reservation under different timeframes and emissions scenarios.

⁴⁹ Number of Extreme Heat Days. (2017). CalAdapt. Retrieved October 4, 2017 from <u>http://cal-adapt.org/tools/extreme-heat/#climatevar=tasmax&scenario=rcp45&lat=37.21875&lng=-119.53125&boundary=locagrid&units=fahrenheit</u>



*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 97 Projected extreme heat days per year for the Chemehuevi Reservation

Significant increases in the number of extreme heat days could have severe health impacts, especially for vulnerable populations such as the elderly, young, outdoor workers, and impoverished households. An increase in extreme heat days could also contribute to more frequent and severe droughts and wildfires.

Extreme Winds

Description

There are several types of wind hazards that affect the planning area. These include high or strong wind events and thunderstorms. Tornadoes are also wind events that have the potential to impact the Chemehuevi Reservation, but due to special hazards associated with these types of events, tornadoes are listed as a separate hazard.

High wind definitions vary by region. In general, high wind events are those events greater than normal wind averages that have damage potential. Wind events are common throughout the United States. However, the severity of high wind events varies depending on location. **Figure 88** below shows wind zones in the U.S. based on ASCE 7-98 criteria. Based on assigned wind zones, the Chemehuevi Reservation is located in Wind Zone I, which experiences winds up to 130 miles per hour.



Figure 108 ASCE 7-98 U.S. Wind Zones⁵⁰

The National Weather Service Center can issue a high wind advisory or warning. 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 of 46 to 57 mph for any duration. A high wind *warning* is issued when sustained winds from 40 mph or higher are expected for at least one hour, or any wind gusts are expected to reach 58 mph or more.⁵¹ The definitions vary from state to state. Areas that frequently experience high winds will not issue the advisory or warning. A Beaufort Wind Scale may also be used to describe wind severity as shown below.

 ⁵⁰ University of Missouri Extension. Weather-related Resources. <u>http://extension.missouri.edu/webster/weather.aspx</u>
 ⁵¹ National Weather Service. <u>https://www.weather.gov/lwx/WarningsDefined#High Wind Watch</u>

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 white with densely blown foam, heavy rolling, lowered visibility	Seldom experienced on land. Trees broken or uprooted, "considerable structural damage"
11	56-63	Violent Storm	Exceptionally high (37-52 ft.) waves, foam patches cover sea, visibility more reduced	N/A
12	64+	Hurricane	Air filled with foam, waves over 45 ft., sea completely white with driving spray, visibility greatly reduced	N/A

Table 19 Beaufort Wind Scale⁵²

Thunderstorms are associated with high wind because wind is typically one component of thunderstorms. Thunderstorms are very dangerous because of their ability to generate tornadoes, hailstorms, strong winds, flash flooding, and damaging lightning. While thunderstorms can occur in all

⁵² Beaufort Wind Scale. <u>http://www.spc.noaa.gov/faq/tornado/beaufort.html</u>

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.

Three conditions need to occur for a thunderstorm to form. First, there needs to be moisture present 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.

According to the NWS, more than 100,000 thunderstorms occur each year, though only about 10% 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 99 illustrates thunderstorm hazard severity based on the annual average number of days with a thunderstorm event. According to the map, the Chemehuevi Reservation is in a location that experiences 5 to 10 thunderstorm days per year.



Figure 119 Average number of days with thunderstorms (NOAA)

Location

High winds, including thunderstorms, can impact the entire Chemehuevi Reservation. The Chemehuevi Reservation resides in a Zone I wind zone, capable of experiencing winds up to 130 miles per hour, as shown in **Figure 28**.

Previous Occurrences

NOAA's NCEI Storm Events Database was investigated for past strong wind and thunderstorm wind events. NCEI reports wind events by county. Town, forecast zone, and/or coordinate locations are provided for some events, but not all. Therefore, all events reported may not have impacted the Chemehuevi Reservation. However, the data provides a general sense of frequency and magnitude for the Reservation. A total of 452 wind events and approximately \$74.4 million in damages (2019 dollars) were reported for San Bernardino County. In addition, seven deaths and 44 injuries were reported. A summary of each NCEI wind category is provided below.

Strong/High Wind Event

Between 1996 and 2019, 324 strong/high wind events were reported in San Bernardino County. These events resulted in \$68.4 million in damages (in 2019 dollars). The maximum wind speed reported was 110 knots (127 mph). Six deaths and 34 injuries were also reported from these events.

Thunderstorm Winds

Between 1955 and 2016, the NCEI storm database reported 128 thunderstorm wind events for San Bernardino County. The events resulted in a combined total of \$6 million (2019 dollars) in damages and had a maximum wind speed of 90 knots (104 mph). One death and 10 injuries were also reported from these events.

Details for significant wind events with descriptions proximate to the planning area are described in more detail below, as found on the NCEI website, including approximate damages (2019 dollars):

- August 29, 1993: A thunderstorm with strong winds of 60 mph hail and rain impacted Lake Havasu City.
- July 28, 1999: Severe thunderstorms impacted Needles and the surrounding areas. Strong wind gusts destroyed carports and downed trees and power lines. Several roads were blocked. This storm resulted in \$135,500 in damages.
- July 16, 2004: Strong winds in the Needles area overturned a semi-truck and snapped several power poles.
- **October 13, 2006**: Thunderstorm winds blew down trees, power lines, storm gutters, signs, and a circus tent. A sheet-metal roof was ripped off one structure.
- July 15, 2011: A thunderstorm knocked out transformers, blew down tree branches, and blew shingles off roofs. \$63,300 in damages were reported.
- **September 4, 2012**: Several large pine trees and power poles were blown down, and the Needles movie theater's roof was blown off. \$246,000 in damages were reported.
- August 12, 2014: Thunderstorm winds blew the roofs off two restaurants, damaged the roofs of several homes, blew down several signs, at least 50 power poles, and several trees in and around Needles. One person was injured when a roof collapsed. Reported damages from this event amounted to \$1,159,000.
- July 17, 2015: A semi-truck was blown over of Interstate 40, and several downed power poles and lines blocked Interstate 40 in both directions. Downed trees and minor roof damage were reported. Reported damages from this event amounted to \$84,400.

Tribal officials noted that the above descriptions underrepresent the number of extreme wind events that impact the Reservation annually. Officials also reported an event in September 2019, the "Labor Day Monsoon," which caused damage to resort mobile homes on the Reservation. In the greater Lake Havasu area, this storm caused several boats, including large houseboats, to sink; loss of power; necessitated water rescues; and incurred hundreds of thousands of dollars in damages. In addition to this event, Tribal officials noted that the Reservation is prone to microbursts capable of removing roofs. A microburst is a powerful downdraft (sinking air) that occurs in a thunderstorm. While not a tornado, a microburst can have similar impacts on life and property, and can have wind speeds up to 150mph.⁵³

Extent

Wind extent can be measured in terms of speed, which is reported in knots. Within San Bernardino County, the strongest wind speed reported was 96 knots (110 mph) during a windstorm event. These speeds do not include those measured during tornado events (see *Tornado* profile). It should be noted that stronger wind events are possible in the planning area.

⁵³ What is a microburst? NWS. Retrieved from <u>https://www.weather.gov/ama/microbursts</u>.

Probability of Future Events

Extreme wind is recognized as a regular occurrence in the planning area. With 452 wind events reported in San Bernardino County in 62 years, the county experienced over seven reported wind events each year, although it is likely that not all these reported events impacted the Chemehuevi Reservation. Many wind events have likely gone unreported. Further, the Reservation is located in a location that experiences approximately five thunderstorm days per year, as shown previously in **Figure 24**. Therefore, the probability of future wind events is considered "highly likely" (greater than 90% annual probability).

Vulnerability Assessment and Estimation of Losses

All current and future buildings, populations, cultural resources, and critical facilities are at risk from wind. During a time of extreme heat and high winds, wildfire threat significantly increases.

All structures, including critical facilities, are considered at risk from extreme wind. Severe wind has the potential to blow shingles, siding, awnings, and other features off buildings. Falling trees and tree limbs can damage structures. Objects picked up by wind can be hurled through the air, damaging structures and breaking windows when contact is made. Power outages can occur when utility lines or poles are downed. When combined with extreme heat or cold, relocations or sheltering may be necessary until power is restored. Further, in the planning area, wind events can pick up loose sediment and dust, impacting air quality and reducing visibility, leading to dangerous driving conditions. The ferry that runs from Lake Havasu City, AZ, to the Reservation cannot operate during significantly high winds, which impacts tourism revenue and further limits ingress/egress to and from the Reservation.

In extreme cases, wind can blow structures off foundations. Mobile homes and structures not built to the California Uniform Building Code are considered at a higher risk. The Reservation has several mobile homes in its resort area, as well as an RV Park. Further, many Tribal members live in Havasu Palms, a mobile home park adjacent to the Reservation boundary. Proper anchoring can make mobile homes more resilient to severe wind.

Flood

Description

Flooding is a very frequent, dangerous, and costly hazard. Globally, it accounts for 40% of all natural disasters, and results in an average of over 6,500 deaths annually.⁵⁴ In the U.S., flooding results in an average of 86 deaths annually.⁵⁵ Nearly 90% of all presidential disaster declarations result from natural events where flooding was a major component.

Due to the widespread geographical distribution of valleys and coastal areas and the population density in these areas, flooding is the most common environmental hazard. The severity of a flooding event is

⁵⁴ Data from 1980-2008. <u>http://www.preventionweb.net/english/hazards/statistics/?hid=62</u>

⁵⁵ http://www.nws.noaa.gov/om/hazstats/resources/weather_fatalities.pdf

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.

• Flash Flooding

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 the same area, or 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 at 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 accumulates.

• 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 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, flood 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 in earlier times. Sites adjacent to rivers and coastal inlets provided convenient places to ship and receive commodities. The price of this accessibility has been 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 intervals.

In addition to types of flooding, there are several types of floodplains. All the flood types described above may occur within or outside of a designated floodplain.

As noted above, the periodic flooding of land adjacent to rivers, streams, and shorelines (land known as a 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 flood frequency is the chance, or percentage of the probability, of flooding in a given 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.

Flood hazard areas, or floodplains, are typically described by the frequency and severity of an event. For example, a 10-year floodplain is typically referred to as a 10% annual chance flood hazard area. The floodplain boundaries of less likely, but more severe events, such as the 1.0% annual chance floodplain (100-year floodplain) will extend beyond the 10-year floodplain.

The U.S. Army Corp of Engineers and FEMA have a role in defining floodplain. The U.S. Army Corps of Engineers calls a 100-year flood (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 (they are mandatory in areas designated as 100-year floodplain). They are also used to identify hazard areas. The FIRM, a paper document, has been digitized to permit mapping (known as a digital FIRM, or DFIRM). Although an all-inclusive description of FEMA flood zones is not included in this document, brief descriptions of the zones generally appearing on the FIRMs are as follows.

• Zones A, AE, AO:

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 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 1.0percent 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 BFEs or depths are shown within this zone. Typically, Zones B and X (shaded) are moderate flood hazard areas, while Zones C or X (unshaded) are 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 invade beyond these anticipated areas. Further, the amount of drainage capacity provided by development can also alter where water goes. 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 FIRMs for San Bernardino County (effective 2016).

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.⁵⁶ 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 Central California, and thus the Chemehuevi Reservation, is increased rainfall and snow 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).⁵⁷

Location

The Chemehuevi Reservation is located in the southeastern California desert, in the Lower Colorado River Basin. The Reservation is adjacent to Lake Havasu, which is created by an impoundment in the Colorado River. The planning area contains several dry washes, most notably the Chemehuevi Wash, which drains into Lake Havasu just south of Havasu Landing. Since flooding is possible and often occurs outside of flood hazard areas (e.g., flash flooding), understanding the location of washes can help determine hazard location. For example, a more severe event, such as one greater than the 500-year flood, could potentially flood the typically dry washes that run through the planning area. Chemehuevi Tribal officials have noted flash flooding on the Reservation during extreme rainfall events, but report that they do not typically have severe impact.

Figure 30 shows the various FEMA flood hazard areas present on the Chemehuevi Reservation's surrounding lands. Of the 30,815 acres that comprise the Chemehuevi Reservation, 426 acres are in the 1.0% annual chance floodplain (ACF), as Zone AE (100-year floodplain). This equates to approximately 1.4% of the Reservation. The remaining 30,389 acres (98.6% of the Reservation) are within FEMA Flood Zone D. Zone D represents areas of possible but undetermined flood hazard. There are no tribal lands or assets located within the mapped 0.2% annual chance floodplain (Zone X, 500-year floodplain). **Table 20** summarizes the Reservation land area in each flood hazard zone.

bie 20 reina rioda riazara areas on the enemenaevi reservatio					
	Area	% of Tribal			
Flood Hazard Area	(acres)	Lands			
1.0-percent ACF (Zone AE)	426	1.4%			
Zone D (Undetermined)	30,389	98.6%			

Table 20 FEMA Flood Hazard Areas on the Chemehuevi Reservation

⁵⁶ <u>http://drought.unl.edu/DroughtBasics/ENSOandForecasting.aspx</u>

⁵⁷ Creating an Earth System: El Niño. Retrieved March 30, 2015.

http://www.ucmp.berkeley.edu/education/dynamic/session4/sess4_hydroatmo3.htm



Figure 31 FEMA flood hazard areas on the Chemehuevi Reservation

Previous Occurrences

The NCEI Storm Events Database reports flood information by county and, when the information is available, by town or by coordinate location. Since NCEI reporting began in 1996, there have been 197 flood events reported in San Bernardino County, totaling approximately \$392.2 million (2019 dollars) in property damages, 13 deaths, and 44 injuries. The communities in San Bernardino County most closely associated with the Chemehuevi Reservation are City of Needles, CA, and Havasu Lake, CA, an unincorporated community adjacent to the Reservation. Of the 197 events reported in the county, NCEI reported 24 events in Needles and/or Havasu Lake. These events resulted in approximately \$75.9 million in property damage (2019 dollars) and one fatality. **Table 215** details NCEI-reported flood events occurring close to the planning area (Needles and Havasu Lake).

Date	Property Damage (2019 dollars)	Deaths/ Injuries	Details
09/04/1996	\$28,820	0/0	
01/26/1997	\$1,878	0/0	
06/22/2000	\$8,768	0/0	A slow-moving thunderstorm dumped over an inch of rain in Needles, causing roads throughout much of the town to become flooded. Power was also out for much of the town that night.
06/23/2000	\$12,275	0/0	Several people were stranded for about two hours on Highway 95 between Fort Mohave and Needles due to the flooding.
08/12/2005		0/0	Several roads flooded, including Needles Highway, which was washed out north of Rainbow Beach.
08/14/2005		0/0	Interstate 95 closed at the Interstate 40 interchange.
10/17/2005		0/0	Interstate 95 flooded from Interstate 40 to the Nevada state line.
07/28/2006		0/0	Flooding closed Interstate 95 near Needles. Several cars were stuck in the water.
07/25/2007		0/0	Needles Highway was closed from Interstate 40 to the Nevada state line due to flooding.
07/20/2008	\$69,212	0/0	Highway 95 was covered with water and debris at San Bernardino County mile marker 43.
08/23/2009		0/0	Five to six inches of water and debris flowed across Highway 95.
01/21/2010	\$23,485,917	0/0	Interstate 95 was closed south of Interstate 40 due to flooding and

Table 21 NCEI Reported flood events on or approximate to the Chemehuevi Reservation

Date	Property Damage (2019 dollars)	Deaths/ Injuries	Details		
			roadway damage. Portions of the highway were closed for a week.		
08/08/2010	\$13,048	0/0	Interstate 95 was closed just south of Interstate 40 due to flooding.		
07/14/2012	\$78,712	0/0	Interstate 95 was washed out at Five Mile Road.		
09/03/2012	\$12,299	0/0	Interstate 95 was closed from Havasu Lake Road to Vidal Junction due to flooding.		
10/11/2012	\$2,460	0/0	Highway 95 was closed at Five Mile Road due to flooding.		
08/25/2013	\$49,629,590	0/0	Interstate 40 was closed at Highway 95 as high water and thick mud stranded several vehicles. A 500-pound propane tank was washed off its foundation. Several stretches of BNSF track, totaling about 2.6 miles, were damaged, and a bridge in the Sacramento Wash was undermined, suspending freight line and Amtrak service.		
08/29/2013	\$271,050	0/0	Highway 95 South was closed near mile marker 71 due to flooding. Water three feet deep damaged Needles Highway, requiring a swift water rescue.		
07/05/2014	\$153,024	0/0	Highway 95 was closed between Interstate 40 and Highway 62 due to flooding in multiple places. There was at least one swift water rescue. Several trucks were stuck in about a foot of flowing water near A Street and Main Street in Havasu Lake.		
07/08/2014	\$77,671	0/0	Multiple vehicles were stuck in flowing water 2 to 3 feet deep on Highway 95. The intersection of Highways 95 and 62 was flooded with debris.		
08/03/2014	\$252,722	0/0	Interstate 95 flooded in multiple places between Needles and Vidal Junction.		
08/12/2014	\$27,823	0/0	Highway 95 was closed from Five Mile Road to Interstate 40 due to flood damage. One swift water rescue occurred at mile marker 56. Street flooding occurred in Havasu Lake.		
09/08/2014	\$798,740	0/0	A large chunk of Highway 95 just south of Needles washed away, and the		

Date	Property Damage (2019 dollars)	Deaths/ Injuries	Details
			highway was flooded with over four feet of water at mile marker 10. Some vehicles were stuck, and others were swept into the desert. Over a foot of water flowed over Trails End Road and A Street in Havasu Lake.
09/16/2014	\$985,383	1/0	Highway 95 was closed from Five Mile Road to Highway 62 due to flooding in several places. Five feet of water, mud, and debris flowed over the highway just north of Vidal Junction.

No other specific flood events were reported by Chemehuevi Tribal officials, but flooding was noted as a regular occurrence, particularly at the wash near the resort and HUD homes, which is impacted by monsoon rains.

Extent

Flood extent can be measured in terms of damage, gauge height, or return period. USGS gauge information was collected from two nearby gauges; one approximately 10 miles west of the Reservation on the Chemehuevi Wash, and one approximately 10 miles south of the Reservation on Lake Havasu near Parker Dam. A peak streamflow of 114 cubic feet/second was recorded in 1962 at the Chemehuevi Wash gauge, and a peak streamflow of 693,000 cubic feet/second was recorded in 1943 and 1953 at the Lake Havasu gauge. Stream gauge values are presented in **Table 22**.

Gage Name	Year	Peak Flow (cfs)	Maximum Recorded Gauge Height (ft)	Drainage Area (sq mi)
Chemehuevi Wash Near Needles ⁵⁹	1962	114	8.51	2.4
Lake Hevery Neer Derker Dem ⁶⁰	10/2 1052	602 000	NI/A	192 700

Table 22 Stream gauge values near the Chemehuevi Reservation⁵⁸

Probability of Future Events

Areas with designated special flood hazard areas are subject to an approximate annual probability of flooding of at least 1.0%. Further, areas designated as Zone D may have flood risks that have not been analyzed. Previous events have shown this area to be at risk to flooding. This results in varying degrees

⁵⁸ USGS (n.d.). USGS. Retrieved from

https://nwis.waterdata.usgs.gov/ca/nwis/peak?county_cd=06071&format=station_list&group_key=county_cd&set_logscale_y =1&date_format=YYYY-MM-DD&rdb_compression=file&hn2_compression=file&list_of_search_criteria=county_cd

⁵⁹ Data is available from 1960 to 1973

⁶⁰ Data is available from 1943 to 1954

of probability across the planning area. Flood events remain a threat on the Chemehuevi Reservation, as discussed further in the vulnerability assessment.

NCEI's Storm Events Database indicated 24 events in the planning area (including Needles and Havasu Lake) between 1996 and April 2019. This results in an average of approximately one event per year, historically. There were likely floods impacting the Chemehuevi Reservation that were not reported to NCEI or heavily covered by the media. However, it is also possible that not all of the events reported by NCEI for the general planning area impacted the Chemehuevi Reservation. Based on reported historic occurrences and the presence of special flood hazard areas in the planning area, the flood hazard was assigned a probability of likely (10 to 90% annual chance).

Vulnerability Assessment and Estimation of Losses

All current and future buildings, critical facilities, populations, and cultural resources are considered at risk from flooding. Flooding can result in a variety of impacts, such as death, injury, property damage, inability to access areas, and road closures. Only Lake Havasu Road connects the Reservation with Interstate 95. This road is approximately 17 miles long, has many dips, and is prone to flooding. When the road is flooded or washed out, access to facilities outside the Chemehuevi Reservation, particularly to the school in Needles, is impacted. Further, descriptions from historic events suggests that Interstate 95 often floods near its intersection with Lake Havasu Road; during one flood, the highway was closed for an entire week. Tribal officials noted that I-95 is prone to debris and sediment over-topping associated with flooding. Closures on Interstate 95 subsequently impact the ability to access the Reservation.

Flooding also saturates the ground and may lead to increased landsliding. 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. 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 planning area. Normally dry washes, such as the Chemehuevi Wash, are prone to flash flooding during heavy rain events.

The Tribe has faced problems when drainage areas fill with sediment and debris. Clogged drainage areas eliminate important storage for stormwater runoff, which otherwise may contribute to flooding.

Tribal Assets

A GIS analysis was used to determine the number of tribal assets at risk from flood hazard. Currently, five of the Tribe's assets, including three critical facilities, are located in or partially within FEMA regulatory special flood hazard areas (1.0% annual chance flood), and none are located in the FEMA 0.2% annual chance flood area. These assets, along with their values, are presented in **Table 236.** In total, the Tribe has \$48,134,250 at risk within FEMA special flood hazard areas. The remainder of the Tribe's assets are located in an area with possible but undetermined flood hazards (Zone D). Therefore,

assets outside of FEMA special flood hazard areas are still at risk to flooding (i.e., pluvial flooding caused by ponding rainfall). **Figure 31 and Figure 32** show these assets in relation to the applicable flood zones.

Tribal Asset	Critical Facility (Y/N)	Approximate Total Value At Risk	%
Colony Single Family House (1)	Y	\$134,250	0.1%
Former Havasu Landing Casino	Y	\$3,000,000	2.4%
Havasu Palms Mobile Home Park	N	N/A	N/A
New Havasu Landing Casino and Hotel	Y	\$45,000,000	35.8%
Resort Homes 2	N	N/A	N/A
TOTAL ASSETS POTENTIALLY AT RISK	3	\$48,134,250	38.3%

Table 237 Summary of Chemehuevi Reservation Assets in the FEMA 1.0% Annual Chance Floodplain



Figure 31 Chemehuevi tribal assets within FEMA Special Flood Hazard Areas



Figure 32 Chemehuevi Tribal Assets within FEMA Special Flood Hazard Areas (Havasu Palms Mobile Home Park)

Climate Change Impacts

Changes in temperature and precipitation can impact the frequency and severity of localized flood events. According to data from CalAdapt, under both the lower and higher emissions scenarios,⁶¹ annual average precipitation on the Chemehuevi Reservation is projected to vary little from the current historical baseline average (4.5 inches per year, 1961-1990).

In addition, the Chemehuevi Reservation is projected to experience an increase in annual average temperature, which could lead to drier conditions and increased drought frequency and severity (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 leading to decreased rainfall infiltration rates.⁶² This, in turn, could increase runoff volumes and lead to flooding.

Landslides

Description

A landslide is the downward and outward movement of slope-forming soil, rock, and vegetation driven by gravity. Landslides can be deep-seated, meaning the bulk of the slide plane is below tree roots (typically 10 feet to several hundred feet deep), or shallow-seated, meaning slides are typically earth and debris that occur within the forest rooting zone. Both natural and human-induced changes in the environment can trigger landslides. These changes include heavy rain, rapid snow melt, steepening of slopes due to construction or erosion, earthquakes, volcanic eruptions, and changes in groundwater levels. Deep-seated landslides are more likely to be triggered by geologic and hydrologic processes such as seismic shaking, volcanic activity, or changes in groundwater. Shallow landslides are more likely to be triggered by soil saturation from heavy rainfall or rapid snowmelt.⁶³

Both deep-seated and shallow landslides can be further categorized into several types of landslides.

- Rock falls are rapid movements of bedrock which result in bouncing or rolling.
- A topple is a section or block of rock that rotates or tilts before falling to the slope below.
- **Slides** are movements of soil or rock along a distinct surface of rupture, which separates the slide material from more stable underlying material.
- **Mudflows**, sometimes referred to as mudslides, mudflows, lahars, or debris avalanches, are fast-moving rivers of rock, earth, and other debris saturated with water. They develop when water rapidly accumulates in the ground, such as heavy rainfall or rapid snowmelt, changing the soil into a flowing river of mud or "slurry."

⁶¹ Annual Averages. (2019). Cal Adapt. Retrieved May 3, 2019 from <u>https://cal-adapt.org/tools/annual-averages/#climatevar=pr&scenario=rcp85&lat=34.53125&lng=-</u>

^{114.40625&}amp;boundary=locagrid&units=inches%20per%20day.

 ⁶² Burch, G.J. et al. (1989). Soil hydrophobic effects on infiltration and catchment runoff. Hydrologic Processes. Vol 3 (3).
 Retrieved October 26, 2017 from <u>http://onlinelibrary.wiley.com/doi/10.1002/hyp.3360030302/full</u>.
 ⁶³ Deep Seated and Shallow-Rapid Landslides: Know the Difference. (2017). Washington Forest Protection Association.

Retrieved from http://www.wfpa.org/news-resources/blog/deep-seated-landslides-shallow-landslides-washington/.

• **Slurry** can flow rapidly down slopes or through channels and can strike with little or no warning at avalanche speeds. Slurry can travel several miles from its source, growing larger as it picks up trees, cars, and other materials along the way. As the flows reach flatter ground, the mudflow spreads over a broad area where it accumulates in thick deposits.

In areas burned by forest and brush fires, a lower threshold of precipitation may initiate landslides. Some landslides move slowly and cause damage gradually, whereas others move so rapidly that they can destroy property and take lives suddenly and unexpectedly.

Among the most destructive types of debris flows are those that accompany volcanic eruptions. A spectacular example in the United States was a massive debris flow resulting from the 1980 eruptions of Mount St. Helens, Washington. Areas near the bases of many volcanoes in the Cascade Mountain Range of California, Oregon, and Washington are at risk from the same types of flows during future volcanic eruptions.

Areas that are generally prone to landslide hazards include previous landslide areas, the bases of steep slopes, the bases of drainage channels, and developed hillsides where leach-field septic systems are used. Areas that are typically considered safe from landslides include areas that have not moved in the past, relatively flat-lying areas away from sudden changes in slope, and areas at the top or along ridges set back from the tops of slopes.

According to the United States Geological Survey, landslides cause nearly \$6.5 billion (2017 dollars) in damage and between 25 and 50 deaths in the United States each year.⁶⁴

Location

Landslides occur along steep slopes when the pull of gravity can no longer be resisted. Heavy rain, especially on wildfire-scarred land where the ground is unstable due to vegetation loss, often catalyzes a landslide event. Human development can also exacerbate risk by building on previously undevelopable steep slopes and constructing roads by cutting through mountains. The Chemehuevi Reservation is situated between two mountain ranges: the Chemehuevi Mountains to the north and the Whipple Mountains to the south. While susceptibility to landslides varies throughout the Reservation, landslides are possible throughout the planning area.

Figure 10 shows deep-seated landslide susceptibility across the Reservation (maps showing Chemehuevi Tribal assets and landslide susceptibility at a closer scale are provided in the *Vulnerability Assessment* section of this profile). Susceptibility is categorized into 11 classes based on rock strength and slope class; with Category 0 has the lowest susceptibility and Category X, the highest. Categories VIII, IX, and X are considered as having "very high" landslide susceptibility.⁶⁵ Category X areas are characterized as

⁶⁴ United States Geological Survey (USGS). United States Department of the Interior. "Landslide Hazards – A National Threat." 2005.

⁶⁵ Willis, C.J., F.G. Perez and C.I. Gutierrez. (2011). Susceptibility to Deep-Seated Landslides in California. California Geological Survey. Retrieved from <u>http://www.conservation.ca.gov/cgs/information/publications/ms/Documents/MS58.pdf</u>.

having the weakest rocks on the steepest slopes. Categories 0, III, V, VII, VIII, IX, and X are present on the Chemehuevi Reservation; these categories are further described below. In the planning area, Category X areas are present in several parts of the Reservation but are most concentrated on the southern half, which is mostly undeveloped, with the exception of the Havasu Palms Mobile Home Park.

Category 0: Characterized by rock of any strength and slope steepness less than 3% **Category III**: Characterized by strong (hard) rocks and moderately steep slopes (10 to 15 degrees)

Category V: Characterized by moderately strong rocks and low-to-moderately steep slopes (3 to 10 degrees)

Category VII: Characterized by strong (hard rocks) and steep slopes (15 to 20 degrees); or, weak rocks and low to moderately steep slopes (3 to 10 degrees)

Category VIII: Characterized by strong (hard) rocks and very steep slopes (30 to greater than 40 degrees); or, moderately strong rocks and moderately steep slopes (10 to 15 degrees)
Category IX: Characterized by moderately strong rocks and steep or very steep slopes (15 to greater than 40 degrees); or, weak rocks and moderately steep slopes (10 to 15 degrees)
Category X: Characterized by weak rocks and steep or very steep slopes (15 to greater than 40 degrees)

It should be noted that landslides, especially shallow ones like rock falls and debris slides, can occur outside of areas categorized as susceptible on the deep-seated landslide map. Further, the Reservation is categorized as having "low" landslide incidence on the USGS national landslide susceptibility index.



Figure 33 Deep-Seated landslide susceptibility on the Chemehuevi Reservation

Previous Occurrences

The NCEI Storm Events Database does not have data for all types of landslides, but does report debris flow events. Events are reported by county, and when available, city. Therefore, debris flow event data solely for the Chemehuevi Reservation is not available. Twenty debris flow events were reported to NCEI for San Bernardino County between 2003 and April 2019. These events resulted in \$8.97 million in damages (2019 dollars), 14 deaths, and 10 injuries. Details for debris flow events are presented in **Table 24.** Based on event descriptions provided by NCEI, none of these events occurred on the Chemehuevi Reservation.

Data	Deaths/	Property Damage		
Date	Injuries	(2019 dollars)		
9/4/2003	0/0	\$128,377		
11/12/2003	0/0	\$48,141		
12/25/2003	14/10	\$8,023,532		
1/2/2004	0/0	\$31,159		
1/3/2005	0/0	\$75,629		
1/9/2005	0/0	\$15,126		
1/10/2005	0/0	\$30,252		
1/10/2005	0/0	\$37,815		
8/17/2012	0/0			
11/9/2012	0/0			
2/28/2014	0/0			
7/6/2015	0/0			
7/18/2015	0/0	\$1,126		
9/15/2015	0/0			
2/17/2017	0/0	\$530,450		
7/7/2018	0/0			
7/11/2018	0/0	\$51,500		
7/12/2018	0/0	\$1,030		
8/16/2018	0/0			
11/29/2018	0/0			

Table 248 NCEI reported debris flow events in San Bernardino County

In addition, 14 of the 27 presidential disaster declarations for San Bernardino County were granted for landslides and/or mud and debris flows. No previous landslide occurrences were reported by Chemehuevi Tribal officials, but it was noted that areas around banks (e.g., lakes and washes) are subject to erosion and prone to small slides.

Extent

Extent can be defined using a variety of measures, including the USGS Landslide Susceptibility Index, Deep-Seated Landslide Susceptibility, and size. For the USGS measure, the greatest extent possible is "high incident, high susceptibility." However, the entire planning area resides in an area of "low

incident" risk (less than 1.5 % of the area is involved in land sliding). Landslide extent can also be defined using California Deep-Seated Landslide Susceptibility Categories. The greatest extent possible is Category X, which is classified as having the weakest rocks located on the steepest slopes. The highest category present of the Chemehuevi Reservation is Category X, which is characterized as having "very high" susceptibility to deep-seated landslides. Lastly, landslide extent can be measured in terms of size (width of slide or tonnage of debris generated). However, since this type of data has not been reported, this measure could not be utilized.

Probability of Future Events

No historic landslides events were reported on the Chemehuevi Reservation. However, is it possible that landslides have gone unreported. Due to the small planning area, looking at the county-level rate is also useful. With 20 events reported in 16 years for San Bernardino County, more than one landslide event occurred each year. Based on historic occurrences for the Chemehuevi Reservation and San Bernardino County, a probability of "possible" (between a 1 and 10% annual probability) was assigned.

Vulnerability Assessment and Estimation of Losses

According to the 2018 California State Hazard Mitigation Plan Update, landslides directly damage structures by disrupting structural foundations caused by deformation of the ground upon which the structure sits, and by the physical impact of debris moving down-slope against structures located in the travel path. As a landslide breaks away from a slope and moves, it deforms the ground into an uneven surface.

When situated on top of a landslide, the deformation distresses structural foundations and the structures themselves by settlement, cracking, and tilting. This can occur slowly, over years, or rapidly, within days or even hours. A water-saturated, fast-moving debris flow (or "mudslide") can destroy all in its path, collapsing walls and shifting structures off their foundations.

In addition to buildings, utilities and roads are vulnerable to the impact and ground deformation caused by landslides and other earth movements. Because of their geographic extent, roads and utility lines have a greater chance of being impacted by landslide events. Further, if any section of a road or utility line is damaged by a landslide, the entire system may be impacted. For instance, a landslide that results in one area of a road being impassible may block accessibility to other roads or locations, preventing evacuations, precluding delivery of goods and services, and disrupting schools and businesses. When utility lines are damages by landslides, functionality of water, sewer, gas, and electricity systems may be compromised.⁶⁶ Chemehuevi Reservation is particularly vulnerable to these types of damages, as the Reservation is accessible by only one road (Lake Havasu Road) that connects it to Interstate 95. Further,

⁶⁶ 2018 California State Hazard Mitigation Plan, Public Review Draft, pg. 312. Cal EOS. Retrieved from <u>http://www.caloes.ca.gov/HazardMitigationSite/Documents/009-</u> <u>2018%20SHMP_Public%20Review%20Draft_April%202018_CH6.pdf</u>.

the Reservation relies on an adequate power supply for cooling due to frequent high temperatures (over 100°F). Loss of power could require evacuations and rescues.

Without reported damage figures, it is not feasible to calculate annualized loss for landslide hazard.

Tribal Assets

A GIS analysis was used to determine the tribal assets at risk to landslide. The California Geological Survey Deep-Seated Landslide Susceptibility map was used to indicate vulnerability.⁶⁷ Assets found to be located on lands deemed susceptible (Category III to Category X) were used to determine vulnerability. In total, 13 of the Chemehuevi Tribe's assets (8.5%) and over \$14.7 million (12%) of total asset value are considered potentially at risk to deep-seated landslides. This includes six critical facilities. No cultural resources are within mapped areas of deep-seated landslide susceptibility. Details regarding vulnerable assets, including critical facilities, are presented in **Table 75. Figures 34, 35** and **116** show these assets relative to landslide susceptibility.⁶⁸ It should be noted that the entire planning area has some vulnerability to landslides, and that the GIS analysis does not capture vulnerability to shallow landslides (less than 10 feet deep), which may be more prevalent throughout the planning area.

Asset	Approximate Total Value At Risk	%	Critical Facility? (Y/N)	Landslide Susceptibility*
Colony House	\$581,625	0.5%	Y	VII
Former Havasu Landing Casino	\$3,000,000	2.4%	Y	IX
Havasu Lake Fire Department	\$8,000,000	6.4%	Y	VII
Havasu Landing Market	\$2,171,950	1.7%	Y	VII
Havasu Palms Mobile Home Park	N/A	N/A	N	Х
HUD House	\$492,750	0.4%	Y	VII
HUD House	\$488,437	0.4%	Y	VII
North Estates	N/A	N/A	N	Х
Resort Homes 1	N/A	N/A	N	VII
Resort Homes 2	N/A	N/A	N	Х
RV Park	N/A	N/A	N	VII
Section 36	N/A	N/A	N	Х
Vista del Lago	N/A	N/A	N	Х
TOTAL POTENTIALLY AT RISK	\$14,734,762	12%	6	N/A

Table 25 Summary of Chemehuevi Tribal Assets Potentially At Risk to Deep-Seated Landslides

*When multiple landslide susceptibility categories impacted a single asset, the highest category was utilized.

⁶⁷ California Department of Conservation (2019). CGS Map Sheet 58: Deep-Seated Landslide Susceptibility. Retrieved from https://www.arcgis.com/home/item.html?id=3cdc744bec6b45c28206e472e8ad0f89.

⁶⁸Landslide vulnerability could not be mapped at a finer scale as available landslide susceptibility data from the California Geological Survey has a maximum scale of 36,000.



Figure 34 Deep-seated landslide susceptibility on the Chemehuevi Reservation


Figure 35 Deep-Seated landslide susceptibility on the Chemehuevi Reservation (Resort Area)



Figure 36 Deep-Seated landslide susceptibility on the Chemehuevi Reservation (Havasu Palms)

Climate Change Impacts

Climate change is projected to result in precipitation extremes (i.e., wetter wet periods and dryer dry periods).⁶⁹ The planning area is not projected to see substantial increases in average annual precipitation under either low or a high emissions scenario (see this section's equivalent under *Flood*). Therefore, increased overall rainfall is unlikely to contribute to increased landslide events on the Reservation. However, more extreme precipitation could contribute to increased landsliding if rain events are more intense. In addition, wildfires, which are frequent precursors to landslides, are projected to increase in the planning area due to climate change, as drought and high temperatures increase.

Lightning Description

Lightning is a discharge of electrical energy resulting from the buildup of positive and negative charges within a thunderstorm, creating a "bolt" when the buildup of charges becomes strong enough. This flash of light usually occurs within clouds, or between the clouds and the ground. A bolt of lightning can reach temperatures approaching 50,000°F. Lightning rapidly heats the sky as it flashes, but the surrounding air cools following the bolt. This rapid heating and cooling of the surrounding air causes thunder, which often accompanies lightning strikes. While most often affiliated with thunderstorms, lightning may also strike outside of heavy rain and can occur as far as 10 miles away from any rainfall.

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

Location

Lightning occurs randomly, so it is impossible to predict where and with what frequency it will strike. It is assumed the Chemehuevi Reservation is uniformly exposed to lightning. **Figure 12** below was compiled with data from 2007-2016 to show the frequency of cloud-to-ground lightning flashes per square mile per year.⁷⁰ This can be used to demonstrate location and measure extent. The Chemehuevi Reservation receives approximately 1.5 to 3 strikes per square mile per year.

⁶⁹ California State Hazard Mitigation Plan (2018). *Section 4.3: Risk Factor: Climate Change*. Retrieved from https://www.caloes.ca.gov/HazardMitigationSite/Documents/002-2018%20SHMP_FINAL_ENTIRE%20PLAN.pdf.

⁷⁰ National Lightning Detection Network. (2017). Vaisala. Retrieved August 10, 2017 from <u>http://www.vaisala.com/en/products/thunderstormandlightningdetectionsystems/Pages/NLDN.aspx</u>



Figure 127 Average lightning strikes per square mile per year⁷¹

Previous Occurrences

The NCEI Storm Events Database reports lightning information by county and, when the information is available, by town or coordinate location. Since reporting to NCEI began in 1996, there has been 55 lightning events reported in San Bernardino County, totaling approximately \$2.1 million (2019 dollars) in property damages, three deaths, and 15 injuries. The town in San Bernardino County most closely associated with the Chemehuevi Reservation is Needles. Of the 55 events reported in the county, NCEI reported two events in Needles. These events resulted in approximately \$63,000 in property damage (2019 dollars) and one injury. Overall, it should be noted that substantial lightning damages to buildings may not be reported to NCEI, as reports are typically limited to public reports and absent of private insurance claim reporting.

⁷¹ <u>http://www.vaisala.com/en/products/thunderstormandlightningdetectionsystems/Pages/NLDN.aspx</u>

Table 86 details NCEI-reported lightning events occurring close to the planning area (Needles).

Location	Date	Property Damage (2019 dollars)	Deaths/ Injuries	Details
Needles	08/01/2011	\$63,339	0/0	Lightning knocked out phone and electric service to a newspaper office and fire station. Computer equipment was destroyed.
Needles Airport	10/9/2000		0/1	A man on a jet ski was struck by lightning at Pirates Cove Resort.

Table 96 NCEI Reported Lightning Events Approximate to the Chemehuevi Reservation

Extent

One method of measuring lightning extent is flash density. According to **Figure 37** (above), most of Southeastern California, including the Chemehuevi Reservation, receives approximately 1.5 to 3 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 damages caused. The greatest amount of damage reported from a single lightning event in the planning area was \$63,339 million (2019 dollars). However, costlier events are possible (particularly due to structural fires resulting from lightning strikes).

Probability of Future Events

According to NCEI, two lightning events were reported in 23 years near the planning area, meaning a lightning event has been reported about once every 11 years. However, it is likely that lightning strikes have gone unreported, as lightning is an annual experience in the area. Due to the small planning area, looking at the county-level rate is also useful. With 55 events in 23 years for San Bernardino County, more than two lightning events occurred each year. Based on historic occurrences for the Chemehuevi Reservation and San Bernardino County, a probability of "likely" (between a 10 and 90% annual probability) was assigned.

Vulnerability Assessment and Estimation of Losses

Given that lightning may strike anywhere, all current and future buildings, critical facilities, populations, and cultural resources are assumed to be at risk from lightning.

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

Tornadoes

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 tornado results from high wind velocity and wind-blown debris, which can be accompanied by lightning or large hail. According to the NWS, tornado wind speeds normally range from 40 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, turning normally harmless objects into deadly missiles.

Each year, an average of over 800 tornadoes are reported nationwide, resulting in an average of 80 deaths and 1,500 injuries.⁷² 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. Although the Great Plains region of the Central United States does favor the development of the largest and most dangerous tornadoes (earning the designation "tornado alley"), Florida experiences the greatest number of tornadoes per square mile of all U.S. states (SPC, 2002). **Figure 38** shows tornado activity in the United States based on the number of recorded tornadoes between 1952 and 2010.

⁷² NOAA, 2009.



Figure 138 U.S. tornado activity⁷³

Tornadoes are most likely to form in late afternoon and early evening. Most tornadoes are a few dozen yards wide and touch down 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, and 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 97). Tornado magnitudes in 2005 and later were determined using the Enhanced Fujita Scale (Table 108).

⁷³ National Weather Service Storm Prediction Center:

http://www.weather.gov/images/hgx/swa/2013_graphs/tornadoes_county.png

F-SCALE NUMBER	INTENSITY	WIND SPEED	TYPE OF DAMAGE DONE
FO	GALE TORNADO	40–72 MPH	Some damage to chimneys; breaks branches off trees; pushes over shallow-rooted trees; damages 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 some distance; cars thrown; 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 re-enforced concrete structures badly damaged.
F6 ⁷⁵	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 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 27 The Fujita Scale (Effective Prior to 2005)⁷⁴

Table 28 The Enhanced Fujita Scale (Effective 2005 and Later)⁷⁶

EF-SCALE NUMBER	INTENSITY PHRASE	3-SECOND GUST (MPH)	TYPE OF DAMAGE DONE
EFO	GALE	65–85	Some damage to chimneys; breaks branches off trees; pushes over shallow-rooted trees; damages 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.

⁷⁴ NWS. *The Fujita Scale*. Retrieved from <u>https://www.weather.gov/ffc/fujita</u>.

⁷⁵ F6 is not always included but has been used to describe extremely strong tornadoes that far surpass F5 levels.
⁷⁶ NWS: The Enhanced Fujita Scale (EF Scale). Retrieved from <u>https://www.weather.gov/oun/efscale</u>.

EF-SCALE NUMBER	INTENSITY PHRASE	3-SECOND GUST (MPH)	TYPE OF DAMAGE DONE
EF3	SEVERE	136–165	Roof and some walls torn off well-constructed houses; trains overturned; most trees in forest uprooted.
EF4	DEVASTATING	166–200	Well-constructed houses leveled; structures with weak foundations blown 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. 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. Therefore, the entire Reservation is assumed to be at risk from tornadoes.

Previous Occurrences

Based on data reported by both the Tribe and NCEI, no tornadoes have directly impacted the Chemehuevi Reservation or its assets. The closest NCEI-reported tornado in San Bernardino County was a touchdown approximately 10 miles northwest of the Reservation. This event occurred on August 7, 1997, and was reported as an F0 on the Fujita scale. As the tornado occurred in a remote location, no damages were reported. **Figure 39** shows this event relative to the Reservation. Overall, San Bernardino County experienced 32 tornado events between 1950 and April 2019, resulting in a total of \$1,286,630 in damages (2019 dollars), no deaths, and three injuries. According to Tribal officials, three tornadoes have been visible across the lake in Lake Havasu City. Further, the Chemehuevi Reservation experiences microbursts (e.g., severe enough to remove a roof), but has not experienced large tornadoes.



Figure 149 Previous tornado occurrences near the Chemehuevi Reservation

Extent

No reported tornadoes have impacted the Reservation or its assets. Using the Fujita Scale, the greatest tornado to impact the county was an F2 (113-157 miles per hour). The county has experienced two F2 tornadoes: one in 1954 and another in 1982. The latter event resulted in two deaths. Another way to measure tornado extent is by damages. The most damaging tornado in San Bernardino County was an F0 tornado that resulted in \$757,635 in damages (2019 dollars). However, stronger and more damaging tornadoes are possible.

Probability of Future Events

Future probability is difficult to determine without a history of events directly impacting the Chemehuevi Reservation or its assets. **Figure 38** shows that over a 58-year period, San Bernardino County experienced 10 to 30 tornadoes. Therefore, a probability of "possible" (between 1% and 10% annual chance) was assigned.

Vulnerability Assessment and Estimation of Losses

All current and future buildings, critical facilities, cultural resources, land holdings, and populations are considered at risk from 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. Annualizing the losses from tornado damage over time is not possible without recorded damage to the Chemehuevi Reservation's property or assets.

Wildfire

Description

A wildfire is any fire occurring in a wildland area (i.e. grassland, forest, brush land) except for prescription fires.⁷⁷ Wildfires are part of the natural management of forest ecosystems, but may also be caused by human factors.

Nationally, over 80% 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, ground, and crown fires. A surface fire is the most common of these three classes. It burns slowly along the floor of a forest, killing or damaging trees. A ground fire (or 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

⁷⁷ Prescription burning, or "controlled burns," are undertaken by land management agencies. It is the process of igniting fires under select conditions in accordance with strict parameters.

planning area, brush fires are known to jump from place to place due to patches of vegetation and winds.

Wildfire probability depends on local weather conditions, outdoor activities such as camping, debris burning, 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 wildfire by creating 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 during La Niña events.

Many individual homes, 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 holiday, weekend, and vacation periods. Unfortunately, wildland residents and visitors are rarely educated or prepared for wildfire events that can sweep through the brush or timber and destroy property.

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 fiscal 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

The Chemehuevi Reservation is predominantly characterized by brush and desert shrubs which are susceptible to brushfires. In order to best portray the potential for fire locations, the USDA Wildfire Hazard Potential (WHP) data was consulted.⁷⁸ The objective of the WHP map is to "depict the relative potential for wildfire that would be difficult for suppression resources to contain."⁷⁹ This data source integrates several measures.

"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*

⁷⁸ 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).

⁷⁹ Wildfire Hazard Potential. (2014). USDA. Retrieved from <u>https://www.firelab.org/project/wildfire-hazard-potential</u>

probability of experiencing torching, crowning, and other forms of extreme fire behavior under conducive weather conditions, based primarily on 2010 landscape conditions." ⁸⁰

The data for Chemehuevi Reservation can be seen in **Figure 40**. A majority of the Chemehuevi Reservation is categorized as having "very low," "low," or "non-burnable" wildfire potential. Some areas in the southern half of the Reservation (defined by sloped topography and undeveloped land) are more susceptible to wildfires than the northern half of the Reservation, which is less sloped, less vegetated, and more developed. Overall, the risk presented by the WHP map aligns with the landscape and desert terrain of the Reservation.

⁸⁰ <u>http://www.firelab.org/project/wildland-fire-potential</u>



Figure 40 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 within the planning area where this interface exists, all within Areas 1 and 2 (in the foothills). 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 Chemehuevi Reservation.

The SILVIS Lab defines the Wildland-Urban Interface as:

"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% 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% 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% vegetated. The minimum size limit ensures that areas surrounding small urban parks are not classified as interface WUI."⁸¹

Figure 41 shows the WUI for the Chemehuevi Reservation.

⁸¹ 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 <u>http://silvis.forest.wisc.edu/maps/wui</u>



Figure 41 WUI areas (Silvis Lab)

According to Tribal officials, the residential Colonies area is the most susceptible to fires, as it is prone to overgrown vegetation. Further, HUD Housing on North and South Valley Mesa Roads was noted as being fire prone by Tribal officials. Tribal officials also noted that the area around Catfish Bay is fire prone, and that while this area is undeveloped, fires can jump Catfish Bay and impact nearby residential areas. All of the areas identified by Tribal officials as prone to wildfires are consistent with areas defined as Intermix within the WUI as shown in **Figure 42**.



Figure 42 WUI areas and wildfire-prone areas identified by Tribal Officials

Previous Occurrences

Data on historic wildfires was collected from Tribal officials, the California Office of Emergency Services (Cal FIRE), and the USDA. Cal FIRE provides data on historic wildfires over 10 acres in size occurring between 1911 and 2016. Cal FIRE reported no fires of the Chemehuevi Reservation during this time; the closest reported fire was the 330-acre Deer Fire of 2009, which was approximately 22 miles southwest of the Reservation. **Figure 43** shows historic fires occurring near the Reservation, as reported by Cal FIRE.



Figure 43 Wildfires greater than 10 acres near the Chemehuevi Reservation, 1911-2016 (Cal FIRE)

Seven fires were reported on the Chemehuevi Reservation by the USDA, which reports fires occurring on federal lands. This includes fires reported between 1980 and 2016. Details for these fire events are shown in **Table 119. Figure 44** shows the historic fire locations on or near the Chemehuevi Reservation from 1980 through 2016. No additional wildfires were noted by Tribal officials.

Year	Agency	Fire Name	Size (acres)	Cause
1996	Bureau of Indian Affairs	Gould	1	Human
1997	Bureau of Land Management	Steamboat	0.1	Human
2002	Bureau of Indian Affairs	Catfish	0.2	Natural
2003	Bureau of Indian Affairs	Shoreline	0.3	Natural
2004	Bureau of Indian Affairs	Beach	4	Human
2004	Bureau of Indian Affairs	Cattail Cove	1	Human
2005	Bureau of Indian Affairs	Firework 1	0.3	Human

Table 109 Wildfires Occurring on the Chemehuevi Reservation, 1980-2016 (USDA)



Figure 44 Wildfires occurring on the Chemehuevi Reservation, 1980-2016 (USDA)

Extent

Wildfire extent is determined by size, such as area burned. The largest fire to burn on the Chemehuevi Reservation was the Beach Fire in 2004, which burned over four acres. Larger, more damaging fires are possible.

Probability of Future Events

Wildfire events — typically small brushfires — will be an ongoing occurrence on the Chemehuevi Reservation. The likelihood of wildfire increases during drought cycles and abnormally dry conditions. Dry, windy conditions with an accumulation of vegetative fuel (such as brush and shrubs) could create conditions for a fire that spreads quickly. Fire data reported seven fires that directly impacted the Chemehuevi Reservation between 1980 and 2016. This results in approximately one fire every five years occurring on the Chemehuevi Reservation. Drier dry seasons are expected for the area as the climate changes, along with warmer temperatures, which will likely increase the frequency and intensity of wildfire. A probability of "possible" (1 to 10% annual probability) was assigned to the wildfire hazard.

Vulnerability Assessment and Estimation of Losses

It is assumed that all current and future buildings, critical facilities, cultural resources, and populations are at risk from wildfire. The Chemehuevi Reservation and its assets are located in a desert climate, with vegetation characterized by shrubland and small trees. Some areas of the Reservation have steep slopes, which are particularly vulnerable to wildfires. The Tribe has noted that the Reservation does not have much brush and does not regularly need brush clearing. However, years receiving above average rainfall can result in shrub overgrowth, which may require clearing to reduce available fuel for wildfires. Mitigation activities currently employed by the Tribe can be found in the Capability Assessment Chapter.

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, and/or result in road closures, impacting accessibility.

The weather can have a major influence on wildfire risk. Wind makes it very difficult to fight fires. Rain can work in the favor of fighting wildfires, helping to quell flames and moisten fuel sources. Terrain, including 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 of wildfires. Lastly, drought can impact the severity of wildfire and the ability to fight it.

Some areas or structures may be more vulnerable than others. Buildings that are not up to the California Uniform Building Code may be more vulnerable to wildfires. Building material and landscaping around the buildings can also impact vulnerability. For example, wood shakes can ignite quickly due to embers. Pine needles 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 of defensible space between vegetation and structures can decrease risk. In addition, there are proactive landscaping schemes that can be used in fire-prone areas, such as avoiding pine straw and mulch.

Burned areas are subject to increased erosion, resulting in the siltation of creeks, streams, and rivers. This can result in channel aggradation (wider, slower channels). Steeps slopes are also destabilized due to the burning of vegetation. Burned areas combined with heavy rain present a serious risk of landsliding and rockfalls. Highest risks areas are on or adjacent to steep slopes.

Tribal Assets

A GIS analysis was used to determine the Tribal assets at risk from the wildfire hazard. The University of Wisconsin's Wildland Urban Interface (WUI) spatial data was used to indicate vulnerability. In total, 139 of the Tribe's 152 identified assets (over 91%) and \$109.3 million (87%) of total asset value are considered potentially at risk from wildfire. This includes 133 of the Tribe's 143 (93%) of the Tribe's critical facilities. One of the Tribe's two cultural resources, the Cultural Center, is potentially at risk from wildfire. Details regarding vulnerable assets are presented in **Table 3012. Figures 135, 146,** and **157** show tribal assets in relation to WUI areas. However, it should be noted that structures outside of the WUI are also at risk.

Tribal Asset	Approximate Total Value At Risk	%	Critical Facility (Y/N)
Chemehuevi Housing Authority	\$621,344	0.5%	Y
Colony Houses (23)	\$7,174,499	5.7%	Y
Community Center	\$1,861,000	1.5%	Y
Conservation Office	\$119,984	0.1%	Y
Cultural Center	\$1,318,946	1.0%	Y
Educational Training Center	\$1,349,783	1.1%	Y
Environmental Services	\$704,014	0.6%	Y
Fuel Tanks	\$1,201,251	1.0%	Y
Hardware Store and Fuel Pumps	\$1,267,627	1.0%	Y
Havasu Landing Market	\$2,171,950	1.7%	Y
Havasu Palms	N/A	N/A	N
Head Start Center	\$1,068,953	0.8%	Y
Health Clinic	\$1,014,604	0.8%	Y
HUD Houses (85)	\$33,992,810	27.0%	Y
HUD Pump Station	\$1,000,000	0.8%	Y
Multipurpose Gym	\$1,870,968	1.5%	Y
New Havasu Landing Casino and Hotel	\$45,000,000	35.8%	Y
North Estates	N/A	N/A	N
Nüwüvi Park Meeting Hall	\$966,085	0.8%	Y
Outdoor Storage Area	N/A	N/A	N

Table 3011 Summary of Chemehuevi Tribal Assets in the WUI

Tribal Asset	Approximate Total Value At Risk	%	Critical Facility (Y/N)
Quail Trail Apartments (3 buildings)	\$2,727,396	2.2%	Y
Real Estate Planning Office	\$245,871	0.2%	Y
Resort Administration	\$687,073	0.5%	Y
Resort Homes 1	N/A	N/A	N
Resort Homes 2	N/A	N/A	N
RV Park	N/A	N/A	N
Section 36	N/A	N/A	N
Senior Complex	\$909,132	0.7%	Y
Storage Warehouse	\$894,672	0.7%	Y
Tribal Administration	\$1,110,421	0.9%	Y
Vista del Lago	N/A	N/A	N
TOTAL ASSETS POTENTIALLY AT RISK	\$109,278,383	87%	132 (93%)



Figure 45 Chemehuevi Tribal assets in the WUI



Figure 156 Chemehuevi Tribal assets in the WUI



Figure 167 Chemehuevi Tribal assets in the WUI (Resort Area)

Climate Change Impacts

Climate change can be expected to increase wildfire frequency and severity on the Chemehuevi Reservation. Warmer temperatures cause drought conditions by reducing soil moisture, which in turn is conducive to wildfires. Average maximum temperatures on the Reservation are projected to increase from a baseline of 87.6°F to upwards of 91.3°F by 2050 and 96.5°F by 2099 (**Figure 20**, located in the *Extreme Heat* hazard profile, shows the projected increase in average maximum temperatures on the Reservation under different emissions scenarios and timelines.) Generally, increased rainfall associated with climate change can increase the amount of vegetation, and therefore the amount of fuel for wildfires. However, climate projects show little change in precipitation for the Chemehuevi Reservation under either high or low emissions scenarios.

Dam Failure (redact for public consumption) Description

A dam is an artificial barrier constructed across a stream channel or a man-made basin for the purpose of storing, controlling, or diverting water. Dams are typically constructed of earth, rock, concrete, or mine tailings. The area directly behind the dam where water is impounded or stored is referred to as a reservoir.

A dam failure is the partial or total collapse, breach, or other failure of a dam that causes flooding downstream. Dam failures can result from natural events, such as a flood, earthquake, or landslide; human-induced events, such as improper maintenance; or a combination of both. In the event of a dam failure, the people, property and infrastructure downstream could be subject to devastating damage.

Dam failures can result from one or more of the following:

- Prolonged periods of rainfall and flooding (the cause of most failures)
- Inadequate spillway capacity, resulting in excess flow overtopping the dam
- Internal erosion caused by embankment or foundation leakage
- Improper maintenance, including failure to remove trees; repair internal seepage problems; maintain gates, valves, and other operational components, etc.
- Improper design, including use of improper construction materials and practices
- Negligent operation, including failure to remove or open gates or valves during high flow periods
- Failure of an upstream dam on the same waterway
- Landslides into reservoirs, which cause surges that result in water overtopping the dam
- High winds, which can cause significant wave action and result in substantial erosion
- Earthquakes, which can cause longitudinal cracks at the tops of embankments that can weaken entire structures

Location

The Chemehuevi Reservation is adjacent to the Colorado River, which has several major dams up and downstream of the Reservation. The following dams have been recognized by the Tribe as having the potential to impact the Reservation.

- **Parker Dam.**⁸² The Parker Dam is approximately 10 miles south of the Chemehuevi Reservation on the Colorado River. It is 320 feet tall from its foundation, although almost three-quarters of the dam is not visible. This dam impounds Havasu Lake, which is adjacent to the Chemehuevi Reservation and plays a large role in the Tribe's economy. Water impounded by Parker Dam is sent to the Colorado River Aqueduct and used to generate hydropower.
- **Davis Dam.**⁸³ The Davis Dam is located approximately 50 miles upstream of the Chemehuevi Reservation. It impounds Lake Mohave, which has a storage capacity of over 1.8 million acrefeet. It is also used to generate hydropower. Davis Dam rises 200 feet from its foundation, 140 feet above the river.
- **Hoover Dam.**⁸⁴ Hoover Dam is approximately 110 miles upstream of the Chemehuevi Reservation. At 726 feet tall, the Hoover Dam is the second largest dam in the U.S. In addition to supplying potable water and hydropower, the Hoover Dam is a major tourist destination; over seven million tourists visit the site each year. The Hoover Dam impounds Lake Mead, the largest reservoir in the U.S.

Figure 168 shows the location of these dams relative to the Chemehuevi Reservation. The U.S. Bureau of Reclamation owns and operations these dams through the Lower Colorado Dams Office. Therefore, the Chemehuevi Reservation does not have the ability to control operations or maintenance of the above dams.

⁸² California: Parker Dam. The Nation Park Service. Retrieved from <u>https://www.nps.gov/articles/california-parker-dam.htm</u>.

⁸³ Davis Dam. U.S. Bureau of Reclamation. Retrieved from <u>https://www.usbr.gov/projects/index.php?id=47</u>.

⁸⁴ Nevada and Arizona: Hoover Dam. National Parks Service. Retrieved from <u>https://www.nps.gov/articles/nevada-and-arizona-hoover-dam.htm</u>.



Figure 178 Colorado River dam locations

Previous Occurrences

No incidents of dam failure have been reported for the Hoover, Davis, or Parker dams. The closest event to failure occurred in 1983, a wet weather year with above average snowpack. Water spilled over Hoover Dam's spillways for the first time since its construction in 1941. Downstream of the Hoover Dam, the Colorado River rose approximately two feet, causing flooding in the resort towns and campgrounds along the river, resulting in 12 deaths and \$12 million in damages. Impacts specific to the Chemehuevi Reservation were not reported.

Generally, due to their size and the large amount of water and hydropower their reservoirs provide to the Western U.S., these dams are closely monitored.

Extent

The extent of dam failure is infeasible to determine given minimal historic incidents and limited details associated with the historic events. However, failure of any of the dams upstream of the Reservation would have catastrophic impacts on the Reservation.

Probability of Future Events

Given that only one historic event has been reported, the probability assigned to this hazard is "unlikely" (less than 1% annual chance). These high-profile dams are regularly inspected and closely monitored, further decreasing the probability of a failure event.

Vulnerability Assessment and Estimation of Losses

All current and future buildings, critical facilities, cultural resources, and populations in dam inundation areas are considered at risk from dam failure on the Chemehuevi Reservation. Dam failure has the potential to have catastrophic impacts on the Reservation, particularly if the Hoover Dam fails, as it would cause downstream dams (Davis and Parker) to fail in a cascading effect. The Tribe practices dam failure exercises and engages in emergency planning in the event of dam failure. The Tribe has designated the Chemehuevi Airport (airfield) at an evacuation location in the event of dam failure.

According to data provided by the Bureau of Reclamation (via the Bureau of Indian Affairs), floodwaters from a breach at the Hoover Dam would take approximately 13 hours and 35 minutes to reach the Chemehuevi Reservation, with maximum discharge reached at approximately 44 hours. The estimated maximum flood depth⁸⁵ for such an event is approximately 84 feet at the Chemehuevi Reservation. This information is based on a sudden beach at the Hoover Dam in which Lake Mead is at capacity.

Tribal Assets

Dam failure simulation inundation area data was provided by Chemehuevi Tribal officials from a study completed by the Bureau of Reclamation. A GIS analysis was completed to determine Tribal assets potentially at risk to flooding from two dam failure scenarios: 1), a scenario in which water is released

⁸⁵ Maximum depths calculated as the difference between the maximum water surface elevation of the flood and the water surface elevation of the DEM at the Colorado River.

using spillways at the Hoover Dam to prevent overtopping, accounting for operations at Davis and Parker Dams, and 2) a sudden breach of the upper one-third of the Hoover Dam, with a chain reaction causing failures at Davis and Parker Dams (considered a worst case scenario).⁸⁶ It should be noted that these inundation scenarios are approximate, as they depend heavily on conditions that could vary from the models, such as the height of the reservoir or the type and location of the failure.

Scenario 1: Spillway Release at the Hoover Dam

Nine Tribal assets (approximately 6%) are located in the mapped Hoover-Davis-Parker dam breach inundation area, including five critical facilities (approximately 4%). These assets total over \$48,783,673, or approximately 39% of the total value of the Tribe's assets. These assets are shown in **Figures 49, 50**, and **51**. **Table 31** presents details on the assets potentially at risk to inundation from a spillway release at the Hoover-Davis-Parker Dam system.

Tribal Asset	Approximate Total Value At Risk	%	Critical Facility (Y/N)
Colony Houses (2)	\$578,250	0.5%	Y
Former Havasu Landing Casino	\$3,000,000	2.4%	Y
Havasu Palms	N/A	N/A	N
New Havasu Landing Casino and Hotel	\$45,000,000	35.8%	Y
Resort Homes 2	N/A	N/A	N
RV Park	N/A	N/A	N
Section 36	N/A	N/A	N
Surveillance Office	\$205,423	0.2%	Y
TOTAL ASSETS POTENTIALLY AT RISK	\$48,783,673	39%	6 (4%)

Table 31 Chemehue	vi Tribal Assets	Potentially	/ At-Risk to Dam	Failure (Spillway	(Release)
Tuble St chemichae	vi iiibui / 055005	1 Oterreiding	, ne man to Dam	i unui e ja	Spinivay	nereaser

⁸⁶ Both scenarios assume the reservoir (Lake Mead) is high, at 1,219.6 feet.



Figure 189 Chemehuevi assets in the Hoover-Davis-Parker Inundation Area (Spillway Release)



Figure 50 Chemehuevi assets in the Hoover-Davis-Parker Inundation Area (Spillway Release)



Figure 19 Chemehuevi assets in the Hoover-Davis-Parker Inundation Area (Spillway release) – Havasu Palms
Scenario 2: Breach of the Hoover Dam

Approximately 76%, or 115 Tribal assets, are located in the mapped Hoover-Davis-Parker dam breach inundation area, including 107 critical facilities. These assets have a total over \$95.4 million, or approximately 76% of the total value of the Tribe's assets. These assets are shown in **Figures 51, 52, 53** and **54. Table 32** presents details on the assets potentially at risk to the failure of the Hoover-Davis-Parker Dam system.

Tribal Asset	Approximate Total Value At Risk	%	Critical Facility (Y/N)
Chemehuevi Housing Authority	\$621,344	0.5%	Y
Colony Houses (23)	\$7,174,499	5.7%	Y
Community Center	\$1,861,000	1.5%	Y
Conservation Office	\$119,984	0.1%	Y
Former Havasu Landing Casino	\$3,000,000	2.4%	Y
Fuel Tanks	\$1,201,251	1.0%	Y
Hardware Store and Fuel Pumps	\$1,267,627	1.0%	Y
Havasu Landing Market	\$2,171,950	1.7%	Y
Havasu Palms	N/A	N/A	N
HUD Houses (70)	\$28,326,747	22.5%	Y
HUD Pump Station	\$1,000,000	0.8%	Y
New Havasu Landing Casino and Hotel	\$45,000,000	35.8%	Y
North Estates	N/A	N/A	N
Nüwüvi Park Meeting Hall	\$966,085	0.8%	Y
Outdoor Storage Area	N/A	N/A	N
Quail Trail Apartments (1 building)	\$909,132	0.7%	Y
Resort Administration	\$687,073	0.5%	Y
Resort Homes 1	N/A	N/A	N
Resort Homes 2	N/A	N/A	N
RV Park	N/A	N/A	N
Section 36	N/A	N/A	N
Storage Warehouse	\$894,672	0.7%	Y
Surveillance Office	\$205,423	0.2%	Y
Vista del Lago	N/A	N/A	N
TOTAL ASSETS POTENTIALLY AT RISK	\$95,406,787	76%	107 (75%)

Table 32 Chemehuevi Tribal Assets Potentially At-Risk to Dam Failure (Maximum Breach)



Figure 51 Chemehuevi assets in the Hoover-Davis-Parker Inundation Area (Maximum Breach)



Figure 52 Chemehuevi assets in the Hoover-Davis-Parker Inundation Area (Maximum Breach)



Figure 53 Chemehuevi assets in the Hoover-Davis-Parker Inundation Area (Maximum Breach) – Resort Area



Figure 54 Chemehuevi assets in the Hoover-Davis-Parker Inundation Area (Maximum Breach) – Havasu Palms

Hazardous Materials Incidents Description

Hazardous materials 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 hazardous material is intended to provide a general overview of the hazard. 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, transportationrelated accidents in the air, by rail, on the nation's highways, and on the water. Approximately 6,774 HAZMAT events occur each year, of which 5,517 are highway incidents, 991 are railroad incidents, and 266 are due to other causes.⁸⁷ 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 extend 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.

⁸⁷ FEMA (1997). *Technological Hazards*. Retrieved from <u>https://www.fema.gov/media-library-data/20130726-1545-20490-2423/mhira_te.pdf</u>.

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 collects information from industrial facilities on the releases and transfers of certain toxic agents. This information is then reported in the Toxic Release Inventory (TRI). TRI sites indicate where such activity is occurring. There are no TRI sites located on the Chemehuevi Reservation, nor are there any TRI sites located within the zip code within which the Reservation lies (92363).

However, other sources of hazardous materials have the potential to impact the Chemehuevi Reservation. The only vehicular access to the Reservation is from Havasu Lake Road, which connects the Reservation with Interstate 95. A hazardous materials incident occurring on Interstate 95 could impact access to the Reservation. Further, hazardous materials released into the Colorado river from facilities upstream of the Reservation could impact the Reservation.

Previous Occurrences

According to Tribal officials, one spill was reported on Lake Havasu Road (Seventeen Mile Road) that prompted activation of the Tribe's Emergency Response Plan.

The U.S. Department of Transportation Pipeline and Hazardous Materials Safety Administration (PHMSA) lists historical occurrences throughout the nation. A "serious incident" is a hazardous materials incident that involves any of these factors:

- 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 gallons or 88.2 pounds of a severe marine pollutant
- The release of a bulk quantity (over 199 gallons or 882 pounds) of a hazardous material

However, prior to 2002, a hazardous materials "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 Pipeline and Hazardous Materials Safety Administration incidents specific to the Chemehuevi Reservation were not available in the PHSMA database. Therefore, incidents occurring in areas

approximate to the Chemehuevi Reservation were considered, including the zip code for the Reservation (92363). Surrounding mobile hazardous materials incidents may also give an indication of events that potentially impacted access to the Reservation in the event the highway was closed. **Table 3313** presents a detailed summary of historic hazardous materials incidents reported for the Tribe's zip code. Two hazardous materials incidents have been reported. These incidents resulted in no deaths or injuries, but just under \$23,000 (2019 dollars) in damages. Neither of these incidents were considered "serious incidents" as defined by the Pipeline and Hazardous Materials Safety Administration.

Date	Location	Quantity Released (LGA)	Hazard Class	Damages (2019 dollars)	Mode of Transportation
05/28/2017	Needles	800	Corrosive	\$17,505	Highway
07/04/2018	Needles	0.25	Corrosive	\$5,460	Highway

Table 3312 PHMSA hazardous materials incident summary for the Chemehuevi Reservation(Zip Code 92363)

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 in the planning area is a highway incident in 2017 that resulted in the release of 800 liquid gallons of a corrosive material in the City of Needles. However, incidents of greater materials release are possible.

Probability of Future Events

The probability of hazardous materials events is difficult to determine, given their unpredictability. Based on the reported two events in two years from PHSMA, the zip code associated with the Chemehuevi Reservation has historically experienced one hazardous materials incident per year. It is unlikely that both of these events impacted the Chemehuevi Reservation. However, Tribal officials have noted hazardous materials incidents that did impact the Tribe in the past. Using these factors as an indicator, a probability of likely (10 to 90% annual probability) was assigned to this hazard.

Vulnerability Assessment and Estimation of Losses

All current and future buildings, critical facilities, cultural resources, and populations are considered at risk from hazardous materials incidents on the Chemehuevi Reservation. Most hazardous materials incidents are contained and suppressed before destroying property or threatening lives. However, they can have a significant negative impact. Such events can cause deaths or injuries, or result in the closing 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. Released chemicals can spontaneously combust and start fires. They can also leach into soil and groundwater, run off into water, and disburse into the air.

Leeched chemicals present a public health hazard, as exposure can result in immediate or long-term health effects.

Non-compliance with fire and building codes, as well as 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.

The Chemehuevi Reservation is particularly vulnerable to mobile hazardous materials incidents, as it is accessed by a single road that connects to Instate 95. Incidents resulting in the closure of this road or near its intersection with Interstate 95 impacts the ability of Tribal members and guests to leave to Reservation (i.e., access to the school in Needles, or access for tourists coming to the hotel and casino). Further, the Chemehuevi Reservation is vulnerable to hazardous materials incidents that may occur on the Colorado River upstream of the Reservation. Lake Havasu is a source of potable water and electric power generation for the Tribe, as well as a source of income due to the tourists that visit the lake and patronize the Tribe's businesses. Therefore, a hazardous materials incident severely impacting the use of the lake could have severe consequences for the Tribe and could result in the need for evacuation or temporary relocation. Tribal officials identified the Pacific Gas and Electric (PG&E) electric power plant as a potential threat to the Reservation; if chromium 6 was to leak from the plant, the Chemehuevi Reservation is directly downstream.

In order to conduct the vulnerability assessment for this hazard, GIS analysis was used for mobile areas. As no TRI sites are within the Tribe's zip code, a fixed-site analysis was not conducted. Two sizes of buffers — 500 and 2,500 meters — were used for the mobile analysis. These areas are assumed to respect both immediate (primary) and secondary levels of effect. 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 mobile analysis, the major roads (Interstate 95 east and west of the Reservation and Interstate 40) and railways (near Needles, CA) were used for the GIS buffer analysis, because they are where hazardous materials that could adversely impact people and buildings are primarily transported. Neither highway nor the railway generated primary or secondary impact areas affecting the Chemehuevi Reservation. However, hazardous materials incidents on these highways could still have indirect impacts on the Reservation.

Power Outage

Description

An adequate supply of power is critical for the Chemehuevi Tribe to maintain its daily processes and functions. Electric power outages occur when the reliable, uninterrupted supply of power to all or part of the Reservation is disrupted, causing detriment to the Reservation's economic and social well-being. According to the 2018 California State Hazard Mitigation Plan, power outages can be intentional or unintentional. Intentional outages include:

- Planned: Scheduled outages for maintenance or upgrading
- Unscheduled: Outages conducted in response to an emergency
- *Demand-side Management:* Outages occurring when a customer has entered into an agreement with the supplier to curtail their demand during peak system usage
- Load Shedding: An outage occurring when the power system is under extreme stress due to heavy demand, so service to some customers is disrupted to prevent the entire system from collapsing (i.e., rolling blackouts)

Unintentional power outages occur with little to no advance notice and are the most problematic. Types of unintentional outages include:

- An accident by the utility or its contractors
- Malfunction or equipment failure
- Equipment overload
- Reduced capability (equipment that cannot operate within its design criteria)
- Vandalism or sabotage
- Weather, including lightning, wind, earthquakes, flood, and broken tree limbs downing power lines)
- Wildfires that damage transmission lines

Location

It is assumed that the entire Chemehuevi Reservation is exposed to power outages. Buildings without solar power or backup generators are more likely to be impacted by power outages.

Previous Occurrences

The Chemehuevi Reservation has experienced numerous routine power outages over the years, but detailed records of these incidents were not recorded. According to Chemehuevi Tribal officials, one outage left the Reservation without power for eight days, and another left the elementary school without power for several weeks.

Extent

Without detailed records of major outages on the Reservation, the severity of power outages is difficult to determine. The most severe event reported by Tribal officials is the outage in which the Tribe went eight days without power. However, longer disruptions are possible.

Probability of Future Events

Power outages are an annual occurrence on the Chemehuevi Reservation, as they are in most places. An outage of just a few hours can have a substantial impact on the Reservation, especially in the summer months when temperatures are high. Therefore, the probability assigned to this hazard is "highly likely" (90% or greater annual chance).

Vulnerability Assessment and Estimation of Losses

All current and future buildings (including critical facilities), infrastructure, and populations are potentially at risk to power outages. Power outages on the Reservation can be caused by several other hazards, including lightning, wind, flood, fire, earthquakes, or terrorism. Outages can also be caused by motor vehicle accidents, such as a dune buggy hitting a substation.

Power outages are a major concern during warm weather months, due to safety and the Reservation being isolated. Temperatures can be over 100°F at night, requiring evacuations, especially of vulnerable populations such as young children and the elderly. Outages can also have impacts to tribal members, such as the economic cost of spoiled food or impacts to those with medical equipment.

In addition, the Tribe's water lift pumps are electric. One pump has backup power, but the other does not, meaning a power outage can impact the Tribe's ability to access potable water. Currently, the Tribe's water tanks provide three days of potable water supply during normal, non-holiday times, but this estimate will decline once the new hotel and casino opens. Similarly, the Tribe's gas pumps need electricity to function, meaning that the ferry cannot be fueled, and fuel for generators cannot be accessed via the gas station when power is out.

The Reservation's isolated location makes the Tribe more vulnerable, as evacuations are difficult and bringing in food and supplies during a prolonged outage can prove challenging. Further, the Reservation's isolated location means there is a lack of redundancy in the power distribution network.

The Tribe has taken some mitigation measures to combat the severe impacts of power outages on the Reservation. Some buildings are outfitted with backup power (i.e., generators), and the Tribe has invested heavily in solar energy. However, many structures, including some critical facilities, are not yet equipped with backup power, and a lack of storage capability for solar energy harvested on the Reservation continues to leave the Chemehuevi Tribe vulnerable to power outages.

Climate Change Impacts

As the climate changes, hotter temperatures on the Reservation will lead to more demand for electrical power to run air conditioning, placing more demand and stress on the power system. Further, hotter temperatures and more frequent high heat days mean that an outage is more likely to have an adverse impact, such as requiring heat-related evacuations and closures.

Terrorism and Similar Criminal Activity (Including Cyber Threats) Description

Terrorism and similar criminal activities are categorized as non-natural, non-technological, humancaused hazards. As a threat to the Tribe, this plan addresses terrorism, non-terrorist criminal activity, and cyber attacks as potential hazards to the Reservation.

Terrorism is the use of violence by individuals or groups to achieve political goals by creating fear. The political motives of terrorism distinguish it from ordinary crime. Terrorism is carried out for a cause rather than for financial gain, personal revenge, or a desire for fame. Terrorism can be used by both international and domestic groups or individuals. A wide range of techniques can be used by terrorists, including bombings, shootings, arson, and hijacking. Regardless of the specific tactics used, terrorists seek the greatest possible media exposure. The goal of terrorists is to frighten as many people as possible, not necessarily to cause the greatest damage possible.

Non-terrorist criminal activity may resemble terrorism, but lacks a political objective. Emergency management is typically not concerned with routine, individual crimes, but does need to prepare for crimes that impact large portions of the population. Such attacks may require resources not available to local law enforcement agencies. Crimes of this sort include active shooters or mass shootings, random sniper attacks, sabotage of infrastructure, and cyber attacks.⁸⁸

Cyber attacks involve the use of computers, electronic devices, and/or the internet to attack computer systems. There are several types of cyber attacks, including:

- Computer viruses, which can damage infected computers
- Denial-of-service attacks, which can shut down a targeted website
- Hacking, in which sensitive information can be compromised

There are many different motives for cyber attacks, including undermining public confidence in cyber security, vandalism, and obtaining or altering information in order to commit fraud, identity theft, extortion, or sabotage. For instance, confidential personal information, such as birth dates and Social Security numbers, can be sold by hackers in order to be used in identity theft. Additionally, ransomware restricts a user's access to their data and requires a user to pay the attacker to regain access.

⁸⁸ Michigan Hazard Mitigation Plan (2013). Michigan Department of State Police.

Location

It is assumed that the entire Reservation is uniformly exposed to terrorism and similar criminal activities. Busy spaces and gathering places, such as the casino, may be at an elevated risk due to the increased number of potential victims.

Previous Occurrences

No previous incidents of terrorism or similar criminal activities were reported on the Reservation. Tribal officials noted an incident in which an armored vehicle sat on the dam during the busy season, shutting down most services. A similar situation could impact tourism or result in a dam branch.

Extent

The extent of terrorism and similar incidents can be measured in terms of injuries and deaths. Due to the unpredictable nature of these type of incidents, the extent of an incident is difficult to determine. The severity of an incident could range from no deaths or injuries (e.g., individual(s) are apprehended prior to inflicting harm) to mass casualties.

In terms of a cyber attack, an incident could be measured in terms of records breached or data compromised; without previous records of cyber attacks, severity is difficult to predict. However, incidents could range from phishing schemes and spam emails to a large breach of the Tribe's records.

Probability of Future Events

The probability of terrorism and similar incidents (including cyber attacks) is difficult to determine given their unpredictability. Given that unpredictability and lack of previous incidents reported by the Tribe, the probability assigned to this hazard is "possible" (1 to 10% annual chance).

Vulnerability Assessment and Estimation of Losses

All current and future populations, structures (including critical facilities), infrastructure, and cultural resources on the Reservation are considered at risk from terrorism and similar incidents. Gathering places, such as the supermarket, schools, places of worship, parks, the casino, and public offices may be at elevated risk. While human-related incidents are difficult to mitigate given their unpredictability, having a response plan that covers different scenarios, as well as performing drills or "lock-down" exercises, may help reduce the impact of such an incident. Prohibiting weapons, and/or use of metal detectors for entry into vulnerable spaces, may also mitigate the likelihood of an event.

Further, all current and future buildings (including critical facilities), infrastructure, and populations are potentially at risk, directly and indirectly, from cyber attacks. Cyber attacks can occur on an individual (i.e., viruses and malware) or large-scale basis (i.e., hacking of Tribal databases or taking control of critical facilities). Places with an open network, and/or many people on one network (such as the casino or hotel) may be at elevated risk. Systems that store large amounts of personal information, such as a health clinic or Tribal Administration, may also have a higher risk of cyber attack. Cyber attacks could result in permanent or temporary loss of access to data and/or monetary damages.

Summary of Overall Risk

Critical Facility Analysis

All critical facilities are assumed to be at risk to drought, earthquake, extreme cold, extreme heat, extreme wind, lightning, tornado, hazardous materials incidents, power outages, and terrorist events. Limited structural damage is expected from drought, extreme heat, and power outages. **Table 34** shows critical facility vulnerability to hazards with defined boundaries, including regulatory floodplain, landslides, wildfire, and dam failure. Critical facilities not within defined boundaries still carry some potential hazard risk. For the table below, X's signal that a critical facility is located within a hazard's geographic boundary, and the numbers in parentheses indicate the number of structures located within the hazard area. For instance, (85) under HUD House/Wildfire means that there are 85 HUD Houses within the Wildland-Urban Interface.

Name	1.0- percent ACF*	Landslides (Deep- Seated)	Wildfire (WUI)	Dam Failure (Breach)
Chemehuevi Housing Authority			x	X
Chemehuevi Vallev Airport				
Chemehuevi Valley Elementary School				
Colony Houses	X (1)	X (1)	X (23)	X (23)
Community Center			X	X
Conservation Office			Х	Х
Cultural Center			Х	
Educational Training Center			Х	
Environmental Services			Х	
Former Havasu Landing Casino	Х	Х		Х
Fire Station		Х		
Fuel Tanks			Х	Х
Hardware Store and Fuel Pumps			Х	Х
Havasu Landing Market		Х	Х	Х
Head Start Center			Х	
Health Clinic			Х	
HUD House		X (2)	X (85)	X (70)
HUD Pump Station			Х	Х
Multipurpose Gym			Х	
New Havasu Landing Casino and Hotel	Х		Х	Х
Nüwüvi Park Meeting Hall			Х	Х
Quail Trail Apartments			X (3)	X (1)
Real Estate Planning Office			Х	
Resort Administration			Х	Х
Resort Water Tank				
Senior Complex			Х	
Sheriff Housing				
Storage Warehouse			Х	Х
Surveillance Office				Х

Table 34 Critical Facility Potential Risk Analysis

Name	1.0- percent ACF*	Landslides (Deep- Seated)	Wildfire (WUI)	Dam Failure (Breach)
Tribal Administration			Х	
Utility Water Building				
Water Tank 1				
Water Tank 2				
Well, East				
Well, West				

*ACF: Annual Chance Floodplain

Priority Risk Index Results

The PRI results are presented in **Table 145**, from the highest scoring hazard to the lowest. This information was used to rank hazards, as presented in **Table 36**.

	Category/Degree of Risk					
Hazard	Probability	Impact	Spatial Extent	Warning Time	Duration	PRI Score
Power Outage	Highly Likely	Catastrophic	Large	< 6 hours	< 1 week	3.9
Extreme Heat	Highly Likely	Catastrophic	Large	6 to 12 hours	< 1 week	3.8
Extreme Wind	Highly Likely	Critical	Large	6 to 12 hours	< 24 hours	3.4
Dam Failure	Unlikely	Catastrophic	Large	< 6 hours	< 1 week	3.0
Drought	Highly Likely	Minor	Large	> 24 hours	> 1 week	2.8
Flood	Likely	Critical	Small	< 6 hours	< 24 hours	2.8
Wildfire	Possible	Critical	Moderate	6 to 12 hours	< 1 week	2.7
Hazardous Materials Incident	Likely	Limited	Moderate	< 6 hours	< 24 hours	2.7
Landslide	Possible	Critical	Small	< 6 hours	< 6 hours	2.4
Terrorism and Similar Criminal Activities	Unlikely	Catastrophic	Small	< 6 hours	< 6 hours	2.4
Earthquake	Possible	Limited	Moderate	< 6 hours	< 6 hours	2.3
Tornado	Possible	Limited	Small	< 6 hours	< 6 hours	2.1
Lightning	Likely	Minor	Negligible	< 6 hours	< 6 hours	1.9
Extreme Cold	Possible	Minor	Moderate	> 24 hours	< 24 hours	1.8

Table 135 Summary of PRI Results for the Chemehuevi Reservation

Hazard Ranking

The ranking of hazards was based on the PRI results and local knowledge. These were then reviewed by Tribal officials. Rankings are presented in **Table 156.**

Ranking	Hazard Ranking
HIGH HAZARDS	 Power Outage Extreme Heat Extreme Wind Dam Failure Flood Wildfire
MODERATE HAZARDS	 Drought Hazardous Materials Incidents Landslides Terrorism and Similar Criminal Activities Lightning
LOW HAZARDS	 Tornado Earthquake Extreme Cold

Table 146 Ranking of Hazards

Key Points on Hazard Vulnerability

In summary, all of the hazards addressed in this plan pose a threat to the Chemehuevi Reservation, including the assets and population within. There are several factors that influence vulnerability, including building construction type, date of construction, social factors, time of occurrence, and capacity to respond, for example. The greatest hazards of concern to the Chemehuevi Reservation are power outages, extreme heat, extreme wind, dam failure, flooding, and wildfire.

Based on the risk and vulnerability assessment analysis and input from the community, key points on vulnerability to inform the mitigation strategy are highlighted below.

Ranking	Key Points
	Power Outage. Extreme temperatures on the Reservation mean that power outages can have severe, even fatal, impacts, potentially requiring evacuations and rescues. The Reservation's isolated location and lack of redundancy in the power distribution network increase vulnerability to this hazard.
	Extreme Heat. Extreme heat events already have a significant health impact, and can exacerbate drought and wildfire. Extreme heat events coinciding with power outages have catastrophic potential for the Tribe. With climate change, extreme heat days could increase to 74 days from a baseline of four days by

Table 157 Key Points on Hazard Vulnerability

Ranking	Key Points
	2099, meaning 20% of the year would consist of extreme heat days on the Reservation.
	Extreme Wind. Damaging wind events are a regular occurrence in the planning area. Taking precautions to secure structures can reduce damages and the threat to life and safety.
	Dam Failure. While a failure event is very unlikely, a failure of the Hoover Dam would result in cascading failures at Davis Dam and Parker Dam, having catastrophic impacts on the Reservation.
	Flood. The Chemehuevi Reservation's topography is characterized by dry washes that are prone to flash flooding during heavy rainfall events. The segment of Interstate 95 used to access the Reservation is prone to flooding. Five of the Tribe's assets, including three critical facilities, are within the FEMA 1.0% annual chance floodplain. The remainder of the Reservation is in an area designated as having undetermined flood hazards (Zone D). Flood insurance is available in Zone D.
	Wildfire. Wildfires occur on the Reservation as small brushfires. The Colonies community and lands surrounding Catfish Bay are most prone to brushfires.
	Drought. Extended drought has and will continue to have severe consequences for the Reservation. Since 2000, some level of drought has occurred every year: droughts may be trending towards a long-term issue rather than occasional occurrence.
MODERATE HAZARDS	Hazardous Materials Incidents. While the Chemehuevi Reservation is not within highway or fixed-site impact areas, the Reservation is vulnerable to releases from facilities upstream on the Colorado River, as well as incidents on surrounding highways (such as Interstate 95) that could impact access.
	Landslides. Parts of the Chemehuevi Reservation are considered vulnerable to deep-seated landslides. However, the Tribe does not have a history of experiencing landslides. Aside from assets located within susceptible areas, utility lines and roadways can be impacted by landslides and debris flows, impacting water, sewer, and power services, as well as access on and off the Reservation.
	Terrorism and similar criminal activities. The Reservation does not have a history of terror events or cyber attacks. Busy places on the Reservation, such as the casino or market, could be targeted for terrorism or similar criminal activities, and systems storing sensitive personal information, such as Tribal Administration or the Health Clinic, may be targeted for cyber attacks.
	Lightning. The Chemehuevi Reservation and its assets are located in an area that receives 0.75 to 3 lightning strikes per year. Damages, deaths, and injuries from lightning strikes are possible due to their infrequent and unpredictable occurrence (and limited public awareness).
	Tornado. The Chemehuevi Reservation does not have a history of tornado events, but is prone to microbursts.
LOW HAZARDS	Earthquake. Given its distance from major fault lines and historic earthquakes with magnitudes above a 5.0, as well as the peak ground acceleration values

Ranking	Key Points
	for the planning area (8%g or under), an earthquake impacting the Reservation would likely result in minor structural damages and/or minor injuries.
	Extreme Cold . Extensive damages from cold/freeze events are unlikely to have significantly impact on the Chemehuevi Reservation or its assets.

In the following sections, a mitigation strategy to reduce the risks to current and future populations and structures will be presented.

Chapter 5. Capability Assessment

The capability assessment identifies the strengths and weaknesses of the Tribe in mitigating risks. It serves as the foundation for designing an effective hazard mitigation strategy. It not only helps establish the goals for the mitigation plan, but also ensures that those goals are realistically achievable under local conditions.

The capability assessment looks at the Tribe's pre- and post-disaster hazard management capabilities as well as financial resources. Government departments, first responders and regional resources were each considered. The Chemehuevi Reservation is prone to power outages, extreme heat, extreme wind, dam failure, flood, and wildfire. All residents, employees, and visitors are subject to these hazards. While residents and employees may be aware of these hazards, many visitors are not. The Tribe has made an effort to build responsibly and to mitigate risk. For instance, the new casino includes pervious surfaces, and the Tribe put a generator and solar panels on the Community Center. The remainder of this chapter details the Tribe's pre- and post-disaster capabilities.

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)]

Planning and Regulatory Capabilities

Planning and regulatory capabilities are the plans, policies, codes, and ordinances that prevent and reduce the impacts of hazards. The Tribe does not have many formal plans in place, and none that relate directly to hazard mitigation. They do adhere to sound building practices. The table below lists many of these types of plans and information about the Tribe.

Tools/Program	Status	Effect on Loss Reduction
Master Plan	Over 10	Does contain information relevant to economic and zoning.
	years old	
Capital	No	However, the new casino/hotel and new Marina Market were all
Improvements or		built with hazard mitigation in mind.
Economic		
Development		
Emergency	No	The Tribe does not have a specific Emergency Operations Plan.
Operations Plan		However, the Fire Department has one. The Tribe did participate
		in an evacuation drill with the local school. Evacuation locations
		are the Airport and the Community Center. However, routes are
		not designated. Signage does not exist directly people to high

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Table 38	Existing	plans	and	informatic)n

Tools/Program	Status	Effect on Loss Reduction
		ground areas or to evacuation areas. These have been included as
		mitigation actions.
Transportation	No	There are few roads on the Reservation and most people travel by
Plans		personal vehicle.
Housing Plans and	No	The Tribe would like to increase the amount of available housing
Zoning Ordinances		on the Reservation. The old Master Plan includes some
		ordinances, but they can be changed at will.
Building Codes	Yes	California Building Codes were recently adopted.
Natural Hazard	Yes	The Tribe follows County ordinances — for instance, EPA No Burn
Ordinances		Days. However, homeowners can do whatever they want.
Maintenance	Yes	Washes throughout the Reservation function as natural culverts.
Programs		The Tribe does not have a regular schedule for maintenance.
		Usually, washes are maintained as grant funding is secured. The
		new casino does include a new road designed for water to run
		under it.

Administrative and Technical Capabilities

These include staff, their skills, and tools that can be used for mitigation planning and to implement specific mitigation actions. The table below details many staff positions and how they relate to pre- and post-disaster capabilities.

Staff/Personnel	Comments				
Resources					
Conservation	The Conservation Department is responsible for:				
Department	 Fishing/Hunting/Camping/Off-road Licenses/Permits 				
	Humane Animal/Wildlife Control				
	Conservation of Cultural Resources				
	Rattlesnake Capture and Release				
	Environmental Protection and Cleanup				
Environmental	The Chemehuevi People have always tried to pursue sustainable development				
Department	without jeopardizing the environment. The Tribe's most valuable resource is				
	their people, followed by their need for clean, unpolluted water and unpolluted				
	land. The protection of the land and water resources is a high priority for the				
	Chemehuevi people.				
	The Tribe is vehemently interested in preserving and improving the environment.				
	The environmental elements of earth, air, fire and water are the core of the				
	Chemehuevi Environmental Plan. Through the environmental education				
	program, the community, young and old alike, are taught to respect Mother				
	Earth. Curriculum materials are distributed to the Education Department and the				
	Chemehuevi Head Start Program.				
	Watershed protection policies are being developed through the EPA CWA (Clean				
	Water Act) grant. The Tribe employs staff such as the Water Quality Technician				
	to continuously monitor surface water.				

Table 39 Staff responsibilities

Staff/Personnel	Comments			
Resources				
	The Non-Point Source Division under the Clean Water Act eradicates the invasive species and works to restore native vegetation and eliminate non-native plants that add unwanted salts to soils along our shoreline. These salts contribute to increased salinity of river and ground water. The Environmental Programs Department will continue to strive and ensure that systems and processes are in place to protect fragile ecosystems via education of youth and development of infrastructure and capacity among members. The Chemehuevi People exist in a fragile environmental balance of the Natural World, needing economic development for financial security of the Tribe, but not willing to achieve it at the cost of damage to water, air, or Mother Earth. ⁸⁹ The Environmental Department has assumed the lead for the development and implementation of the hazard mitigation plan. They also function as the Emergency Manager for the Tribe. They have the only GIS ability on the Reservation and do not maintain any specific hazard data. They would like to increase their GIS capacity, and have included this in the list of mitigation actions.			
Historian/Cultural Advisor	The Cultural Center and Museum assume this role for the Tribe.			
Financial or Grants Specialist	The Environmental Department assumes the responsibility for applying for all grants related to hazard mitigation. They have successfully secured grants, including one from FEMA for developing this Hazard Mitigation Plan.			
Administrative Staff	The Tribal Council and the Executive Committee function as leadership for the Tribe.			
Indian Health Service	A Tribal employee runs the Indian Health Service.			
Warning Systems	The Tribe wants to adopt Reverse 911, and has added this as a mitigation action. There is one siren, located at the Fire Department, to alert people to an emergency; however, it cannot be heard everywhere on the Reservation. Acquiring an additional siren has been added to the list of mitigation actions.			
MOUs	The Environmental Department approached several first responders in Havasu City about forming an MOU. The agencies do assist each other as necessary. The City was not interested in a formal agreement because of the Tribe's limited capacity to provide assistance.			
Mitigation Committee	The Environmental Department leads the Hazasu Lake Emergency Planning group. This group was in effect prior to the development of the Hazard Mitigation Plan. It was expanded to meet the needs of the planning process and will remain in effect to implement the Hazard Mitigation Plan.			

Education and Outreach Capabilities

Part of this plan is to identify education and outreach programs and methods already in place that could be used to implement mitigation activities and communicate hazard-related information. The table

⁸⁹ <u>http://www.chemehuevi.net/environmental-department/</u>

below defines several education and outreach programs that relate to hazard mitigation or emergency management.

Program or Organization	Comments			
School Programs	The Tribe participates in activities organized by the school. In			
	addition, the Tribe organized an evacuation drill at the school.			
Fire Safety	The Fire Department does not run any specific education or outreac			
	programs on the Reservation.			
Tribal Programs	The Tribe does not have specific disaster-related education or			
	outreach efforts. However, they are interested in implementing			
	these types of programs, and have included several mitigation			
	actions related to education and outreach in the plan.			

Financial Capabilities

Considering financial capabilities illustrates the Tribe's ability to generate funds for mitigating risk. The Tribe has received several grants in the past related to mitigation, including an EPA Grant, a Water Quality Grant, a BIA Noxious Weed Abatement grant, a General Assistance Program grant, and a California Homeland Security Grant. The Homeland Security Grant was used to purchase emergency radios, and the Tribe is hoping to secure this grant again so they can expand the coverage of the radios to the whole Reservation. Tribal members receive per capita funds from gaming and enterprise revenue. The Tribe relies on grant funding for many of mitigation actions it wants to implement.

National Flood Insurance Compliance

The Chemehuevi Indian Tribe does not participate in the National Flood Insurance Program. If they did participate, the Environmental Department would probably lead the effort and designate a person as the Floodplain Administrator. This would stress staff who already have a full workload, and not necessarily provide tremendous benefit to the Tribe. Areas of flooding tend to impact roadways more than homes.

Summary of Findings

The Environmental Department is working closely with Tribal Leadership, the help, and members of the Reservation community to make everyone aware of hazard risks and to mitigate them. Support for this planning process and for mitigating risk on the Reservation has been high, as is seen by participation in the survey and the public meetings held for the development of this plan. The Tribe has proven success at seeking and receiving grant funds, and needs to continue these efforts. The new casino and hotel are indicative of the Tribe's commitment to hazard mitigation, as evidenced by how they raised the road to avoid flooding and put pervious surface in the parking lot.

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 the result of multiple meetings and thorough public outreach. The work of the HLEP was essential in developing the mitigation goals and actions included in this chapter. As described in Chapter 3: Planning Process, the HLEP worked in a consistent, coordinated manner to identify and prioritize the goals and mitigation actions for this Plan.

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)]

The Tribe receives funding from the casino and gas station as well as from grant funding. All of the identified mitigation actions in the following chapter have pre-identified funding sources. The Tribe relies on grant funding for their sustainability. Grant funding covers some staff positions in addition to project funding. The Tribe received a FEMA grant for the development of this Hazard Mitigation Plan and relies on future funding to update the plan.

Potential Sources of Funding

The following paragraphs detail the sources of funding from FEMA and other government, tribal, and private sources of funding the Tribe is eligible to apply for.

FEMA Funding Sources

FEMA recognizes a nation-to-nation relationship with tribal governments. FEMA's Hazard Mitigation Assistance program offers three grants that provide funding for mitigation projects. These three projects are described below. More information about each of these projects is available online at www.fema.gov/hazard-mitigation-assistance or by contacting FEMA Region IX.

- 1. The Hazard Mitigation Grant Program assists in implementing long-term hazard mitigation planning and projects following a Presidential declaration of major disaster.
- 2. The Pre-Disaster Mitigation Grant Program provides funds for hazard mitigation planning and projects on an annual basis.
- 3. The Flood Mitigation Assistance Grant Program provides funds for planning and projects to reduce or eliminate risk of flood damage to buildings that are insured under the National Flood Insurance Program (NFIP) on an annual basis.^{*}

^{*} Note: At the time this plan was developed, the Chemehuevi Indian Tribe does not participate in the National Flood Insurance Program.

Additional Funding Sources

The table below lists additional funding sources.

Table 41 Additional funding sources				
Potential Funding Sources	Types of Mitigation Actions/Projects			
Federal funding				
Bureau of Indian Affairs	If the Tribe is federally recognized, they are viewed by DHS-FEMA and the state as a federal entity.			
Bureau of Land Management (BLM)	Manages large tracts of BLM land in the western U.S. Much of it is leased to mining and ranching interests; some recreation.			
Community Assistance Program (for NFIP)	Supports state floodplain management program through the office of the State NFIP Coordinator.			
DHS FEMA Cooperating Technical Partners	FEMA designation for state and local government entities that allows state/local proactive matching for Risk MAP digital flood plain and coastal mapping and flood studies.			
Emergency Management Performance Grant	Planning, equipment, education and outreach for state and local emergency management agencies.			
Federal Housing Administration	Variety of housing programs, usually delivered through state housing departments or authorities.			
Fire Management Assistance Grant Program	Supports state and local firefighting resources.			
Homeland Security Grant Program	Planning, equipment, education and outreach for state, local, and UASI entities.			
HUD Community Development Block Grants (CDBG)	Mirrors HMGP; requires congressional budget allocation (usually after catastrophic events). Usually used to match FEMA HMGP grants as well as support housing mitigation projects deemed not cost-beneficial.			
HUD Disaster Supplemental Funds	Housing, infrastructure. Can be directed at specific housing groups such as the elderly, low income, etc.			
National Dam Safety Program	Supports state dam safety engineers to inspect dams per state/federal dam regulations.			
NOAA National Weather Service	National weather monitoring service. Operates Miami National Hurricane Center. SLOSH modeling and training at NHC. Hurricane and TD advisory systems based on instrumentation and hurricane hunter data. Operates system of stations across the country that collect data, verify tornadoes, participate on state emergency weather conference calls. Repository of National Climatic Data Center weather record.			
Sustainable Communities Initiative (DOT, HUD, EPA)	Post-disaster redevelopment Infrastructure restoration/hardening			
U.S. Army Corp of Engineers	Operates Silver Jackets program, providing technical assistance to states. Dam/levee operation. Post-disaster federally-assigned missions, including debris management. GIS and Modeling: debris, floodplain, coast (SLOSH, surge zones). Watershed-based "plans" and solutions Flood prevention analysis, plans, and options. Used to sponsor some acquisition, demolition, and elevation projects. Section 203 Tribal Partnership Program			
U.S. Small Business Administration	Post-disaster loans for property owners and businesses for repair and mitigation in counties with SBA declarations.			

Potential Funding Sources	Types of Mitigation Actions/Projects
USDA Natural Resources	Post-disaster Emergency Watershed Program (stream and river damage
Conservation Service	assessment and restoration). This is usually a post-disaster
	Congressional Allocation. Dam Safety/Levee technical assistance;
	General Agricultural Technical Assistance.
USDA U.S. Forest Service	Prime agency for wildfire suppression. National Forest may be used for
	timber, recreation, fishing and hunting. These funds do support wildfire
	suppression.
USGS	Post-disaster high water mark and other perishable data collection
	through FEMA federal agency cooperative agreements. Operates a
	coastal monitoring system as well as riverine gauging system. Mapping
	and GIS.

State/Local funding: if the Tribe is eligible, they may apply for the following programs.

Capital Investment Programs	State-specific programs with specific spending goals/initiatives.
Community Economic Development departments	State or local entity for sponsorship of FEMA and other housing programs. Varies per state and county.
Natural Resource, Environmental, Agricultural Departments	State-specific organizations that generally house State NFIP Coordinator (about half are with state EM departments); water pollution, recreation, forestry, agriculture, dam safety (some are also with EM departments); recreation and wildlife habitat; and hunting/fishing agencies.
Smart Growth Management Departments	Some progressive state and local governments have instituted these departments to assure new development or redevelopment adheres to sustainability principles. These can extend beyond LEED to protection of natural resources, and are often overlaid to floodplain, coastal and wetland protection.
State Emergency Management/Public Safety Departments	Varies from state Governor/cabinet level to a state department/division of Homeland Security and Emergency Management. The agencies provide technical assistance and funding for: preparedness Planning (state and local); COOP repository for state agencies/universities/colleges); operating EOCs; disaster and mitigation services; hazardous materials response and training; grants management; post-disaster, pre-disaster mitigation, DHS, state EM, EMPG.
State programs to improve stormwater and water/wastewater systems	Regional stormwater management facilities to address volume of water, usually for a one- or two-year storm event. These have become more prescriptive for water pollution control since the 1988 Clean Water Act Reauthorization.
State programs to improve utilities	Usually a revolving loan fund (pass-through from EPA, sometimes state funds added) for water treatment and sewage treatment upgrades. Can include mitigation.

Non-governmental funding

American Red Cross	Post-disaster victim support: sheltering, food, clothing, medicine,		
	cleaning supplies.		

Potential Funding Sources	Types of Mitigation Actions/Projects
Private businesses	COOP Plans; disaster insurance or self-insured (risk spread across all assets); emergency operations plans; corporate emergency management support to state and FEMA: Target, CVS, Walgreens, LOWES, Home Depot for event-specific donations of materials, services and funds
Public utilities/Private utilities	COOP Plans (which can include generators); different emergency preparedness requirements per state Corporation commission or other entity requirements; usually self-insured; some have EOPs and exercise: nuclear plants required by NRC; private utilities eligible for PA (Section 406 mitigation), HMGP 404
Salvation Army	Post-disaster victim support: sheltering, food, clothing, medicine, cleaning supplies

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)]

The Mitigation Goal Statements are a direct result of the identification of the biggest hazards and vulnerabilities to the Tribe and the reservation. They represent solutions to problems identified through the risk and capability assessments and through stakeholder engagement. The key issues or problems identified were:

- Power outages
- Communication
- Emergency management capacity

Based on these issues, the following four goal statements were developed:

- 1. Protect people, property, and natural and cultural assets from natural hazards through climate adaptation and hazard mitigation actions.
- 2. Implement systems to combat the impacts of power outages.
- 3. Expand capacity to communicate with people on the reservation before, during, and after a disaster.
- 4. Build the capacity of emergency management on the reservation to increase the tribe's resilience to natural hazards.

These goals represent what the Tribe hopes to achieve with implementation of this mitigation plan. These goal statements are consistent with the goals of the California State Hazard Mitigation Plan and the San Bernardino County Multi-Jurisdictional Hazard Mitigation Plan (July 2017). These goals satisfy the Tribe's primary concerns for the safety of people on the reservation and the protection of their land and culture. Each of these goals is effective in mitigating the multiple hazards identified in this plan.

Mitigation Actions

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)]

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 of the mitigation actions are classified into one of four categories: Local Plans and Regulations, Structure and Infrastructure Projects, Natural Systems Protection, and Education and Awareness Programs. These categories are shown in Figure below, and are taken from FEMA's Tribal Mitigation Planning Handbook.⁹⁰ The consulting team shared these definitions with the HLEP to educate them about the different types of mitigation actions that are possible.

1.	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.		
2.	Structure and Infrastructure	Modifying existing structures and infrastructure or constructing new structures to reduce the impact of hazards.		
3.	Natural Systems Protection	Minimize losses while reserving or restoring the function of natural systems.		
4.	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.		

Types of Mitigation Action

Figure 55. Mitigation action categories

The mitigation actions developed for this plan are shown in the table below. They are sorted by goal, and each action includes a full description, the problem the action addresses, and whether the action protects a critical facility. The actions were developed by the HLEP and are based on tribal objectives, as well as problems identified in the risk assessment. All actions developed for this plan are included in Table 42 below and are sorted according to goal.

⁹⁰ Tribal Mitigation Planning Handbook, page 33.

Action #	Action	Problem Addressed	Action Description	Critical Facility Protected?			
Goal 1. through	Goal 1. Protect people, property, natural and cultural assets from natural hazards through climate adaptation and hazard mitigation actions.						
1	Add a water tower to the Reservation.	Drought, Earthquake, Flood, Power Outage	The Reservation currently has two water towers, but a third is necessary to meet the needs of an increasing population. The added water tower would benefit the expected increase in visitors to the reservation and increase emergency water storage capacity.	Yes			
2	Conduct a study to determine ways to mitigate risk to the road that serves as the only way on and off the Reservation (other than ferry service). This would need to include a designated space to safely cross the wash. Implement feasible recommendations.	Dam Failure, Earthquake, Flood, Wildfire	Improving the resiliency of the one road on and off the Reservation improves the resiliency of the Reservation by giving people a safe way on and off the Reservation.	Yes			
8	Add a secondary road off of the Reservation.	Dam Failure, Earthquake, Flood, Wildfire	The only way to leave the Reservation is via the one road or via ferry. The road becomes flooded during heavy rain events. The Tribe would benefit from a second route. The road becomes flooded during heavy rain events.	Yes			
9	Renovate airport.	Dam Failure, Earthquake, Flood, Hazardous Materials Incidents, Power Outage, Terrorism, Tornado, Wildfire	The airport runway was recently improved by removing debris and tumbleweeds. There are no functional buildings at the airport. Adding a building that could be used as an Emergency Operations Center, cooling center, and pre-staging equipment site would be a great benefit to the Tribe. The airport is on	Yes			

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Action #	Action	Problem Addressed	Action Description	Critical Facility Protected?
			high ground and would not be impacted by catastrophic flooding. It is a natural muster area. Having the airport accessible to air traffic would facilitate disaster response not only to the Tribe, but to the region. A functioning airport could be used by people to charter flights into to visit the reservation. This could benefit the Conservation Department if new hunting/fishing opportunities on the Reservation were advertised.	
24	Develop and maintain fire breaks in the South End to protect the Resort.	High Winds, Wildfire	If the wash along the South End of the Resort were to catch fire, multiple homes would be in danger. Firebreaks are created to reduce flammable materials to protect homes and infrastructure. In addition to building the firebreaks, a plan needs to be developed to maintain them.	No
25	Create riparian areas to prevent flooding west of developed areas of the reservation.	Flood	Creating riparian areas will prevent flooding on the reservation.	Yes
26	Join the FireWise program.	Wildfire, High Winds	The National Fire Protection Association (NFPA) Firewise USA program teaches people how to adapt to living with wildfire and work together to take action and prevent losses.	Yes
27	Develop a brush-clearing program to protect wildland urban interface areas defined as intermix. These include the	Wildfire, High Winds	Wildland Urban Interface areas defined as intermix are the most prone areas on the reservation to wildfires. The	Yes

Action #	Action	Problem Addressed	Action Description	Critical Facility Protected?
	Colonies, North and South Valley Mesa Road and Catfish Bay.		Tribe will develop a plan to clear brush in these areas.	
Goal 2.	Implement systems to combat the	ne impacts of pow	er outages.	
10	Buy and install a generator and solar battery backup for the gym so it can be used as a shelter.	Earthquake, Extreme Winds, Extreme Cold, Flooding, Lightning, Tornadoes, Power Outage	The gym is considered a critical facility. It already has a kitchen and bathrooms. The addition of a generator would make it an ideal shelter.	Yes
11	Add generators and solar battery backup to sewage lift stations that do not have them.	Power Outage	Only one water pump has backup power. Having backup power on both pumps ensures that water will not be limited during a power outage. Solar energy at the water pumps would reduce their energy consumption even in non- emergencies.	Yes
12	Add a generator to the East Well so water may be delivered during a power outage.	Power Outage	At the present time, only one well has a generator. The water tanks can hold water for about three days and this will ensure it can be distributed.	Yes
19	Add generators to the department buildings that do not have them, including the EPA Department and Administration Building.	Power Outage	Having backup power will ensure that government operations continue during a power outage.	Yes
20	Add backup power for gas station pumps.	Power Outage	There is only one place on the Reservation to access gasoline, and it should be accessible during power outages. This would allow the Tribe to operate normally during extended power outages. Keeping the casino generators and the ferry	Yes

Critical Action Problem Action **Action Description** Facility # Addressed Protected? running are critical to the economic stability of the Tribe. 21 Collect data regarding power **Power Outage** Collecting data regarding the Yes impacts of power outages outage impacts. and other disasters will assist the Tribe to justify the cost of mitigation actions by making Benefit Cost Analysis (BCA) possible to estimate. 23 Add a generator to the school **Power Outage** This will ensure the school Yes can remain open during a building. power outage and function as a shelter or a warming/cooling center. A project at the school could be used as an outreach opportunity to teach students about emergency preparedness. Goal 3. Expand capacity to communicate with people on the reservation before, during, and after a disaster. 6 Build a tribal radio station. Dam Failure, Communication on the No Earthquake, Reservation is challenging Extreme Heat, due to a lack of options. A Extreme Winds, Tribal radio station would Flood, Hazardous enable to the Tribal Materials Government to make Incidents, announcements before, during, and after a disaster. It Landslides, Power Outage, would also serve as a Terrorism, mechanism for education. It Tornado, Wildfire could notify casino and hotel visotors about emergencies and current events such as HLEP meetings, the Earth Day Celebration, and cultural holidays. 7 Expand the warning siren Dam Failure, The one siren on the No system on the Reservation to Flood, Tornado, Reservation is located near alert people to disasters, Wildfire the firehouse. The sound especially a dam breach. does not reach the central

Critical Action Problem Action **Action Description** Facility # Addressed Protected? parts of the Reservation, including the HUD homes. Purchase a couple of LED signs Dam Failure, 14 LED signs can be updated No that can be used pre- and post-Earthquake, easily and remotely. These Extreme Heat, disaster to inform guests and signs give the Tribe the those on the reservation of Extreme Winds, opportunity to quickly and easily keep the public and current events. Flood, Power residents informed of current Outage, Terrorism, hazards. Tornado, Wildfire 15 Develop a flyer to distribute to Extreme Heat. Many people who visit the No visitors to the Reservation Extreme Winds, Reservation are unaware of informing them of heat Power Outage, conditions here. A flyer advisories, the emergency Wildfire educating them about radio station, and current potential dangers on the events. Reservation and how they can protect themselves is necessary. With the opening of the new casino, the Tribe is acutely aware of their increased responsibility to guests. This project is cost effective and fits well with the priorities of the Tribal Council. 17 Identify vulnerable individuals Dam Failure, The Tribe lacks a formal list No and populations on the Earthquake, of citizens/residents with Reservation. Extreme Cold, functional needs who may be Extreme Heat, particularly at risk during a Extreme Winds, disaster. According to the Flood, Hazardous HELP, a significant Materials percentage of elders are Incidents, diabetic according to the HLEP. A study needs to be Landslides, Lightning, Power conducted to identify these Outage, Tornado, people and a system Wildfire developed to maintain the list. The list would be shared with first responders, particularly the Fire Department. 28 Improving the capacity of **Encourage Reservation** Dam Failure, Yes residents to improve their residents to mitigate risk to Earthquake,

Action #	Action	Problem Addressed	Action Description	Critical Facility Protected?
	household preparedness by educating them on how to prepare for hazards as well as how to manage hazards on the Reservation.	Extreme Winds, Flood, Hazardous Materials Incidents, Landslides, Lightning, Power Outage, Terrorism, Tornado, Wildfire	their property and be self- sufficient during a disaster increases the resilience of the Tribe.	
Goal 4. Build the capacity of emergency management on the reservation to increase the tribe's resilience to natural hazards.				
3	Develop a Tribal police force.	Terrorism, Power Outage	The San Bernardino County Police are slow to reach the Reservation. A faster response is needed, especially with the opening of a larger casino and hotel. Some staff should attend the BIA training to get certified to carry weapons. It would be helpful to have armed security at the casino and the hotel. Casino and resort security could benefit from increased training. The Tribe does recognize that it is under Public Law 208.	No
4	Develop and implement a system to number and label all streets and homes on the Reservation.	Dam Failure, Earthquake, Extreme Winds, Flood, Hazardous Materials Incidents, Landslides, Lightning, Power Outage, Terrorism, Tornado, Wildfire	Homes and streets on the Reservation are not labeled, making it extremely challenging for first responders to locate callers. In many instances, local names differ from those on Google Maps. A system needs to be developed that includes naming all beaches. In the future, this could be used to increase mail delivery capacity on the Reservation.	Yes
5	Improve radio communication for essential staff and first responders.	Dam Failure, Earthquake, Extreme Heat,	The current radio system lacks range and does not function adequately for	No

Critical Action Problem Action **Action Description** Facility # Addressed Protected? Extreme Winds, internal operations. The Flood, Hazardous system needs to be Materials expanded with additional Incidents, equipment, including Landslides, repeater towers. With enough channels, the radios Power Outage, Terrorism, can also be used by all Tornado, Wildfire departments for daily operations. 13 Expand CERT on the Dam Failure, Casino and resort security No Reservation by training Earthquake, could participate in training. additional volunteers and Extreme Heat. increasing training offerings on Extreme Winds, the Reservation. Flood, Landslides, Lightning, Power Outage, Tornado, Wildfire 16 **Develop Memorandums of** Dam Failure, The MOUs could include No Understanding with adjacent various types of disaster Earthquake, tribal governments to offer Extreme Heat, assistance. shelter to elders during a Extreme Winds, disaster. Flood, Hazardous Materials Incidents, Landslides, Power Outage, Terrorism, Tornado, Wildfire 18 Purchase a vehicle to use Dam Failure, Some seniors and others on No during evacuations. Earthquake, the Reservation do not have Flood, Power cars. A vehicle with four-Outage, wheel drive is necessary to pick people up and move Terrorism, Tornado, Wildfire them to safety during disasters. 22 Update the infectious Infectious Updating these supplies No disease/contamination trailer Disease increases the resiliency of the with current supplies. Tribe and gives the CERT team training supplies.

Types of Mitigation Action

The Tribe worked to identify actions for each of the four types defined above. In addition, they considered mitigating risk to all of the hazards identified. The table below is sorted by action type and includes the hazards addressed for each action.

Action #	Table 43 Mitigation actions sort Mitigation Action	ed by type Hazards Addressed		
Plans and Regulations				
2	Conduct a study to determine ways to mitigate risk to the road that serves as the only way on and off the Reservation (other than ferry service). This would need to include a designated space to safely cross the wash. Implement feasible recommendations.	Dam Failure, Earthquake, Flood, Wildfire		
3	Develop a tribal police force.	Terrorism, Power Outage		
4	Develop and implement a system to number and label all streets and homes on the Reservation.	Dam Failure, Earthquake, Extreme Winds, Flood, Hazardous Materials Incidents, Landslides, Lightning, Power Outage, Terrorism, Tornado, Wildfire		
16	Develop Memorandums of Understanding with adjacent tribal governments to offer shelter to elders during a disaster.	Dam Failure, Earthquake, Extreme Heat, Extreme Winds, Flood, Hazardous Materials Incidents, Landslides, Power Outage, Terrorism, Tornado, Wildfire		
17	Identify vulnerable individuals and populations on the Reservation.	Dam Failure, Earthquake, Extreme Cold, Extreme Heat, Extreme Winds, Flood, Hazardous Materials Incidents, Landslides, Lightning, Power Outage, Tornado, Wildfire		
21	Collect data regarding power outage impacts.	Power Outage		
26	Join the FireWise program.	Wildfire, High Winds		
Structure	and Infrastructure			
1	Add a water tower to the Reservation.	Drought, Earthquake, Flood, Power Outage		
5	Improve radio communication for essential staff and first responders.	Dam Failure, Earthquake, Extreme Heat, Extreme Winds, Flood, Hazardous Materials Incidents, Landslides, Power Outage, Terrorism, Tornado, Wildfire		
6	Build a tribal radio station.	Dam Failure, Earthquake, Extreme Heat, Extreme Winds, Flood, Hazardous Materials Incidents, Landslides, Power Outage, Terrorism, Tornado, Wildfire		

Action # **Mitigation Action Hazards Addressed** 7 Expand the warning siren system on the Dam Failure, Flood, Tornado, Wildfire Reservation to alert people to disasters, especially a dam breach. Dam Failure, Earthquake, Flood, 8 Add a secondary road off the Reservation. Wildfire 9 Dam Failure, Earthquake, Flood, Airport renovation. Hazardous Materials Incidents, Power Outage, Terrorism, Tornado, Wildfire 10 Buy and install a generator and solar battery Earthquake, Extreme Winds, Flooding, Lightning, Tornadoes, Power Outage backup for the gym so it can be used as a shelter. 11 Add generators and solar battery backup to Power Outage sewage lift stations that do not have them. 12 Add a generator to the East Well so water may be Power Outage delivered during a power outage. 18 Purchase a vehicle to use during evacuations. Dam Failure, Earthquake, Flood, Power Outage, Terrorism, Tornado, Wildfire 19 Add generators to the department buildings that **Power Outage** do not have them, including the EPA Department and Administration Building. 20 Add backup power for gas station pumps. Power Outage 22 Update the infectious disease/contamination **Infectious Disease** trailer with current supplies. 27 Develop a brush-clearing program to protect Wildfire, High Winds wildland urban interface areas defined as intermix. These include the Colonies, North and South Valley Mesa Road, and Catfish Bay. **Natural Systems Protection** Develop and maintain fire breaks in the South 24 High Winds, Wildfire End to protect the Resort. 25 Create riparian areas to prevent flooding west of Flood developed areas of the reservation. **Education and Awareness** 13 Expand CERT on the Reservation by training Dam Failure, Earthquake, Extreme additional volunteers and expanding training Heat, Extreme Winds, Flood, offerings on the Reservation. Landslides, Lightning, Power Outage, Tornado, Wildfire 14 Purchase a couple of LED signs that can be used Dam Failure, Earthquake, Extreme pre- and post-disaster to inform guests and those Heat, Extreme Winds, Flood, Power on the reservation of current events. Outage, Terrorism, Tornado, Wildfire 15 Develop a flyer to distribute to visitors to the Extreme Heat, Extreme Winds, Power Reservation informing them of heat advisories, Outage, Wildfire the emergency radio station, and current events. 28 Encourage Reservation residents to improve their Dam Failure, Earthquake, Extreme household preparedness by educating them on Cold, Extreme Winds, Flood, Hazardous Materials Incidents,
Action #	Mitigation Action	Hazards Addressed
	how to prepare for hazards as well as how to	Landslides, Lightning, Power Outage,
	manage hazards on the Reservation.	Terrorism, Tornado, Wildfire

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 HLEP 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 following point system and criteria were considered.

CRITERIA	POINTS	HIGH	POINTS	MEDIUM	POINTS	LOW
LIFE/ Safety impact	10	Significant impact on public safety for businesses, residents, properties	6	Direct impact on businesses, residents, properties	2	Minimal/negligible impact on businesses, residents, properties
ADMINISTRATIVE/ TECH ASSISTANCE	5	No additional staff or technical support needed to implement	3	Some administrative and technical support needed to implement	1	Significant administrative and technical support needed to implement
PROJECT COST	5	Low cost (<\$25,000)	3	Moderate cost (\$25,000-\$100,000)	1	High cost to implement (>\$100,000)
OTHER CONSIDERATIONS	5	Strongly supports/ advances other Tribal objectives	3	Supports other Tribal objectives to an extent	1	Does not support other Tribal objectives or policies

Figure 55 Point system for prioritization

Using the point system, the HLEP determined that high priority actions scored in the range of 19-25, medium actions had a score of 15-19, and low priority actions were between 9-14. The HLEP reviewed the list of prioritized actions several times. Consistent with a planning process that included qualitative and quantitative analysis, some actions scoring 19 were rated as high and some medium. The results of the scoring are included in Appendix E. The scoring system clarified the benefit-cost ratio of the projects and emphasized actions that significantly impact public safety. The Tribe and the HLEP 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 of the mitigation actions are shown below. The Environmental Department, Specifically the Deputy Director, Lex Koscielak is responsible for overseeing the implementation of all mitigation actions. In the future, the Tribe may work to share this responsibility with other departments.

1	Add a water tower to the Reserve	ation.	
Action Description	The Reservation currently has two water towers, but a third is necessary to meet the needs of an increasing population. The added water tower would not only benefit the expected increase in visitors to the Reservation but would increase emergency water storage capacity.		
	Problem Addressed	Emergency Management Capacity	
	Partners	Water Department, Planning	
	Cost	High	
Llink	Possible Funding Sources	EPA, FEMA, OES, Water Department	
nigri	Implementation Schedule	April 2020 - December 2024	
	Hazards	Drought, Earthquake, Flood, Power Outage	
	Critical Facility Protection	Yes	
	Type of Mitigation Action	Structure and infrastructure project	
2	Conduct a study to determine ways to mitigate risk to the road that serves as the only way on and off the Reservation, other than ferry service. This needs to include a designated space to safely cross the wash. Implement feasible recommendations.		
Action Description	Improving the resiliency of the one road on and off the Reservation improves the resiliency of the Reservation by giving people a safe way on and off the Reservation.		
	Problem Addressed	Emergency Management Capacity	
	Partners	Caltrans	
	Cost	Medium	
	Possible Funding Sources	FEMA, EPA, BOR, Caltrans	
High	Implementation Schedule	October 2021 - September 2023	
	Hazards	Dam Failure, Earthquake, Flood, Wildfire	
	Critical Facility Protection	Yes	
	Type of Mitigation Action	Local Plans and Regulations	
3	Develop a Tribal police force.		
Action Description	The San Bernardino County Police are slow to reach the Reservation. Quicker response is necessary, especially with the opening of a larger casino and hotel. Some staff should attend the BIA training that would certify them to carry weapons. It		

Table 44 All mitigation items

	would be helpful to have armed security at the casino and hotel. Casino and resort security could benefit from increased training. The Tribe does recognize that it is under Public Law 208.		
	Problem Addressed	Emergency Management Capacity	
	Partners	BIA, HLR, Casino	
	Cost	High	
Uiah	Possible Funding Sources	FEMA, OES, BIA	
nigii	Implementation Schedule	May 2020 - April 2022	
	Hazards	Terrorism, Power Outage	
	Critical Facility Protection	No	
	Type of Mitigation Action	Local Plans and Regulations	
4	Develop and implement a system to number and label all streets and homes on the Reservation.		
Action Description	Homes and streets on the Reservation are not labeled, making it extremely challenging for first responders to locate callers. In many instances, local names differ from those on Google Maps. A system needs to be developed that includes naming all beaches. In the future, this could be used to increase mail delivery on the Reservation.		
	Problem Addressed	Emergency Management Capacity	
	Partners	Housing, San Bernardino County, USPS	
	Cost	Low	
	Possible Funding Sources	FEMA, OES, BIA, SB County	
High	Implementation Schedule	March 2020 - December 2021	
	Hazards	Dam Failure, Earthquake, Extreme Winds, Flood, Hazardous Materials Incidents, Landslides, Lightning, Power Outage, Terrorism, Tornado, Wildfire	
	Critical Facility Protection	Yes	
	Type of Mitigation Action	Local Plans and Regulations	
5	Improve radio communication fo	r essential staff and first responders.	
Action Description	The current radio system lacks range and does not function adequately for internal operations. The system needs to be expanded with additional equipment, including repeater towers. With enough channels, the radios can also be used by all departments for daily operations.		

	Problem Addressed	Emergency Management Capacity
	Partners	All tribal departments
	Cost	Medium
	Possible Funding Sources	FEMA, OES
	Implementation Schedule	January 2020 - December 2022
nigi	Hazards	Dam Failure, Earthquake, Extreme Heat, Extreme Winds, Flood, Hazardous Materials Incidents, Landslides, Power Outage, Terrorism, Tornado, Wildfire
	Critical Facility Protection	No
	Type of Mitigation Action	Structure and infrastructure project
6	Develop a tribal radio station.	
Action Description	Communication on the Reservation radio station would enable the Tr during, and after a disaster. It wo would notify casino and hotel vising the HLEP meetings, the Earth Day	on is challenging due to a lack of options. A Tribal ibal Government to make announcements before, uld also serve as a mechanism for education. It tors about emergencies and current events such as Celebration, and cultural holidays.
	Problem Addressed	Communication
	Partners	FCC
	Cost	Medium
	Possible Funding Sources	FEMA, OES, FCC
Uish	Implementation Schedule	January 2024 - December 2025
ngn	Hazards	Dam Failure, Earthquake, Extreme Heat, Extreme Winds, Flood, Hazardous Materials Incidents, Landslides, Power Outage, Terrorism, Tornado, Wildfire
	Critical Facility Protection	No
	Type of Mitigation Action	Structure and infrastructure project
7	Expand the warning siren system especially a dam breach.	on the Reservation to alert people to disasters,
Action Description	The one siren on the Reservation reach the central parts of the Res	is located near the firehouse. The sound does not ervation, including the HUD homes.

	Problem Addressed	Communication	
	Partners	HLR and Casino, Planning, SB County	
	Cost	Medium	
	Possible Funding Sources	FEMA, OES, BOR	
nigri	Implementation Schedule	January 2023 - December 2023	
	Hazards	Dam Failure, Flood, Tornado, Wildfire	
	Critical Facility Protection	Νο	
	Type of Mitigation Action	Structure and infrastructure project	
8	Add a secondary road off the Res	servation.	
Action Description	The only way to leave the Reserva becomes flooded during heavy ra route.	ation is via the one road or via ferry. The road in events. The Tribe would benefit from a second	
	Problem Addressed	Emergency Management Capacity	
	Partners	Caltrans, BLM, Planning	
	Cost	Very High	
High	Possible Funding Sources	FEMA, OES, Caltrans, BLM	
Ŭ	Implementation Schedule	January 2024 - December 2025	
	Hazards	Dam Failure, Earthquake, Flood, Wildfire	
	Critical Facility Protection	Yes	
	Type of Mitigation Action	Structure and infrastructure project	
9	Airport renovation.		
Action Description	The airport runway was recently improved by removing debris and tumbleweeds. There are no functional buildings at the airport. Adding a building that could be used as an Emergency Operations Center, a cooling center, and pre-staging equipment site would be a great benefit to the Tribe. The airport is on high ground and would not be impacted by catastrophic flooding. It is a natural muster area. Having the airport accessible to air traffic would facilitate disaster response not only to the Tribe, but to the region. A functioning airport could be used by people to charter flights to visit the reservation. This could benefit the Conservation Department if new hunting/fishing opportunities on the Reservation were advertised.		
	Problem Addressed	Emergency Management Capacity	
High	Partners	FAA, SB county	

	Cost	Very High
	Possible Funding Sources	FEMA, OES, BIA, FAA, SB County
	Implementation Schedule	April 2020 - December 2024
	Hazards	Dam Failure, Earthquake, Flood, Hazardous Materials Incidents, Power Outage, Terrorism, Tornado, Wildfire
	Critical Facility Protection	Yes
	Type of Mitigation Action	Structure and infrastructure project
10	Buy and install a generator and s as a shelter.	olar battery backup for the gym so it may be used
Action Description	The gym is considered a critical fa addition of a generator would ma	cility. It already has a kitchen and bathrooms. The ke it an ideal shelter location.
	Problem Addressed	Power Outage
	Partners	Housing, Planning
	Cost	Medium
	Possible Funding Sources	FEMA, SCE
High	Implementation Schedule	April 2020 - May 2021
	Hazards	Earthquake, Extreme Winds, Flooding, Lightning, Tornadoes, Power Outage
	Critical Facility Protection	Yes
	Type of Mitigation Action	Structure and infrastructure project
11	Add generators and solar battery them.	backup to sewage lift stations that do not have
Action Description	Only one water pump has backup ensures that water will not be lim water pumps would reduce their	power. Having backup power on both pumps ited during a power outage. Solar energy at the energy consumption even in non emergencies.
	Problem Addressed	Power Outage
	Partners	Water Department, Planning
High	Cost	Low
	Possible Funding Sources	FEMA, SCE
	Implementation Schedule	January 2020 - December 2023

	Hazards	Power Outage
	Critical Facility Protection	Yes
	Type of Mitigation Action	Structure and infrastructure project
12	Add a generator to the East We	Il so water may be delivered during a power outage.
Action Description	At the present time, only one we for about three days; this will er	ell has a generator. The water tanks can hold water sure it can be distributed.
	Problem Addressed	Power Outage
	Partners	Water Department, Planning
	Cost	Medium
High	Possible Funding Sources	Water Department, FEMA, OES, EPA
	Implementation Schedule	January 2020 - December 2025
	Hazards	Power Outage
	Critical Facility Protection	Yes
	Type of Mitigation Action	Structure and infrastructure project
13	Expand CERT on the Reservation by training additional volunteers and increasing training offerings on the Reservation.	
Action Description	Casino and resort security could participate in training.	
	Problem Addressed	Emergency Management Capacity
	Partners	HLR, Casino, Community Members
	Cost	Low
	Possible Funding Sources	SB County, FEMA, OES
Medium	Implementation Schedule	February 2020 - December 2025
	Hazards	Dam Failure, Earthquake, Extreme Heat, Extreme Winds, Flood, Landslides, Lightning, Power Outage, Tornado, Wildfire
	Critical Facility Protection	No
	Type of Mitigation Action	Education and Awareness Program
14	Purchase a couple of LED signs to guests and those on the reserva	that can be used pre- and post-disaster to inform ation of current events.

Action Description	LED signs can be updated easily and remotely. Having these signs gives the Tribe the opportunity to quickly and easily keep the public and residents informed of current hazards.		
	Problem Addressed	Communication	
	Partners	HLR, Casino, Planning	
	Cost	Low	
	Possible Funding Sources		
Medium	Implementation Schedule	January 2020 - December 2022	
	Hazards	Dam Failure, Earthquake, Extreme Heat, Extreme Winds, Flood, Power Outage, Terrorism, Tornado, Wildfire	
	Critical Facility Protection	No	
	Type of Mitigation Action	Education and awareness program	
15	Develop a flyer to distribute to visitors informing them of heat advisories, the emergency radio station, and current events.		
Action Description	Many people who visit the Reservation are unaware of conditions on the Reservation. A flyer about potential dangers on the Reservation and how they can protect themselves is necessary. With the opening of the new casino, the Tribe is acutely aware of the increased responsibility of guests to the Reservation. This project is cost effective and fits well with the priorities of the Tribal Council.		
	Problem Addressed	Communication	
	Partners	Conservation, HLR, Casino	
	Cost	Low	
	Possible Funding Sources	EPA, FEMA, OES, CIT Conservation	
Medium	Implementation Schedule	March 2020 - February 2021	
	Hazards	Extreme Heat, Extreme Winds, Power Outage, Wildfire	
	Critical Facility Protection	No	
	Type of Mitigation Action	Education and awareness program	
16	Develop Memorandums of Understanding with adjacent tribal governments to offer shelter to elders during a disaster.		
Action Description	The MOUs could include various types of disaster assistance.		

	Problem Addressed	Emergency Management Capacity	
	Partners	CRIT, Fort Mohave, Morongo	
	Cost	Low	
	Possible Funding Sources	Tribal Governments	
II	Implementation Schedule	February 2020 - January 2022	
Medium			
	Hazards	Dam Failure, Earthquake, Extreme Heat, Extreme Winds, Flood, Hazardous Materials Incidents, Landslides, Power Outage, Terrorism, Tornado, Wildfire	
	Critical Facility Protection	No	
	Type of Mitigation Action	Local Plans and Regulations	
17	Identify vulnerable individuals an	nd populations on the Reservation.	
Action Description	The Tribe lacks a formal list of citizens/residents with functional needs who may be particularly at risk during a disaster. According to the HELP, a significant percentage of elders are diabetic. A study needs to be conducted to identify these people and a system developed to maintain the list. The list would be shared with first responders, particularly the Fire Department.		
	Problem Addressed	Communication	
		Chemehuevi Health and Wellness Department,	
	Partners	Housing, IHS	
	Partners Cost	Housing, IHS Low	
	Partners Cost Possible Funding Sources	Housing, IHS Low IHS, FEMA, BIA, OES, EPA, IHS	
Medium	Partners Cost Possible Funding Sources Implementation Schedule	Housing, IHS Low IHS, FEMA, BIA, OES, EPA, IHS January 2020 - December 2025	
Medium	Partners Cost Possible Funding Sources Implementation Schedule	Housing, IHS Low IHS, FEMA, BIA, OES, EPA, IHS January 2020 - December 2025	
Medium	Partners Cost Possible Funding Sources Implementation Schedule Hazards	Housing, IHS Low IHS, FEMA, BIA, OES, EPA, IHS January 2020 - December 2025 Dam Failure, Earthquake, Extreme Cold, Extreme Heat, Extreme Winds, Flood, Hazardous Materials Incidents, Landslides, Lightning, Power Outage, Tornado. Wildfire	
Medium	Partners Cost Possible Funding Sources Implementation Schedule Hazards Critical Facility Protection	Housing, IHS Low IHS, FEMA, BIA, OES, EPA, IHS January 2020 - December 2025 Dam Failure, Earthquake, Extreme Cold, Extreme Heat, Extreme Winds, Flood, Hazardous Materials Incidents, Landslides, Lightning, Power Outage, Tornado, Wildfire No	
Medium	Partners Cost Possible Funding Sources Implementation Schedule Hazards Critical Facility Protection Type of Mitigation Action	Housing, IHS Low IHS, FEMA, BIA, OES, EPA, IHS January 2020 - December 2025 Dam Failure, Earthquake, Extreme Cold, Extreme Heat, Extreme Winds, Flood, Hazardous Materials Incidents, Landslides, Lightning, Power Outage, Tornado, Wildfire No Local Plans and Regulations	
Medium	Partners Cost Possible Funding Sources Implementation Schedule Hazards Critical Facility Protection Type of Mitigation Action	Housing, IHS Low IHS, FEMA, BIA, OES, EPA, IHS January 2020 - December 2025 Dam Failure, Earthquake, Extreme Cold, Extreme Heat, Extreme Winds, Flood, Hazardous Materials Incidents, Landslides, Lightning, Power Outage, Tornado, Wildfire No Local Plans and Regulations	
Medium	Partners Cost Possible Funding Sources Implementation Schedule Hazards Critical Facility Protection Type of Mitigation Action Purchase a vehicle to use during	Housing, IHS Low IHS, FEMA, BIA, OES, EPA, IHS January 2020 - December 2025 Dam Failure, Earthquake, Extreme Cold, Extreme Heat, Extreme Winds, Flood, Hazardous Materials Incidents, Landslides, Lightning, Power Outage, Tornado, Wildfire No Local Plans and Regulations	

	Problem Addressed	Emergency Management Capacity
	Partners	Chemehuevi Health and Wellness Department, IHS
	Cost	Medium
	Possible Funding Sources	FEMA, GSAXcess, OES, EPA, IHS
Medium	Implementation Schedule	April 2025 - December 2025
	Hazards	Dam Failure, Earthquake, Flood, Power Outage, Terrorism, Tornado, Wildfire
	Critical Facility Protection	No
	Type of Mitigation Action	Structure and infrastructure project
19	Add generators to department b Department and Administration	uildings that do not have them, including the EPA Building.
Action Description	Having backup power will ensure that government operations continue during a power outage.	
	Ducklass Adducesed	Device Outries
	Problem Addressed	Power Outage
	Partners	All Tribal Departments
	Cost	Medium
Madium	Possible Funding Sources	FEMA, OES, EPA
Medium	Implementation Schedule	January 2020 - December 2025
	Hazarda	Power Outage
	Critical Eacility Protection	Vos
	Type of Mitigation Action	Structure and infrastructure project
	Type of Miligation Action	
20	Add backup power for gas statio	n pumps.
Action Description	There is only one place on the Reservation to access gasoline, and it should be accessible during power outages. This could allow the Tribe to continue to operate during extended power outages. Keeping the casino generators and the ferry running are critical to the economic stability of the Tribe.	
	Problem Addressed	Power Outage
Medium	Partners	HLR
	COST	Ivieaium

	Possible Funding Sources	HLR, Casino, FEMA, OES
	Implementation Schedule	January 2020 - December 2025
	Hazards	Power Outage
	Critical Facility Protection	Yes
	Type of Mitigation Action	Structure and infrastructure project
	//	
21	Collect data regarding power out	age impacts.
Action Description	Collecting data regarding the impacts of power outages and other disasters will assist the Tribe to justify the cost of mitigation actions by making Benefit Cost Analysis (BCA) possible to estimate.	
	Problem Addressed	Emergency Management Capacity
	Partners	Tribal Departments
	Cot	
	LOST	
Medium	Possible Funding Sources	EPA Budget
		January 2020 - December 2025
	Hazards	Power Outage
	Critical Facility Protection	Yes
	Type of Mitigation Action	Local Plans and Regulations
22	Update the infectious disease/co	ntamination trailer with current supplies.
Action Description	Updating these supplies increases training supplies.	s the resiliency of the Tribe and gives the CERT team
	Drahlom Addressed	Emorgoney Management Canacity
	Problem Addressed	
	Partners	SB County
	Cost	Low
Low	Possible Funding Sources	SB County,
LOW	Implementation Schedule	September 2021 - December 2022
	Usesada	
	Critical Facility Protection	NO
	Type of Mitigation Action	Structure and infrastructure project

23	Add a generator to the school bu	ilding.
Action Description	This will ensure the school can reashelter or a warming/cooling cent outreach opportunity to teach stu	main open during a power outage and function as a ter. A project at the school could be used as an idents about emergency preparedness.
	Problem Addressed	Power Outage
	Partners	Needles School District
	Cost	Medium
Low	Possible Funding Sources	FEMA, OES, Needles School District
	Implementation Schedule	January 2020 - December 2025
	Hazards	Power Outage
	Critical Facility Protection	Yes
	Type of Mitigation Action	Structure and infrastructure project
		· · ·
24	Develop and maintain fire breaks	s in the South End to protect the Resort.
Action Description	If the wash along the South End o would be in danger. Firebreaks ar homes and infrastructure. In addi developed to maintain them.	f the Resort were to catch fire, multiple homes e created to reduce flammable materials to protect tion to building the firebreaks, a plan needs to be
	Problem Addressed	Emergency Management Capacity
	Partners	Planning Department, Cal Fire, CA Department of Conservation, Fire Safe Council, San Bernardino County
	Cost	Medium
Low	Possible Funding Sources	BIA, CalFire, FEMA
	Implementation Schedule	January 2022 - December 2025
	Hazards	High Winds, Wildfire
	Critical Facility Protection	No
	Type of Mitigation Action	Natural resource protection
25	Create riparian areas to prevent reservation.	flooding west of developed areas of the

Action Description	Creating riparian areas will preven	nt flooding on the reservation.
	Problem Addressed	Emergency Management Capacity
	Partners	BIA, CA Department of Conservation
	Cost	Medium
Low	Possible Funding Sources	FEMA
	Implementation Schedule	January 2022 - December 2025
	Hazards	Flood
	Critical Facility Protection	Yes
	Type of Mitigation Action	Natural resource protection
26	Join the FireWise program.	
Action Description	The National Fire Protection Asso people how to adapt to living with and prevent losses.	ciation (NFPA) Firewise USA program teaches n wildfire and how to work together to take action
	Problem Addressed	Emergency Management Capacity
	Partners	Planning Department, Cal Fire, CA Department of Conservation, Fire Safe Council, San Bernardino County
	Cost	Low
Low	Possible Funding Sources	NFPA, CalFire, BIA, FEMA
	Implementation Schedule	February 2020-December 2025
	Hazards	Wildfire, High Winds
	Critical Facility Protection	Yes
	Type of Mitigation Action	Local Plans and Regulations
27	Develop a brush-clearing program defined as intermix. These includ Road, and Catfish Bay.	n to protect wildland urban interface areas e the Colonies, North and South Valley Mesa
Action Description	Wildland Urban Interface areas de reservation to wildfires. The Tribe	efined as Intermix are the most prone areas on the will develop a plan to clear brush in these areas.
Low	Problem Addressed	Emergency Management Capacity

	Partners	Planning Department, Cal Fire, CA Department of Conservation, Fire Safe Council, San Bernardino County
	Cost	Low
	Possible Funding Sources	FEMA, CalFire, BIA
	Implementation Schedule	January 2022 - December 2025
	Hazarda	Wildfire High Winds
	Critical Eacility Protection	Voc
	Tune of Mitigation Action	Structure and Infrastructure Project
	Type of Witigation Action	Structure and infrastructure Project
	Encourage Reservation residents	to improve their household preparedness by
28	on the Reservation.	Te for flazarus as well as now to filaliage flazarus
Action Description	Improving the capacity of residen sufficient during a disaster on the Education may take the form of b workshops.	ts to mitigate risk to their property and to be self- Reservation increases the resilience of the Tribe. rochures, website content, warning signs, and
	Problem Addressed	Communication
	Partners	Tribal Departments
	Cost	Low
	Possible Funding Sources	EPA Budget
Low	Implementation Schedule	January 2020 - December 2025
LOW	Hazards	Dam Failure, Earthquake, Extreme Cold, Extreme Winds, Flood, Hazardous Materials Incidents, Landslides, Lightning, Power Outage, Terrorism, Tornado, Wildfire
	Critical Facility Protection	Yes
	Type of Mitigation Action	Education and awareness program

Opportunities to Incorporate the Mitigation Plan

C6. Does the plan describe a process by which the tribal government will incorporate the requirements of the mitigation plan into other planning mechanisms, when appropriate? [44 CFR § 201.7(c)(4)(iii)]

The Tribal Multi-Hazard Mitigation Plan is the Chemehuevi Indian Tribe's primary resource for mitigating risk. It details the risks to and vulnerabilities of tribal critical facilities, tribal lands, and the Reservation. It represents the Tribe's strategy for mitigating risk. In addition to the implementation of this plan, the Environmental Department will participate in regional emergency management meetings and those of the So Cal Tribal Emergency Management Group.

The Planning Department and the Tribal Council are aware of high hazard areas and the need to mitigate risk wherever it develops on the Reservation. The new casino/hotel included a number of hazard mitigation measures in its development, including pervious surface in the parking lot and erosion barriers along the roadway. All new buildings are built to the highest levels of California building codes. The Tribe does not have a formal Master Plan, but they are committed to adhering to the principles of hazard mitigation when building on the Reservation.

The HLEP and the Environmental Department developed the list of mitigation actions with the primary goal of integrating these actions with current philosophy and direction that the Tribe is headed. Some specific examples are shown in the table below.

Action	How can this action be integrated into other programs?
Add a water tower to the Reservation.	The added water tower would not only benefit the expected increase in visitors to the Reservation, but would increase emergency water storage capacity.
Develop a tribal police force.	Casino and resort security could both benefit from more formal training and support from a tribal police force.
Develop and implement a system to number and label all streets and homes on the Reservation.	In the future, this could be used to increase mail delivery capability on the Reservation.
Improve radio communication for essential staff and first responders.	Improving the radio communication system increases the resilience of the Tribe and prioritizes safety.
Develop a tribal radio station.	The radio station can inform visitors to the reservation of special events such as HLEP meetings, the Earth Day Celebration, and cultural holidays.
Expand the warning siren system on the Reservation to alert people to disasters, especially a dam breach.	With the opening of the new casino and the increase of residents and guests on the Reservation, the tribe has an increased responsibility to protect and inform people. A warning siren is consistent with the priorities of tribal government to protect its residents.
Airport renovation.	A functioning airport could be used by people to charter flights to visit the reservation. This could benefit the Conservation Department if new hunting/fishing opportunities on the Reservation were advertised.
Buy and install a generator and solar battery backup for the	Solar arrays on the gym would make it more affordable for the Tribe to use on a regular basis.

Table 45 Integrating mitigation actions into other programs

Action	How can this action be integrated into other programs?
gym, so it may be used as a shelter.	
Add generators and solar battery backup to sewage lift stations that do not have them.	Solar energy at the water pumps would reduce their energy consumption even in non emergencies.
Purchase a couple of LED signs that can be used pre- and post- disaster to inform guests and those on the reservation of current events.	Signs can be used to inform the public of day-to-day events and weather, as well as emergent situations.
Develop a flyer to distribute to visitors to the Reservation informing them of heat advisories, the emergency radio station, and current events.	With the opening of the new casino, the Tribe is acutely aware of their increased responsibility for guests to the Reservation. This project is cost effective and fits well with the priorities of the Tribal Council.
Identify vulnerable individuals and populations on the Reservation.	This information would benefit the county as well as the Tribe. The housing department could use the data to pursue funding for home renovations.
Purchase a vehicle to use during evacuations.	The vehicle could also be used to transport elders to events around the community.
Add backup power for gas station pumps.	This could allow the Tribe to continue normal operations during extended power outages. Keeping the casino generators and the ferry running are critical to the economic stability of the Tribe.

Chapter 7. Plan Maintenance

The Plan Maintenance process outlines three critical pieces of the mitigation plan.

- 1. A system for reviewing the implementation of the plan.
- 2. A schedule and method to keep the plan current.
- 3. A discussion for how the tribal government will continue to involve the public.

The Environmental Department, specifically the Deputy Director, is responsible for leading all efforts to maintain and implement the mitigation plan. This position is supported by Tribal leadership. The Deputy Environmental Department Director is responsible for keeping the tribal leadership apprised of the status of plan implementation. The Chemehuevi Indian Tribe Tribal Council understands the value of this plan, the value of hazard mitigation, and the relationship of the tribe with FEMA. They intend to continue updating this plan and implementing the plan's mitigation strategies.

System for Reviewing Implementation Progress

C7. Does the plan describe a system for reviewing progress on achieving goals as well as activities and projects identified in the mitigation strategy, including monitoring implementation of mitigation measures and project closeouts? [44 CFR §§ 201.7(c)(4)(ii) and 201.7(c)(4)(v)]

Implementing the mitigation actions identified in this plan and meeting the stated goals of the plan are the most important result of this Tribal Hazard Mitigation Plan. The Tribal Council and Executive Leadership recognize the value of implementing this plan. They recognize that future development on tribal lands must coincide with the goals of this plan.

The Deputy Environmental Director is responsible for the overall implementation of this plan and will be supported by the Tribal Council, Executive Leadership, and the Havasu Lake Emergency Planning Group (HEPL). The responsibility for implementation of specific mitigation actions falls to the lead department identified in the Mitigation Strategy. For the 2019 Hazard Mitigation Plan, the Environmental Department is the lead department responsible for initiating all identified mitigation actions. Tribal departments are expected to use the timeline and priority level assigned to each mitigation action to guide their implementation efforts and schedule.

The Deputy Environmental Director will send a reminder, and the Mitigation Action Tracker Worksheet, to each department head on a biannual basis to collect status updates for each mitigation action. Each department head will use the Mitigation Action Tracker Worksheet to easily track the progress of mitigation actions, including schedule, budget, and project deadlines. The Deputy Environmental Director will update the Mitigation Action Tracker with results from collected worksheets.

The Deputy Environmental Director will meet with the HLEP on a biannual basis for the sole purpose of reviewing the status of each mitigation action and identifying potential new actions and funding sources. Following the HLEP meetings, the Deputy Environmental Director will modify the Hazard Mitigation Plan as necessary by updating the Record of Changes page at the beginning of the plan and

attaching an addendum. The Deputy Environmental Director will maintain minutes and sign-in sheets from these biannual meetings, which will serve as a permanent record of the progress made implementing the Plan. The Deputy Environmental Director will develop a biannual Mitigation Plan Implementation Status Report for to share with the Tribal Council.

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 Chemehuevi Indian Tribe 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 Hazard Mitigation Plan is considered a living document. In reality, a continuous process of monitoring, evaluating, and updating the plan is required. 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.

Three key methods to keeping this plan current are monitoring, evaluating, and updating the Plan. FEMA defines these in the following way:

- Monitoring: Tracking the implementation of the plan over time
- Evaluating: Assessing the effectiveness of the plan at achieving its stated purpose and goals
- Updating: Reviewing and revising the plan at least once every five years

Monitoring

The Deputy Environmental Director will track the relevance and implementation of the mitigation plan over the five-year period the plan is current. Monitoring includes holding meetings with the HLEP and others on a biannual basis, as well as post-disaster, to determine the validity of the plan goals and mitigation actions and to monitor implementation progress. If the team determines changes are needed to the plan, the Deputy Environmental Director, with support of the Tribal Council, will make the changes.

Evaluating

The Deputy Environmental Director will convene a meeting with the HLEP to evaluate the planning process and make recommendations for future 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 E: Implementation Plan Supporting Materials. This completed worksheet will be used by the team when the Tribe formally updates the plan annually. The HLEP 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 HLEP 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.

Updating

The Deputy Environmental Director, with assistance from the HLEP, will take the lead to revise the plan every five years for FEMA approval. In addition, following any disaster, the HLEP will review the plan to make sure that the goals, objectives, and mitigation actions continue to meet the needs of the Tribe. The table below shows a five-year schedule for plan maintenance. The revised edition of this plan will include additional data to reflect new homes, businesses, or infrastructure chosen by the HLEP for inclusion. In addition, the revised plan will include a revised hazard risk assessment and vulnerability study, a revised capability assessment, and additional or revised mitigation strategies. As the Tribe works to update the plan, they will consider opportunities to integrate the plan with other tribal planning mechanisms. In this way, they ensure the plan integrates with current and future planning efforts.

Timeframe	Actions
Annually	 The HLEP meets following any large incidents on the reservation to review the mitigation plan and discuss new funding opportunities. The HLEP meets to discuss implementation of mitigation actions. The HLEP requests the incorporation of this plan into plans of relevant departments. The HLEP works with departments seeking mitigation funding to assist with identifying grant opportunities and completing grant applications. The HLEP proceeds with mitigation action implementation. The HLEP completes and files biannual reports.
Months 1-12	 The HLEP initiates discussion of lessons learned from the development of the 2019 plan. All annual actions listed above.
Months 13-36	All annual actions listed above.
Months 37-48	The HLEP seeks funding for updating this plan.
	All annual actions listed above.
Months 49-60	 The HLEP updates this plan according to current FEMA standards.
	All annual actions listed above.

Table 46 Five-year schedule to update the Mitigation Plan

In addition, the HLEP will review this plan following any disaster. An update will include a narrative of all relevant impacts from the disaster, its effects, and damages to the reservation and its critical facilities. Finally, the HLEP will also review the mitigation plan goals, objectives, and actions for priority and relevance. Changes to the plan will be made based on need. The Deputy Environmental Director will develop the biannual progress reports combined with any disaster write-up, which will serve as the Plan's annual update. These annual reports will be referenced toward the plan update in 2025.

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 Chemehuevi Indian Tribe involved tribal members, the public, and regional stakeholders in their planning process for development of this plan. The tribe is committed to involving the public in plan implementation as well. They have designed multiple mitigation actions that specifically involve the public, such as public outreach and education campaigns. The Environmental Department will educate the community at community events on the status of the plan and specific projects.

In addition, the tribe is committed to maintain and improve this mitigation plan. They are committed to including regional stakeholders in their process, as well as the HLEP, which includes state and county leaders and first responders. Coordinating with these stakeholders is a key part of implementing and maintaining this mitigation plan. As mentioned above, the Deputy Environmental Director will host biannual meetings with the HELP for the sole purpose of reviewing the plan.

The Deputy Environmental Director will represent the Tribe at county-wide emergency management meetings and tribal-specific emergency management meetings, such as the SoCal Tribal Emergency Managers Group. The Tribe will also engage county leaders regarding issues such as flooding and wildfire mitigation. Continued collaboration with these stakeholders will bring success to mitigating risks on the reservation.

List of Acronyms

ASCE	American Society of Civil Engineers
BIA	Bureau of Indian Affairs
BNSF	Berkshire Hathaway, Burlington Northern Santa Fe, LLC Railways
CA HMP	California State Hazard Mitigation Plan
COOP	Continuity of Operations Plan
CWA	Clean Water Act
DMA	Disaster Mitigation Act
EM	Emergency Management
EMPG	Emergency Management Performance Grant
ENSO	El Niño–Southern Oscillation
EOC	Emergency Operation Centers
EPA	Environmental Protection Agency
FAA	Federal Aviation Administration
FEMA	Federal Emergency Management Agency
GIS	Geographic Information System
HLEP	Havasu Lake Emergency Planning Group
HMGP	Hazard Mitigation Grant Program
HUD	Department of Housing and Urban Development
LEED	Leadership in Energy and Environmental Design
LHC	Lake Havasu City
MMI	Modified Mercalli Intensity
NFIP	National Flood Insurance Program
NHC	National Hurricane Center
NOAA	National Oceanic and Atmospheric Administration
NRCS	Natural Resources Conservation Service
NWS	National Weather Service
PGA	Peak Ground Acceleration
PHMSA	Pipeline and Hazardous Materials Safety Administration
PRI	Priority Risk Index
RCP	Representative Concentration Pathway
SA	Spectral Acceleration
SB	San Bernardino
SBC	San Bernardino County
SBC HMP	San Bernardino County Hazard Mitigation Plan
SLOSH	Sea, Lake and Overland Surges from Hurricanes
TRI	Toxic Release Inventory
UASI	Urban Areas Security Initiative
USDA	United States Department of Agriculture
USDOT	United States Department of Transportation
USFS	United States Forest Service
USGS	United States Geological Survey
WHP	Usda Wildfire Hazard Potential
WUI	Wildland-Urban Interface

Appendixes

Appendix A. Planning Process Supporting Materials

Havasu Lake Emergency Planning Group April 11, 2019

HAVASU LAKE E	MERGENCY PLANNING	G GROUP	and the second s	
Project: Che	emehuevi Hazard Mitigation P	lan	Meeting Date:	April 11, 2019
Facilitator: Lex	Koscielak, Deputy Director, E	Environmental Department	Place/Room:	Chemehuevi Reservation
Name	Title	Company	Phone	E-Mail
Erik Garcia	Outroach & Education Cocchineter	Chemehuevi En Ultion one nta (760-853-1140	
John Csics	Propety Marages	HLR	-575-557-8C	
F. RIULT	Co-sur a	chun	76 b-464-745)	
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August 21, 2019



HAVASU LAK	e Emer	GENCY PLANNING	s Group		
Project:	Chemehu	levi Hazard Mitigation Pl	an	Meeting Date:	August 21, 2019
Facilitator:	Lex Kosc	ielak, Deputy Director, E	nvironmental Department	Place/Room:	Chemehuevi Reservation
Name		Title	Company	Phone	E-Mail
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Joseph Steer	art	Public Utility Specialist	124	SJC. 500. 3155	Josque Stewarte 5: 4. 400
John Gore	hur	where guildies	cit water	611-104-072	Chemehreni - wate John
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1500 by		CIT Counciliment	t o	740-694-1325	(sue tribal paper
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Lourie Ellswor	之	Housing pin.	617	742 858 4564	dir. hog@eit-non.gov
Jushen	し	Head Start	ert	760 85 8 4918	dir . hs oct new gv

HAVASU LAKE	EMER	RGENCY PLANNING	GROUP		
Project:	Chemehu	levi Hazard Mitigation Pl	an	Meeting Date:	August 21, 2019
Facilitator:	-ex Kosc	ielak, Deputy Director, E	nvironmental Department	Place/Room:	Chemehuevi Reservation
Name		Title	Company	Phone	E-Mail
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Emmind	- Uman	MANT-FOREMAN	CHEMENUEVI Trub E	5219-11-1152	Currestudia 26 m
Christina H	W/W	Halard Nitigation planner	Stantec	919-325-919	Christina. Huveye
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Ler toscipl	al	Deputy Director environmental Department	Cheme he fut EPA	060-828-1140	ast dr. epa Octomsn. gov

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HAVASU LAKE EM	ERGENCY PLANNING	s GROUP		
Project: Chem	ehuevi Hazard Mitigation Pl	an	Meeting Date:	August 21, 2019
Facilitator: Lex K	oscielak, Deputy Director, E	invironmental Department	Place/Room:	Chemehuevi Reservation
Name	Title	Company	Phone	E-Mail
Christing	F.c.P	Head Start	7160.858- 4918	fcp.hns@cit-nsn.gw
Adam Trusillo	Hend Sturt Busonias	Hed Surt Deft CIT	9515JS460	Trui ile asserwice@yahue, com
Freder of Riven	Conservation		LShL-h9h-09L	acodet-nsn, gov
Donner Ellsword	h palminstrater	e 1 7	760-836-4219	edministrater e cit-nsn. jou
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Daniel Leiva	S Chomehuevi	terne	760 858	Farmi may @ cit-wsw.
Sheridan Silversmith	Tribal Employment Right Office 12inctur	により	740 856 S100	dirtero@ cit-nsn.gov

January 21, 2020

Chemehuevi Indian Tribe Hazasu Lake Emergency Planning Group Meeting January 21, 2020

Meeting Agenda

Project Update

- Risk Assessment Results
- Plan Development

Mitigation Strategy

- Mitigation Actions Review
- Prioritization of Mitigation Actions
- Plan Implementation

Next Steps

- Public Meeting this Evening
- Review Hazard Mitigation Plan Draft
- FEMA Review and Tribal Adoption



MARCH 2020

Project:	Chemeh	uevi Hazard Mitigation F	lan	Meeting Date:	January 21, 2019
Facilitator:	Lex Koso	cielak, Deputy Director, I	Environmental Department	Place/Room:	Chemehuevi Reservation
Name		Title	Company	Phone	E-Mail
Lex board	cul~				
Jamie Ca	plan	tration	rice	413-0861	Janie ejamicapion.con
Thomas	t			8192-148-60h	
John Cs!	csery	P.M.	HLR		
Sheridan	th	ED outroad	EPA	The sse	recp. 2pale cit-nsn.gor
Frederich	ہ ر	Conservetui	Chrinchuci Ardrein	LSHL hth-OIL	acoacit-nsn.gov
Losar	Jr.	El S	EPA	760 362	issue 24 charles D. com
MARIO DO NALW		E.P.4	EP.A	8812 5789	Mario. donahue 77@gmail,
Byin L.	V Sugment	E.Y.A	Crew Loop	-s14-02/1	s UNAAU @ GAMBIL. Com
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Project:	Chemehi	uevi Hazard Mitigation Pl	UE	Meeting Date:	January 21, 2019
Facilitator:	Lex Koso	sielak, Deputy Director, E	nvironmental Department	Place/Room:	Chemehuevi Reservation
Name		Title	Company	Phone	E-Mail
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		-			

Stakeholder and Public Engagement August 21, 2019



CHEMEHUEVI IN	NDIAN	TRIBE PUBLIC MI	EETING			
Project: Cł	hemehu	evi Hazard Mitigation Pl	an	Meeting Date:	August 21, 2019	
Facilitator:	ex Kosci	elak, Deputy Director, E	nvironmental Department	Place/Room:	Chemehuevi Reservation	
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Name		Title	Company	Phone	E-Mail	
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John Schery		property	NLR	5000-028.826	Ucsicsery amyhilt . Con	
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DUVVIN CVOI	5	CUMMUNITY				
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Bruce Peru	_	Sec/Receptioned))	TUGUSAY also	reneegohing 0 g mail a)
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CHEMEHUEVI	INDIAN	TRIBE PUBLIC M	EETING		
Project:	Chemehu	levi Hazard Mitigation P	lan	Meeting Date:	August 21, 2019
Facilitator:	Lex Kosc	ielak, Deputy Director, E	invironmental Department	Place/Room:	Chemehuevi Reservation
Name	troj.	Title	Company	Phone	E-Mail
Chelsea Bun	in	EPR Receptionist	Chemehvevi Indian Tribe	(Juo)281-5731	secrepadit-nsn.gov
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bregery				703-743-90H	
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Baland	WCDar	N VICCOMME	CIT	N/26 205 0/2	Vice & Hair Q CIT- NSN GJU
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Martha	Loka			2012-2115-2012	Martha, Italio DOP an eili mil
MICHAEL M	/unany	OPT.	ssla FD	909 519 6458	MMURPHYBERGRE.ORG
Jonathan Sh	lothacer	Firefighter Paramedic	soco FD	400 260-1154	Jschlotthauer@sacfire.org

CHEMEHUEVI IND	IAN TRIBE PUBLIC M	EETING		
Project: Chei	mehuevi Hazard Mitigation P	lan	Meeting Date:	August 21, 2019
Facilitator: Lex	Koscielak, Deputy Director, E	invironmental Department	Place/Room:	Chemehuevi Reservation
Name	Title	Company	Phone	E-Mail
Shirley Smith		Carmentel Newber	L128-829 09L	Sriversmith (Damalcom
HORE L. HINNA.			928 511-7432	0
JEFF JOHNS	serv	HLR	9287065560	
AMINGH WE	105	TUBAL MEMSER	760 412 1388	
IIA-clohon		lowmunity (ennumity	760 644 7799	K. diracıt-usn.gov Joun winkızagmail.com
THOMAS REMAI	uć	Community	190-212-3710	Thomas poncille @ unhoo.cut
Gylene Neyh	art	community Center	702.339.0610	avlenenssamai
I sson Ch		EPA	760-362.25	
Oelone Contr			4802 LLb 192	

January 21, 2020

CHEMEHUEVI INDIAN TRIBE
PUBLIC MEETING DISASTER MITIGATION January 21, 2020 Chemehuevi Community Center 5:00 p.m. – 6:30 p.m.
The development of the Chemehuevi Indian Tribe Hazard Mitigation Plan is nearly complete. This plan will serve as a strategy for reducing current and future risks on the Reservation and enable the Tribe to leverage Federal funding sources to prevent damages from natural hazards such as wildfires, power outages, and floods. During this public meeting, we will review the draft plan including the proposed list of mitigation projects. You will have an opportunity to share your ideas for making the Tribe more resilient to natural hazards.
Take the Chemehuevi Disaster Preparedness Survey Today: <u>https://www.surveymonkey.com/r/chemehuevi</u>
Your Participation is Needed!
Raffle for movie tickets and restaurant gift cards! Five chances to win!Power Outages, Wildfires and WindstormsYou don't have to be a tribal citizen to attend. All are welcome!Power Outages, Wildfires and Windstorms
FOR MORE INFORMATION CONTACT Lex Koscielak, Deputy Director Environmental Department Chemehuevi Indian Tribe (760) 858-1140 x382 ast.dir.epa@cit-nsn.gov

		Martin Dian		Monting	Date: laniary 21 2010	
Project:	Chemehuevi Hazard Mi	Itigation Plan		Meeting	Uate: January 21, 2019	
Facilitator:	Lex Koscielak, Deputy I	Director, Envirol	nmental Department	Place/R	oom: Chemehuevi Rese	vation
Name		Resident or Employee	Phone		E-Mail	
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Non Sel	alethaver	Fire emp.	(909) 560-1154 760 391 339	7 th	J. Schle Hhaver Q	Sóchire. Of c

Project:	Chemehuevi Hazard	I Mitigation Plan		Meeting Dat	e: January 21, 2019
Facilitator:	Lex Koscielak, Depu	ity Director, Environ	mental Department	Place/Room	t: Chemehuevi Reservation
Name		Resident or Employee	Phone	E-M	ail
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Jamie Co	plan	consultant	418-586-08t	57 jan	nie Egniecaplan.com
TANICE .	Hultguist	Res. Res			
Ren C	l'mir	Emp	128- 111	07	Kenn har sor of gill cu
Tho Ma	f Hermounds	2 Res Res EPA	409-241	-2018 4	Wist Kurly agreed
Ablance	Lougan,	RES	11 11 11		My Praissen
vice. Chair @ Cut-nsn.gou Chemehuevi Reservation January 21, 2019 E-Mail Meeting Date: Lex Koscielak, Deputy Director, Environmental Department Place/Room: 7400-485-Phone Resident or Employee Connil Chemehuevi Hazard Mitigation Plan **CHEMEHUEVI PUBLIC MEETING** Sieva Penuille Facilitator: Project: Name

Public Preparedness Survey

Chemehuevi Disaster Preparedness Survey

Q1 This survey provides an opportunity for you to share your opinions and participate in the mitigation planning process. The information you provide will help us better understand your hazard concerns and can lead to mitigation activities that should help lessen the impacts of future disasters. Participation in this survey is voluntary and none of the information you provide will be attributed to you directly. If you have any questions regarding this survey or would like to learn about more ways you can participate in the development of the Hazard Mitigation Plan, please contact Lex Koscielak, Deputy Director, Chemehuevi Environmental Department, 760-858-1140 ext. 382 or ast. dir.epa@cit-nsn.gov.

Answered, 2 Skipped: 93

#	RESPONSES	DATE
1	inspectorbridget@gmail.com	3/13/2019 2:38 PM
z	This is a test; Lex	3/12/2019 1:05 PM

Chemehuevi Disaster Preparedness Survey

Q2 How concerned are you about the following hazards?





		Chen	hehue	vi	;Disas	ster Pre	epared	ness Su	irvey				
	64%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%		
	Very	Concerr	ed 📕	Neutral	N	ot Conce	ernød						
						VE	RY	IED	NEUT	RAL	NOT	IED	TOTAL
Extreme Temperatures							1	67.37% 64	26.	32% 25	6	6.32% 6	95
Drought							1	60.64% 57	28,	72% 27	10).64% 10	.94
Dam Failure							1	55.32% 52	31.	91% 30	12	2.77% 12	94
Extreme Winds (Santa Ana Dust Devils)	, Wind Er	rosion, T	ornadoe	es, Thunc	lerstorn	6		53.68% 51	38.	95% 37	7	.37% 7	95
Flood							ł	53.19% 50	34.	04% 32	12	.77% 12	94
Climate Change							2	52.13% 49	25.	53% 24	22	2.34%	94
Insect Pests and Diseases							3	47.31% 44	41.	94% 39	10).75% 10	93
Wildfire								45.74% 43	39.	36% 37	14	.89% 14	94
Earthquake								36.17% 34	50.	00% 47	13	8.83% 13	94
Lightning							3	26.88% 25	48,	39% 45	24	.73% 23	93
Landslides/Mudslides							3	21.28% 20	54.	26% 51	24	.47% 23	94
Hailstorm							-	15.05% 14	52.	69% 49	32	.26%	93
Tropical Storm, Hurricane							-	14.89%	42.	55%	42	.55%	04
								7.4		40		40	34

Chemehuevi Disaster Preparedness Survey

Q3 How important is it to you to protect the following categories?

Answered: 86 Skipped: 9

People (Loss of life and/... Infrastructure (Damage/loss... Cultural/Histor ic (Damage o... Economic (Business... Environmental (Damage,... Governance (Ability to ... 0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100% Moderately Notatall Very

	VERY	MODERATELY	NOT AT ALL	TOTAL
People (Loss of life and/or injuries)	90.70% 78	9.30% 8	0.00% 0	86
Infrastructure (Damage/loss or roads, bridges, utilities, schools, etc.)	74.42% 64	24.42% 21	1.16% 1	86
Cultural/Historic (Damage or loss of libraries, museums, historic properties, etc.)	76.19% 64	20.24% 17	3.57% 3	84
Economic (Business interruptions/closures, job losses, etc.)	73.81% 62	23.81% 20	2.38% 2	84
Environmental (Damage, contamination or loss of forests, trees, etc.)	73.81% 62	21.43% 18	4.76% 4	84
Governance (Ability to maintain order and/or provide public amenities and services.)	73.81% 62	23.81% 20	2.38%	84











10/22

		VERY IMPORTANT	NEUTRAL	NOT IMPORTANT	TOTAL
Water D	epartment	91.86%	6.98%	1.16%	00
		(9		1	oc
Fire Sta	tion	94.19% 81	4.65%	1.16%	86
Market		89.53%	10.47%	0.00%	
The Her		77	9	0	86
Commu	nity Center	75.29%	23.53%	1.18%	
		64	20	1	85
Hardwa	re Store	67.06%	30.59%	2.35%	
-		5/	26	2	8:
Ferry		80.00%	16.47% 14	3.53%	8
Airport		50 50%	27 6504	11 76%	
MILPOIL		50,59%	37,65%	11.78%	88
Tribal A	dministration Building	73.81%	21.43%	4.76%	
		62	18	4	84
Casino		58.33%	28.57%	13.10%	
		49	24	11	84
Environ	mental Department	75.00%	19.05%	5.95%	
		63	16	5	84
Gym		61.90%	27.38%	10.71%	
A. 10. 3 1		52	23	9	04
Resort A	Administration	59.52%	32,14%	8.33%	84
Lload St	art	64 2006	20.05%	1 7604	
neau St	au c	54	26	4,70%	84
Educatio	on Center	66.67%	28.57%	4.76%	
		56	24	4	84
Realty a	nd Planning Department	58.33%	32.14%	9.52%	
		49	27	8	84
Health C	Clinic	80.95%	16.67%	2.38%	
		68	14	2	84
Cultural	Center	66.67%	23.81%	9.52%	8
launten	Desidential	74.000	00 514	0 410/	
Housing	Department	71.08%	26.51%	2.41%	83
Flement	any School	68.67%	26 51%	4 82%	
		57	22	4	83
tt.				DATE	
1	Houses			8/27/2010	1:32 PM
2	all are important			0/07/0010	1.07 DM
2	Health and Mallance Costor			5/20/2019 -	
4	Health and Wellness Center			0/10/2019	11:45 AM
-	Health and Weimess Center			3/16/2019 1	LI.45 AM
2	My house.			3/13/2019 1	1:52 PM

Chemehuevi Disaster Preparedness Survey

Chemehuevi Disaster Preparedness Survey

Q5 In your opinion, what are some actions that the Tribe could take to reduce or eliminate the risk of future natural hazard damages in your community?

Answered 32 Skipped 63

Chemehuevi Disaster Preparedness Survey

#	RESPONSES	DATE
1	communication and planning	1/29/2020 2:21 PM
2	All homes should have a short wave radio just in case we need to communicate with authorities.	1/29/2020 12:50 PM
3	Preventative maintenance to the whole reservation and emergency routes.	1/29/2020 12:33 PM
4	Keep our community clean.	8/27/2019 1:52 PM
5	Have a plan in case anything happens.	8/27/2019 1:48 PM
6	Drills, triage, mock	8/27/2019 1:45 PM
7	Sound system to warn of danger,	8/27/2019 1:42 PM
8	Brush clearance on empty lots and tribal areas in colony.	8/27/2019 1:34 PM
9	Individual generators for community houses.	8/27/2019 1:32 PM
10	Awareness	8/27/2019 1:30 PM
11	Safety courses.	8/27/2019 1:29 PM
12	Educate and train.	8/27/2019 1:07 PM
13	good planning	8/27/2019 1:04 PM
14	Clean up the dead grass and tumbleweeds in everyone's yards and around the houses to reduce fire risk.	8/27/2019 1:00 PM
15	Emergency kit and emergency alert system	8/27/2019 12:55 PM
16	Implement evacuation plan and exercises, make sure everyone is aware of this topic by providing resources and discuss the topic at meetings	6/12/2019 6:32 PM
17	Maintain the infrastructure and waste resources to ensure safety and health of the residents and visitors.	6/12/2019 3:38 PM
18	Clean up shoreline in tribal areas.	6/10/2019 12:14 PM
19	Council to get involved	5/20/2019 10:41 AM
20	Outreach, education, planning, drills, and assessments	5/17/2019 11:43 AM
21	Build more awareness/ meetings/ clubs.	5/17/2019 11:41 AM
22	Add more water tanks. The tribe to start its own fire department.	3/24/2019 10:29 AM
23	Earthquake preparedness	3/18/2019 11:45 AM
24	Set up a cooling place for families and elders in case of power outage, a place with water and food. a evacuation plan for families in case of a natural disaster, a ready medic area for people in case of natural disaster. Maybe water reservoirs in case our water system is compromised.	3/15/2019 7:33 PM
25	Institute an Air Quality Management system. Early warning system for natural and man made disasters.	3/15/2019 5:33 PM
26	Upgrade and repair older buildings to mitigate structural degradation and continued damage from wind and water, such as the serious roof, support structure, and foundation damage to the administrative building. Improve drainage and flood mitigation on all roads and near any structures. Grade around existing structures and put in drainage and water diversions so that water doesn't flood and pool against foundations (there are a lot of foundations here cracking and crumbling from this over the years).	3/15/2019 5:13 PM
27	I believe that the best action is to be informed. Establishing the Emergency Planning Committee is a great first step. Next is educating the community in ways to respond in the event of an emergency.	3/15/2019 3:20 PM
28	Research and planning	3/13/2019 2:40 PM
29	Manned fire personnel - medical services	3/13/2019 2:38 PM

Chemehuevi Disaster Preparedness Survey

30	We need a larger fire department. I know it's not the tribes responsibility but we need something. If there's a problem on the top floor of the new casino we have no way to get help to it.	3/13/2019 2:13 PM	
31	I don't know I'm not a scientist.	3/13/2019 1:52 PM	
32	Who is here to assist us in any emergency or medical aid situation if we have no fire dept. NO ONE!!!	3/13/2019 12:57 PM	

Chemehuevi Disaster Preparedness Survey

Q6 What have you done to prepare for a disaster?







0% 10%

		HAVE DONE	PLAN TO DO	NOT DONE	UNABLE TO DO	TOTAL	
Talked v disaster	vith family members about what to do in case of a natural	55.42% 46	26.51% 22	18.07% 15	0.00% 0	83	
Develop	ed a "Household/Family Emergency Plan."	39.02% 32	36.59% 30	24.39% 20	0.00% 0	82	
Prepare	d a "Disaster Supply Kit."	32.93% 27	43.90% 36	21.95% 18	1.22% 1	82	
Installed smoke detectors on each level of our house.		86.59% 71	7.32% 6	6.10% 5	0.00% 0	82	
Purchased insurance policies to cover losses from specific risks (e.g. flood or earthquake insurance)?		36.59% 30	13.41% 11	47.56% 39	2.44% 2	82	
Cut brush around my home.		59.76% 49	18.29% 15	18.29% 15	3.66% 3	82	
Secureo wall?	your water heater, cabinets, bookcases, and pictures to the	50.00% 41	20.73% 17	28.05% 23	1,22% 1	82	
Gathere	d information on natural disasters or emergency preparedness.	45,68% 37	25.93% 21	28.40% 23	0.00% 0	81	
Discuss	ed a utility shutoff procedure in the event of a natural disaster.	35.80% 29	25.93% 21	37.04% 30	1.23% 1	81	
Been tra	ained in first aid or CPR in the last year.	37.50% 30	22.50% 18	38.75% 31	1.25% 1	80	
#	OTHER PREPAREDNESS ACTIVITIES (PLEASE SPECIF	Y)			DATE		
1	Learn what areas on the Reservation are soft after flooding as well as after a disaster.				1/29/2020 12:4	5 PM	
2	My family knows what to do in case of a disaster.				8/27/2019 1:48	PM	
з	batteries, radio				8/27/2019 1:46 PM		
4	maintain Bug Out Bag with Shelf Stable Food, Shelter supplies, and First Aid				3/15/2019 7:31	PM	

Chemehuevi Disaster Preparedness Survey

20% 30% 40% 50% 60% 70% 80% 90% 100%

17/22

Chemehuevi Disaster Preparedness Survey

Q7 What is the most effective way for you to receive information about how to make your home and Reservation more resistant to natural hazards?



0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

ANSWER CHOICES	RESPONSES	
Email	54.76%	46
Text message	47.62%	40
Internet (social media)	42.86%	36
Internet (web pages)	41.67%	35
Public workshop	28.57%	24
Radio	22.62%	19
Television	19.05%	16
Mail	13.10%	11
Newspaper	8.33%	7
Total Respondents: 84		

Chemehuevi Disaster Preparedness Survey

#	OTHER (PLEASE SPECIFY)	DATE
1	Chemehuevi Newsletter.	8/27/2019 1:48 PM
2	classes	8/27/2019 1:46 PM
3	Community alarm	8/27/2019 1:33 PM
4	In person.	8/27/2019 1:10 PM
5	neighbors	8/27/2019 12:56 PM

Chemehuevi Disaster Preparedness Survey

Q8 Check all that apply to you.



39.47%

21.05%

I am a Tribal member

Total Respondents: 76

20/22

53

36

30

16

Chemehuevi Disaster Preparedness Survey

Q9 If you live on or near the Reservation, please let us know what area of the is your home.



ANSWER CHOICES	RESPONSES	
нир	38.24%	26
Resort	23.53%	16
Other	10.29%	7
Colony	7.35%	5
Senior Complex	7.35%	5
Quail Trail	5.88%	4
Vista Del Lago	4.41%	3
North Estates	2.94%	2
Havasu Palms	0.00%	0
TOTAL		68

Chemehuevi Disaster Preparedness Survey

Q10 Please add any comments you would like to make regarding hazard mitigation and disaster preparedness.

Answered: 10 Skipped: 85

#	RESPONSES	DATE	
1	Senior complex needs water access in the back yard.	1/29/2020 2:17 PM	
2	Put a sign up at the senior complex to let people know it's a place for seniors and add lighting.	1/29/2020 12:51 PM	
3	Keep a supply of non-perishable foods at the Community Center.	8/27/2019 1:46 PM	
4	Water and power is critical. SCE is the power utility. We need more power/electric resiliency/redundancy. Move toward microgrids. Need to better protect water assets as well.	8/27/2019 1:09 PM	
5	text message of flood from dam break	8/27/2019 1:05 PM	
6	Colony is called "Lakeside Subdivision" the Colony was closed years ago through litigation that the tribe won.	B/27/2019 1:02 PM	
7	Better lighting in senior complex.	8/27/2019 12:56 PM	
8	Thunderhead 1	6/12/2019 1:13 AM	
9	its not Colony anymore it considered the sub-division	3/24/2019 10:37 AM	
10	vacation home in resort	3/13/2019 5:54 PM	

Appendix B: Capability Assessment Supporting Materials

Chemehu	evi Eme	rgency	Inventory
		J /	

Description	Quantity
ID Wristbands	10bx
Triage Tags	1 bx
Pants/shirt - grey (mens)	1 LT
Pants/shirt - green (mens)	1 LT
Emergency Air supply, 5 min	2
Emergency Air supply, 10 min	2
Shoe Cover, Chemical Resistant	1 cs
Hazmat Boots - Large	1bx
Hazmat Boots - XLarge	1bx
Hazmat Boots - Medium	1bx
Lightweight Hood with Cape	2cs
HE2 Filter	2cs
Adhesive Bandages	1 bx
Disinfectant	4 cs
Flu Kit PPE	20
Mask, N95, 1860	1 cs
Medical-Personal Gear Bag	5
Surgical Mask	4 cs
Scrub Bottom (sm)	1 bx
Scrub Bottom (xs)	1 bx
Scrub Top (2XL)	1 bx
Scrub Top (L)	1 bx
Sphygmomanometer (Child)	1 bx
Sphygmomanometer (adult)	1 bx
Defibrillator	1
Particulate Mask	10 CS
Medication Dispenser	2
Blood/Glucose Monitoring system	20
Crutch Adult	10
Crutch Youth	5
Gloves Examination PVC	2 CS
Oral Hygine Kit	1 CS
Hand wash Station	1
Crutch Kits blue	1 CS
Soap Dispenser	2 CS
Post Op Knee Brace	2
Mask Procedure	2 CS
Paper for Life Pack	2 RL

Lab Coats (XXL)	1 CS
Scale patient overhead lift	1
Scale patient overhead lift	1
Surgical Field Sink	1
Scale Pediatric	1
Sharps Container 2 gal	
Disposable Washcloth	2bx
3 Pannel Screen	10EA
Amber Sample Container	1EA
Sandbags	5 HD
Knee High Boot	1 bx
Lanyard	100
50' ft Hose	2
75' ft Hose	1
CPR Manikins	1 lt
Pest Control	1
Cots	20
Diesel Generator 15kw	2
Tent System	10
Generator	1
Mosquito Net	10
Mosquito Trap	2
Mosquito Trap	1
Radio's	1 LT
Respirator air purifying	1
Respirator air purifying	1
Sleeping Bags	70
Lantern - 8D	2 CS
Sleeping Mat	10
Diesel Generator 10kw	2
Flashlight military anglehead	10
Illumination system	1
Life Vest	15
Water Canteen	50
Air Cleaner	1
Diesel Generator 15kw Trailer Mount	1
Disaster Blanket	20
Gas Mask (Need Filters)	6
Microscope	1
Microscope	1
PPE Coverall (L)	4 CS
PPE Coverall (XXL)	2 CS

PPE Coverall (XXXL)	1 CS
PPE Gloves	6
Centrifugal Pump	3
Rain Suit (L)	20
Rain Suit (XL)	10
SCBA	1
Stove Kit	8 CS
Radio 2 way	

Appendix C: Mitigation Strategy Supporting Materials

Mitigation Action Priority Ranking

Action #	Mitigation Action	Life Safety Impact	Administrative Tech Assistance	Project Cost	Other	Total Score	Priority
1	Add a water tower to the Reservation.	10	5	1	5	21	High
2	Conduct a study to determine ways to mitigate risk to the road that serves as the only way on and off the Reservation (other than ferry service). This would need to include a designated space to safely cross the wash. Implement feasible recommendations.	10	1	3	5	19	High
3	Develop a tribal police force.	10	3	1	5	19	High
4	Develop and implement a system to number and label all streets and homes on the Reservation.	10	5	5	5	25	High
5	Improve radio communication for essential staff and first responders.	10	5	3	5	23	High
6	Develop a tribal radio station.	10	3	3	5	21	High
7	Expand the warning siren system on the Reservation to alert people to disasters, especially a dam breach.	10	5	3	5	23	High
8	Add a secondary road off of the Reservation.	10	5	1	5	21	High
9	Airport renovation.	10	3	1	5	19	High
10	Buy and install a generator and solar battery backup for the gym so it may be used as a shelter.	10	5	3	5	23	High
11	Add generators and solar battery backup to sewage lift stations that do not have them.	10	5	5	5	25	High
12	Add a generator to the East Well so water may be delivered during a power outage.	10	5	3	1	19	High
13	Expand CERT on the Reservation by training additional volunteers and expanding training	6	5	5	1	17	Medium

Action #	Mitigation Action	Life Safety Impact	Administrative Tech Assistance	Project Cost	Other	Total Score	Priority
	offerings on the Reservation.						
14	Purchase a couple of LED signs that can be used pre- and post-disaster to inform guests and those on the reservation of current events.	6	5	5	3	19	Medium
15	Develop a flyer to distribute to visitors to the Reservation informing them of heat advisories, the emergency radio station, and current events.	6	5	5	3	19	Medium
16	Develop Memorandums of Understanding with adjacent tribal governments to offer shelter to elders during a disaster.	6	5	5	1	17	Medium
17	Identify vulnerable individuals and populations on the Reservation.	6	5	5	1	17	Medium
18	Purchase a vehicle to use during evacuations.	6	5	3	1	15	Medium
19	Add generators to the department buildings that do not have them, including EPA Department and Administration Building.	6	5	3	1	15	Medium
20	Add backup power for gas	6	5	3	1	15	Medium
21	Collect data regarding	6	5	5	1	17	Medium
22	Update the infectious disease/contamination trailer with current supplies.	2	5	5	1	13	Low
23	Add a generator to the school building.	6	3	3	1	13	Low
24	Develop and maintain fire breaks in the South End to protect the Resort.	2	3	3	1	9	Low
25	Create riparian areas to prevent flooding west of developed areas of the reservation.	2	3	3	3	11	Low
26	Join the FireWise program.	2	5	5	1	13	Low
27	Develop a brush clearing program to protect wildland urban interface areas	2	3	5	1	11	Low

Action #	Mitigation Action	Life Safety Impact	Administrative Tech Assistance	Project Cost	Other	Total Score	Priority
	defined as intermix, these include the Colonies, North and South Valley Mesa Road and Catfish Bay.						
28	Encourage Reservation residents to improve their household preparedness by educating them on how to prepare for hazards as well as how to manage hazards on the Reservation.	2	5	5	1	13	Low

Appendix D: Implementation Plan Supporting Materials

Mitigation Action Progress Worksheet

PROGRESS REPORT PERIOD	FROM:	то:
PROJECT TITLE		
RESPONSIBLE DEPARTMENT		
CONTACT NAME		
CONTACT PHONE/EMAIL		
PROJECT STATUS (CHECK ONE)	Project completed Project canceled Project on scheduled Estimated completion of Project delayed Explanation for delay:	date

Summary of Project Progress for Reporting Period

- What was accomplished for this project during this reporting period?
- What obstacles, problems, or delays did the project encounter?
- If not completed, is the project still relevant? Should the project be changed or revised?
- Additional comments:

Mitigation Plan Annual Review Questionnaire

This worksheet may help your planning team monitor and evaluate the plan. It uses a series of questions to identify areas where the plan may need to be updated to stay current. It is helpful to use this worksheet as a discussion guide when the plan is being monitored and evaluated annually, or according to your plan maintenance procedures.

Plan Chapter	Considerations	Explanation
Planning Process	Are new Tribal jurisdictions invited to participate in future plan updates?	
	Have any internal or external Tribal agencies been invaluable to the mitigation strategy?	
	Can any procedures (e.g. meeting announcements, plan up-dates) be done differently or more efficiently?	
	Has the planning team undertaken any public outreach activities?	
	How can public participation be improved?	
	Have there been any changes in public support and/or decision- maker priorities related to hazard mitigation?	
Risk Assessment	Has a natural and/or manmade disaster occurred since the plan was last adopted?	
	Should the list of hazards addressed in the plan be modified?	
	Are there new data sources and/or additional maps and studies available? If so, what are they and what have they revealed? Should the information be incorporated into future plan updates?	
Vulnerability Analysis	Do any new critical facilities or infrastructure need to be added to the asset lists?	
	Have any changes in development trends occurred that could create additional risks?	

	Are there repetitive losses and/or severe repetitive losses to document?	
Capability Assessment	Are there different or additional technical, financial, and human resources available for mitigation planning?	
	Has the Tribe adopted new policies, plans, regulations, or reports that could be incorporated into this plan?	
Mitigation Strategy	Is the mitigation strategy being implemented as anticipated? Were the cost and timeline estimates accurate?	
	Should new mitigation actions be added to the implementation strategy? Should existing mitigation actions be eliminated from the plan?	
	Are there new obstacles that were not anticipated in the plan that will need to be considered in the next plan update?	
	Are there new funding sources to consider?	
Plan Maintenance Process	Was the plan monitored and evaluated as anticipated?	
	Have elements of the plan been incorporated into other planning mechanisms?	